Interview: Munther Haddadin

Mideast water development: making the desert bloom

Dr. Munther Haddadin of Jordan has had long experience dealing with water resources. He has served as both a public official and private consultant throughout the Middle East. As a former director of the Jordan Valley Authority, with ministerial rank, he was responsible for heading Jordan's central water management institution during the critical years of its existence. He currently serves as chief of Jordan's delegation to the Multilateral Talks on Water, and as the principal expert on water issues on the Jordanian delegation to the Bilateral Peace Talks with Israel. He gave the following interview to Joseph Brewda and Marcia Merry in Washington on June 1.

EIR: Could you describe the physical setting of Jordan and the greater region in terms of water and power?

Haddadin: The occurrence of water is unaware of the political boundaries, so one speaks of the region at large. It is an arid or semi-arid region, because, with the exception of the coastal strip on the East Mediterranean, and a bit in the southwest corner of the Arabian Peninsula, there can hardly be any agriculture there without irrigation. The source of water is precipitation, which is that part of the hydrological cycle where rainwater comes down from clouds which originate in the oceans and the seas. And that precipitation is simultaneously used for rain-fed agriculture in part of the region, but limited to the coastal strip of the East Mediterranean.

Outside of that rainy season, where simultaneous use of precipitation is possible, one has to have storage of the water that precipitates through rainfall, and that storage is either natural or man-made. By natural, we mean the ground water aquifers that feed the perennial flow of rivers, and wadis [seasonal streams] in the region, and that are also the drain for the flood-flows during the precipitation season. By man-made reservoirs, we mean the reservoirs that can be made by the construction of dams on the water-courses, to store flood-flow, and make it available for use later on, outside the rainy season.

The major rivers of the region, from east to west, are the Tigris, the Euphrates, the Orontes, the Jordan, and the Nile. All of them have storage facilities made by man, with the exception of the Jordan River basin, where the storage is actually natural, with a bit of intervention by man, and that intervention is in the form of controlling the outlet of that river from Lake Tiberias through a gated structure, thereby using the lake itself as a reservoir for the storage of flood-flow (**Figure 1**).

The region between the Mediterranean and the desert east of Amman, is the region that faces huge imbalances in the population-to-water resources equation. There are today a lot more people than the water resources in that structure of land can accommodate. And when we say accommodation of man by the water resources, we mean the provision of the means to provide livelihood from these water resources, water needed to drink and clean and for various other domestic and municipal needs, and also to produce food. And that amount of water per capita is in accordance with variation in rainfall, because rainfall, as we mentioned, is capable of producing rain-fed agriculture—food.

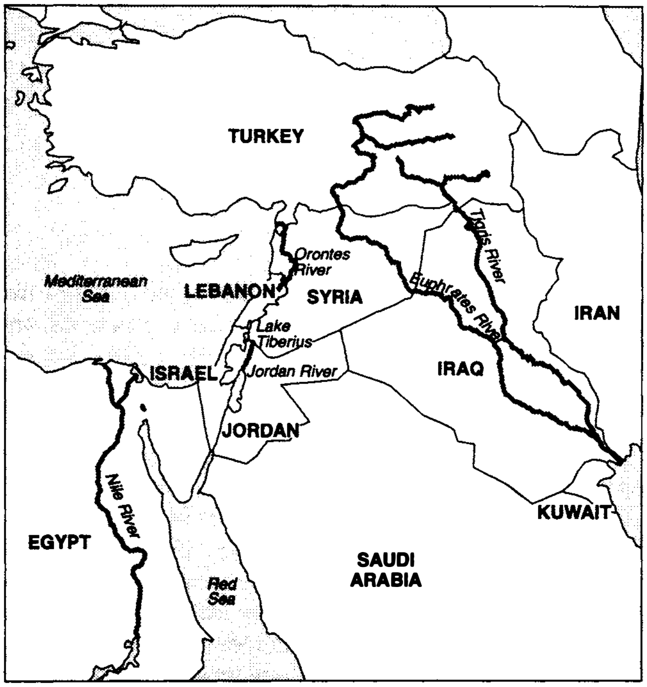
But where that rainfall is not capable of producing that food, or also providing grazing land for livestock, which is again food for man, then we have estimated that about 2,100 cubic meters (m^3) per year are needed for food requirements and drinking water requirements and other domestic use per capita. In areas where there is rainfall to raise rain-fed crops, then the requirement is less than that 2,100.

The above assumes that only 25% of that amount is lost between the source and the point of use, which is a reasonable assumption; that means an overall water use efficiency of 75%, which is something that very few countries in the world have achieved so far. But we know in our region that it can be achieved. And for a society to put its resources to good use and achieve that level of efficiency, I have also calculated that the per capita income in that country should not be less than $2,500 per capita per year, where you take a portion of it for investment in infrastructure to make it so efficient as to allow the loss of only 25% of your water from the source to the point of use. If you are poorer than that, then your efficiency will go down proportionately. Take a country like Egypt, and you see that water use efficiency does not exceed 42%—fortunately for them, the lost water can be used again.

EIR: What about other countries in the region?

Haddadin: If you look at a country like Turkey, you see the water use efficiency does not exceed 38%. They have a lot

FIGURE 1
The five major rivers of the Middle East region



of water, but not enough wealth to divert toward investment in their irrigation sector to make it more water-tight. You look at Jordan, where we could achieve an efficiency of 80% in some regions in the summer, and some 60% in other regions, with an overall irrigation efficiency these days which averages 66%. We did that with a maximum peak of $1,500 per capita per year, and yet we took away a share of other investments to put them in irrigation, and borrowed money, even from the outside, to achieve that. So, when you are cornered for water, you can come up with solutions that make water efficiency higher.

If we say that the water requirement at the source per capita in that region between the Mediterranean and the desert is 2,100 m^3 per capita per year, as we look at the availability, we see that it is short of that number; so much so, that, with today's population in Jordan of 4 million, you can calculate that a requirement of perennial flow of water is something like 1,200 m^3 per capita per year to produce our food and cope with our municipal requirements. The balance of the 900 m^3 per capita per year is provided by rain-fed agriculture. Of the 1,200 requirement, we only have 200. So, we only have 15% of the water we need in 1992 to maintain a balance in food trade. By food trade, I mean that you produce and consume food, and you export the surplus, but you also import other foods which you did not produce. To get a balance in that trade you need something like 1,200 m^3 per capita per year.

You look at Israel, and you see that requirement per capita is less, because of the advantage they have of rain-fed land. This is also the case in Lebanon. You look at Egypt, and you would definitely need that minimum of 2,100, if their efficiency is 75%, but we know that their efficiency is not that. So their requirement would go up to something like 3,500 m^3 per capita per year. The precipitation season there does not allow rain-fed agriculture; all their food production is irrigated. With that, one discovers why Egypt produces around only 60% of their food requirements.

Whoever thinks there is surplus water in the Nile should think again. Either you would have to double the Nile flow with the current efficiencies to maintain that balance in food trade for Egypt, or you would have to reduce consumption by one-half, through capital investments in irrigation systems, to make them more efficient in conveyance and distribution, and training farmers to operate these new systems. They would eventually wind up with drip irrigation systems on the farm, and pipe distribution systems, and maybe large, lined canals for conveyance, to minimize losses. Now, where would a country like Egypt come up with the capital to improve what the Pharaohs have done?

EIR: What countries are potentially food self-sufficient?
Haddadin: The countries that have potential to become food self-sufficient, in the political borders as known today, are Iraq, Lebanon, and Turkey. The other countries are not capable of reaching that level of self-sufficiency. They would have to be net importers of food at this time, and more so in the future, unless technological breakthroughs in biotechnology will increase food production per unit flow of water.

EIR: What should be done about this gap between available and needed water?
Haddadin: The gap has two terminals, the supply terminal and the demand terminal. The gap is in-between. Today we have much higher demand than supply, and the solution is to work on both. The supply side, through augmentation of the water resources, and, on the demand side, controlling the demand.

Look at the region between the Mediterranean and the desert. If you look at its water resources and its arable land, and precipitation, I've calculated that that region can possibly sustain something like 5 million people at the most, with today's technology. What do we have today? Something like 10 million people. The problem is carrying capacity.

To work and control the demand has also multiple avenues. One is research and extension. How best can you manage the limited water resources and produce the maximum tonnage of that limited flow of water that you can bring to that plant? We have depended in this field on research done elsewhere, in the developed sector. Instead of producing 2 tons per unit flow, you can produce 10 tons, using the same kind of water. How much and when to irrigate and what kind of plant species should be used? There comes also the technological facilities of automatic control, so you can drip your water when the plant needs it exactly, balance the evapotranspiration with the water supply to the plant.

More importantly, you have to control the growth of population. And in that region you have two kinds of growth: One is natural and the other is man-made. It is man-made through forced migrations that create regional demographic imbalances. You throw more people into Jordan, and Jordan has to carry these people without resources. And then you bring in migrants from elsewhere in the world, like Israel has done. So, how do you plan to make a livelihood for all these people, the displaced and the newcomers, if you look at the resources of the region? Otherwise you would be totally dependent on other countries of the world for your subsidies.

On the natural growth, you have to work on education. There are cultural and religious factors that you have to cope with, where the population is indigenous and has roots in history. But there are also factors that governments today can put a control on, by controlling incoming waves of migrants. Why bring them into Palestine and Israel, when they can stay where they are, with an improved environment for living, like in Russia? They have better chances in Russia than they would have in Israel. So this is the demand side.

On the supply side, you speak of using the water more efficiently, of protecting the water resources from degradation in quality and pollution, to maintain them for sustainable use. Then you can tap the potential usage of the lower-quality water the region has, on the proper type of soils, sandy soils. These are within the reach of every country, if capital is made available. And brackish water, limited as it is in the renewable sense of water resources, but it is not very limited when you talk of fossil water.

EIR: Do you think it is a reasonable idea to use this fossil water?

Haddadin: The use of fossil water is not renewable. There will come a time when it is not there any more. So you don't want to end up like the coal mine villages in the U.S., that were set up and then had to be abandoned when the source of supply was gone. We should not use it, if we have lost hope of developing cheap and safe power, like fusion power. But if that hope is there, I would definitely go in and use the fossil water.

EIR: What about other methods?

Haddadin: Well, there is the transfer of water from one basin to another. And that, too, works within each country and the region at large. We carried out projects that transfer water from one basin to another for municipal purposes, and that is expensive. You practically run out of water resources that can be economically developed and transferred. They do it in Syria. They do it in Iraq, where water from the Tigris is transported to the Euphrates. They've done it in Israel, where water of the Jordan River has been transported over to the desert. But by doing that, the Israelis are just using water against its nature. Naturally, you generate power with the use of water. In these cases, you need power to take the water out. That's where we treat water and energy as twins. To reclaim brackish water, you also have to have energy.

So the interbasin transfers have been made, in Jordan, from the Jordan Valley over to Amman, from the Azraq Oasis over to Amman, from the Jordan Valley over to Irbid, and from Wadi Wala over to Amman. In Israel, it's from Lake Tiberias all the way down through the National Water Carrier to the desert. In Iraq, from the Tigris down to the Thartar Depression over to the Euphrates. In Syria, from the Euphrates over to Aleppo. In Lebanon, from the Litani River over to the Awali River for power generation. This is possible within each country to relieve regional shortages.

When you look at a country like Syria and its inland water resources, you would find something like 900 m^3 per capita at this time, available to Syrians, only from the inland resources. You have to add to that their share of the Euphrates River. And that would bring them closer to self-sufficiency, or the balanced situation in foreign trade in food commodities. But you look at the Damascus area and you find the water stress there high, because of the demand for municipal water. You look at resources which historically have been used for agriculture, and now they have been diverted for municipal and industrial uses in the Damascus urban area.

That's why you see farmers around Damascus drilling wells, despite the legislation that prohibited that. There is an overpumping of ground water aquifers, to the extent that there is a drawdown of something like 7 meters per year, which is a danger to these aquifers, despite the availability of water elsewhere in the country. It is capital-intensive to bring water from the water-rich regions inside Syria to the high demand areas. But you could solve the country's problem in a fashion like that.

This does not, however, relieve the region of a shortage of water, and when you speak of the region, you go all the way down to the Arabian Peninsula, even over to Egypt.

If you look for the areas of water surplus at this time, you identify the Tigris, and Turkey as such.

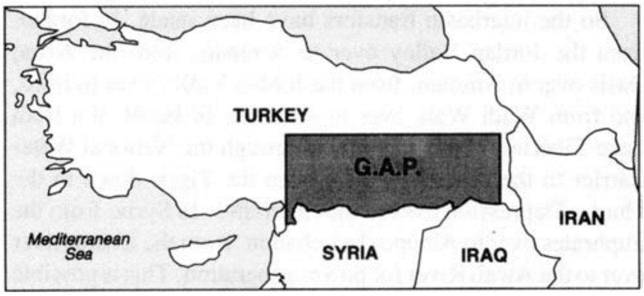
EIR: There seems to be increasing tension between Turkey, Syria, and Iraq over their shared use of the Euphrates and Tigris rivers.

Haddadin: If you look at the situation between Turkey, Syria, and Iraq, you look at a standoff over water-sharing of the Euphrates and the Tigris. More sensitive is the Euphrates, because of the actual dependency of Iraq—and of Syria—on the waters of that river. Turkey has also come in, too, to establish a dependency on the waters of the same river.

The storage facilities on the Euphrates itself total 106 billion m^3 worth of storage capacity. But the river's annual flow does not exceed 32 billion. So you have three times as

FIGURE 2

Area targeted for development in the Southeastern Anatolia Project (GAP) in Turkey



much storage capacity as you have flow. Granted a good part of that storage capacity is meant for power generation, but the new structures, primarily the Ataturk Dam, have a dual purpose: to consume water for irrigation and also use water for power generation.

If you look at the consumptive uses that are planned by each riparian [state] and the total thereof, you would need something like 55 billion m^3 of the Euphrates' flow to satisfy the planned consumptive use of the Euphrates water. But that river yields on the average something like 32 billion, so you are short of the claims by each riparian state as opposed to the total flow of the river. So what do you do in this case?

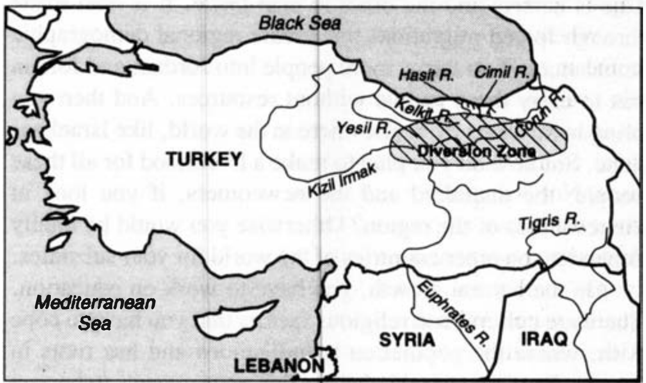
It is an established fact that the dependency that Turkey plans or has planned on the river is now being enforced at a late stage, compared to the usages in Iraq and Syria. And Turkey has a justified reason to do that, to develop Southeast Anatolia where poverty is very widespread, and to increase the population in that area, have it develop, and halt the rural-to-urban migration. It is a worthwhile objective that Turkey is after, under GAP, except that the water needed for that project will tip the balance of uses that the three riparians have previously talked about. [GAP is the Guneydogu Anadolu Projesi, or Southeastern Anatolia Project, a planned system of 21 dams and 17 hydroelectric power plants on the Euphrates and Tigris rivers. See **Figure 2**—ed.].

EIR: What should be done about this?

Haddadin: One way of solving that standing dispute is to increase the flow of the Euphrates. How? If you look at Turkey and the coastal plain adjacent to the Black Sea, you will find that precipitation on that area is high enough and long enough in duration to demand minimum amounts of water for irrigation. You also will see a series of rivers originating in the Turkish plateau that flow north into the Black Sea. These rivers have been put to use for power generation only, and modest irrigation uses for the arable land in the north, closer to the Black Sea. When you check that, I think

FIGURE 3

Proposal to augment the flow of the Euphrates River, by diverting southward some of the water now flowing into the Black Sea



you will find that water of these rivers can be saved and diverted toward the Euphrates River, so that you maintain the irrigation requirements of the Black Sea area. The highest rainfall in Turkey is here, in the Rize region.

So you maintain the irrigation requirements for the plains of north Turkey near the Black Sea, and you divert the surplus waters toward the Euphrates. Doing that, you would also be able to generate power from these flows from the dams that are already constructed downstream on the Euphrates itself. And you increase that flow in such a way as to bring Turkish water into Turkey, over to the GAP. The Turkish part will irrigate Turkish land; plus their potential share of the regional flow of the Euphrates (see **Figure 3**).

These two waters, that of the Euphrates and the new waters that we add, can cope with the demands that the GAP project requires, and will leave enough water for the basin in Syria, and the basin in Iraq. There should be something close to 20 billion m^3 of water added as a result. That again requires heavy capital development in terms of investment. So when you bring in 20 more from the north to the 32 that there is on the average, that's 52.

Then, you can also work on the irrigation technology in all three states, so that you can produce the same, irrigate the same area with less water through higher efficiencies. And there you would have more surplus of water in the Euphrates basin, which you could share with other countries in the region.

EIR: What about drainage problems resulting from the new irrigation?

Haddadin: When these irrigation systems are at "cruising altitude" in terms of water uses, there will be drainage problems in the new irrigated areas, especially in the GAP region. The natural outlet for the drained water would be the Euphrates basin itself. Now that by itself poses dangers on the quality of river water in the Euphrates, if you let the drained water blend with the flow of the river. This has been witnessed with the irrigation that is already there, in August 1989 at the Syrian-Iraqi border, where the salinity levels went up to 900 parts per million of total dissolved solids; and that is about triple the undisturbed salinity value in the Euphrates.

When more areas are irrigated, more drainage waters come in, and you have to protect the quality of the water. You can do that by building a huge drain in the river basin to intercept the drainage water and carry it away from the river course itself. Also, that drainage water has potential uses. Not essentially for the same cropping patterns that the river water can support, but with different cropping patterns in desert areas, you could start a livestock industry, fodder crops—barley and other fodder crops that tolerate lower-quality water. With that kind of development you open territories for civilization, for settlements for the growing population of these countries, be it Iraq or Syria.

With adequate engineering norms, you will be able to recover no less than 50% of the used water. Where would that water go? It would either go to aquifers and mix with the sweet water, or it would clog, and then you would have to dig trenches and drain it. Part of it goes through evapotranspiration into the atmosphere and water cycle, but no more than 15% of the water applied; so the other 85% finds its way into the Persian Gulf, or into aquifers, or gets clogged. The Iraqis have built such drains, the Great Drain, which they are still working on, between the Tigris and Euphrates. Maybe this new drain could be linked up with that Great Drain, and drain into the Shatt al Arab, which is not used anyway, except for navigation. And you will see the beneficial effect on the environment of the Gulf, with less-saline water flowing into it, brackish as it is (see **Figure 4**).

The same applies to the Nile basin. True, there are severe limitations on the transfer of Nile water outside the basin. There are nine riparian states on that river. You cannot just unilaterally transfer the water of the Nile elsewhere because of the needs of one riparian. But you could use the drainage water. You cannot reuse the drainage water in the Delta, because of the historic dependence of that delta on the fresh water of the Nile. But you could use it to open new territories in the Sinai, or in the west, depending on the lift that is needed.

FIGURE 4
The route of the 'Great Drain'

A run-off channel, under construction by Iraq, to carry away used water, to protect the water quality of the Tigris and Euphrates Rivers, and regional groundwater.

EIR: What about the Jordan River?

Haddadin: I think people are giving it too much importance. The total flow of the river is not enough for the population of the region. It can sustain 5 million. It has 10 million. So regardless of how it's resolved, it's not going to solve anyone's problem. Any adjustment in water-sharing would shift part of the headache from one side to the other, but the headache is there. So, it's not new to me; it's not new to the Israelis. They have their headaches; we have our headaches. But we look at the water-sharing as a takeoff platform for mutual cooperation. I cannot really go out with you, if I know you have stabbed me in the back several times, and you are about to stab me again. But then we clear up our record, set the record straight, and then join hands for future cooperation.

EIR: There have been proposals to build a canal from the Mediterranean to the Dead Sea and from the Red Sea to the Dead Sea.

Haddadin: Either of these schemes, from the Mediterranean to the Dead Sea, or from the Red Sea to the Dead Sea, has the objective of controlling the level of the Dead Sea. The Dead Sea has been receding because of man's activities, the diversion of the Jordan River waters to the Negev, our use of the basin. But our use drains back into the Jordan. So, our part of the responsibility is much less than the Israelis, where the entire water is diverted outside the basin. And there are the effects of the potash mining on both sides (see **Figure 5**).

The level of the Dead Sea has fallen dramatically and has an effect on the stability of the aquifers on both sides, we think. The water column of the Dead Sea, when high, will suppress the outflow of fresh water into the sea because of the pressure of the water column. Now, if that water column is lowered, the pressure is less, and then you lose your fresh water, on both sides of the Dead Sea. So, either of these plans has as its objective maintaining the historical level of the Dead Sea by transferring waters from the open seas to that closed lake, the Dead Sea.