

WATER TRANSFER FROM TURKEY TO WATER-STRESSED COUNTRIES IN THE MIDDLE EAST

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ABSTRACT

The world as a whole has witnessed a substantial increase in water consumption during the last century stemming from rising affluence, rapid urbanization and population growth. This trend will continue in the decades to come as water resources are getting scarcer and more polluted in many parts of the world. It has been reported that some of the countries of the Middle East will suffer most and face serious water crisis during the next 25 years. In no other region is water considered as politically sensitive and strategic resource as in the Middle East. Given the gradual worsening of hydrological and climatic conditions and the transboundary nature of the rivers of the region, water issues might lead to tensions and worsening of relations between States.

In this context, what role governments, international organizations and NGOs could play to properly address the anticipated water crisis? Turkey has made great strides in water resources development and management during the last three decades. It has the potential to play an important, constructive and beneficial role to this end.

Turkey seems to be the only country where fresh water is available and it can be transported either by pipelines or tankers to the region. To this end we have introduced the concept of transfer of fresh water by sea and are planning to supply water by utilizing the unpolluted and unusable waters of the rivers originating in the Taurus Mountains in the southern coast and feeding into the Mediterranean Sea.

An intergovernmental agreement between Turkey and Israel was signed concerning the purchase by Israel of treated water for a period of 20 years. The water will be shipped to Israel by purpose-built tankers. The provision of 50 million cubic meters per annum of water to Israel and the potential to transfer additional quantities might ease the pressure on the limited water resources in the Jordan River Basin.

As a result Israel might consider sharing more water with its neighbors.

Turkey has planned and realized various multi-purpose water infrastructures including the 32 billion US Dollar GAP project. GAP is one of the world's largest and most comprehensive sustainable development projects in the basin of the Tigris and Euphrates rivers. It has been internationally recognized as an example of a successful passage from simple water development to efficient water management.

Another regional project which Turkey has developed is the "Peace Pipeline Project" which seeks to provide freshwater to Syria, Jordan, Palestine, Saudi Arabia and other Gulf States from its rivers, namely the Seyhan and the Ceyhan. According to the project, an annual amount of 2.2 billion cubic meters of fresh water will be transferred by two large diameter pipelines. The pre-feasibility has shown that the project is feasible and applicable.

It is the view of the author that Turkey has the will and the capacity to contribute to the establishment of an enabling environment for socio-economic development of the people of the region which in turn could enhance peace and security in the Middle East.

INTRODUCTION

Of all the planet's renewable resources, water may be the most unforgiving. Difficult to purify, arduous to store and impossible to substitute, water is essential to food, to socio-economic development and to life itself. Access to water is critical to all aspects of life whereas hundreds of millions of people do not have access to safe drinking water and sanitation.

Throughout most of human history, the world's fresh water reserves were more than adequate to serve human needs while maintaining the integrity and biological diversity of the earth's ecosystems. But as populations have grown, water has become increasingly less available where and when it is needed.

The world population more than doubled, from 2.3 billion to 5.3 billion between 1940 and 1990. It has augmented to 6.3 billion today

and is growing by almost 10,000 an hour. It is expected to reach 7.2 billion by 2015 according to UN reports. The same reports suggest that two-thirds of the world population shall experience lack of safe drinking water by 2030.

Per capita use of water consumption doubled from about 400 to 800 cubic meters per person per annum between 1940 and 1990 due to increased affluence, rapid urbanization and industrialization.

Understanding the limits of renewable water resources requires an analysis of how little of the planet's 1.4 billion cubic kilometers of water fits into that category. Only 2.5 per cent of this 1.4 billion is fresh meaning suitable for drinking, growing crops and most industrial uses. Besides, 69 per cent of this 2.5 per cent is locked in polar ice caps and mountain glaciers or stored in aquifers too deep to tap under current and foreseeable technology.

Fresh water availability is dictated, to a large extent, by climate, and particularly by the timing and location of precipitation and by evaporative demand which is put in calculations in terms of hydrology to indicate how much moisture the atmosphere can absorb that is chiefly determined by average temperature. Some arid countries in the Middle East and North Africa have such low precipitation and high evaporation that only a small amount of water can be captured for human use. By contrast, countries such as Sweden, Norway, Denmark, Great Britain, Iceland, Canada as well as the Benelux countries, where precipitation high and evaporative demand low, enjoy abundant water resources yearlong.

Water availability can vary tremendously from season to season, causing wet and dry seasons even in well-watered regions. For example, Bangladesh is inundated with rainfall during its two-to-three month monsoon season, but lacks rainfall for much of the rest of the year. Water availability also varies from year to year, making even semi arid-regions vulnerable to a succession of dry years, gripped 20 sub-Saharan countries from 1981 to 1984 and California and more recently east and southeast Turkey from 2000 to 2002.

To serve the purpose, water resources must be in close proximity with the populations that need them. Three quarters of Mexico's

population lives in its dry central highlands, while four-fifths of the surface water lies in the wetter coastal regions.

In calculating how much fresh water is available for human use on average terms, what counts is not the sum total of global fresh water supplies, but the rate at which fresh water resources are renewed or replenished by the global hydrologic cycle. Powered by the sun, this cycle each year deposits about 113,000 cubic kilometers of water on the world's continents and islands as rain and snow. Of that, 72,000 cubic kilometers evaporates back into the atmosphere. That leaves 41,000 cubic kilometers a year to replenish aquifers or to return by river or other run-off to the oceans.

Moreover, not all of this water of 41,000 cubic kilometers can be captured for human use. More than half flows unused to the sea in floodwaters and as much as one-eighth falls in areas too far for human habitation to be put in service for use. It is suggested that the upper limit of the world's available renewable fresh water resources lie between 9,000 and 14,000 cubic kilometers per year. An uncertain yet significant proportion of this amount is needed to sustain ecosystems in and around rivers, wetlands and coastal waters and the millions of living species they contain. If this uncertain amount of water were also included in the calculations made to establish the figure for the available water per capita in terms of 6.3 billion world population as of today and 7.2 billion as of 2015, the results would be 2222 cubic meters/person/year and 1944 cubic meters/person/year respectively, based on 14,000 cubic kilometers as the upper limit and 1429 cubic meters/person/year and 1250 cubic meters/person/year respectively emerged from 9,000 cubic kilometers as the lower limit for the total available water for possible human use worldwide.

The critical fresh water availability limits, as a matter of fact, are not at the global level but at local, national and regional levels. In measuring a country's water resources, hydrologists refer to the term *endogenous* (e.g. *endogenous precipitation*), or internal, and *exogenous*, or external, resources. Internal supply refers to the precipitation that falls on national territory, minus that portion lost to evaporation. Endogenous water supply is that which flows into a country from rivers or aquifers originating in neighbor countries. While most of both kinds of renewable fresh water would be available

for a country's use under ideal conditions, many countries can only mobilize a part of their water resources potential, depending on the suitability of their land for water storage in reservoirs and the extent and the condition of their water infrastructure.

Some developing countries can currently mobilize only 20 to 30 per cent of their potential water resources.

TURKEY'S WATER POTENTIAL

A common misconception that needs to be dispelled at the outset is the idea that Turkey has abundant water and Iraq suffers from water scarcity. In fact, contrary to the general perception, Turkey is neither a water rich country nor the richest country in terms of water resources in the region.

The annual average precipitation in Turkey is estimated at 643 mm, corresponding to a volume of 500 cubic kilometers or 500 billion cubic meters. The annual run-off in the aftermath of natural events is calculated as 186 billion cubic meters. Subtracting from this figure the minimum flow requirements for pollution control, aquatic life as well as the amounts happen to be constrained as useless within topographic and geologic conditions, the annual available water potential emerges as 98 billion cubic meters. If the extractable groundwater potential of 12 billion cubic meters is added to abovementioned figure, the total annual water resources potential in Turkey is computed as 110 billion cubic meters. The amount of available water per capita per year is then 1,486 cubic meters as it is found dividing the figure above by the population of Turkey which is 72 million as of mid-2004.

Precipitation differs considerably both from year to year and among the river basins. The annual depth of precipitation is as high as 250 cm in the Eastern Black Sea region and as low as 30 cm in some parts of Central Anatolia. Most of the country's water potential lies in the south-east. The contribution of this region to the country's total water potential is 28 per cent.

On the other hand, Turkey has also considerable hydropower potential, among the highest in Europe. The feasible hydropower energy potential is estimated at 125,000 GWh/year (Giga Watt

hour/year). The installed capacity potential for hydropower is 35,000 MW (Mega Watt).

WATER AND SUSTAINABLE DEVELOPMENT

Turkey attaches importance to the elimination of regional disparities in the socio-economic development of the country. This concern originates from the sound diagnosis that mobilization of the development potential of least developed regions would contribute greatly to the realization of such national goals as economic growth, social stability and a rise in export capacity. In this context, Turkey has developed one of the world's largest sustainable development projects in the Tigris-Euphrates River basin.

The Region is also named as the "Fertile Crescent" or "Upper Mesopotamia", and known to be the cradle of civilization in human history. Throughout history, the Region has served as a bridge ensuring passage from Anatolia to Mesopotamia.

The Tigris and the Euphrates, two important transboundary rivers, flow through the Region. Both originate from Eastern Anatolia and reach to sea in the Persian/Arabian Gulf. Southeastern Anatolia receives less precipitation compared to the other regions of the country. Hence the utilization of the rich water potential of the two rivers for the realization of GAP. It would not be an overstatement to suggest that the project is starting an economic revolution in southeast Turkey.

The high potential generated in both agriculture and industry by the GAP has already tripled the average income in some areas and will increase the income level of the other areas in the region fivefold when the remaining components of the GAP project is put under operation and will generate employment opportunities for 3.8 million people living in a region whose total population is projected to be over 9 million in 2005.

TURKEY'S WATER RESOURCES POLICY

Turkey has developed its water resources policies over the years taking into consideration recent developments at global and regional levels, its contractual obligations, the on-going EU accession process

as well as Turkey's present and future water needs for its fast-growing population.

Priority has been given to fully utilize Turkey's water potential in an efficient manner through necessary measures and projects. To this end, the focus has been on protection of quantity and the quality of the available resources but more importantly on building new water storage capacities in the deep canyons of Anatolia where water can easily be utilized not only for irrigation but also for hydropower generation.

TURKEY'S ACCESSION TO THE EUROPEAN UNION

Turkey as a candidate country to the European Union (EU) is expecting to start accession talks with the EU in 2005. In this context, a "National Environmental Strategy and Action Plan" sponsored by the World Bank has been adopted. The Plan was identified as a comprehensive one by the OECD's Environmental Performance Review. Turkey has also started harmonizing its domestic legislation with that of the EU in the field of environment and water resources.

As regards the harmonization in the field of water resources the Ministry of Foreign Affairs has established two working groups with the participation of representatives of relevant institutions, legal experts, academicians and representatives of the private sector. One of the working groups will prepare the new water legislation taking into consideration Turkey's basic needs, the EU Water Framework Directive, other relevant EU legislation and regional conventions.

The second working group will carry out the work necessary for the restructuring of the Turkish water institutions. The working group may propose a reassignment of responsibilities among relevant ministries and institutions and the establishment of new bodies to meet EU standards.

The harmonization of the Turkish legislation and the restructuring of the institutions will be accelerated with the accession talks. The EU Commission is expected to do its part to reach the set objectives in due course.

TRANSBOUNDARY WATERS

It is the view of the author that water is not necessarily a source of conflict. On the contrary, it could be used as a catalizator and bridge-builder. History suggests that there is more tendency to cooperate for water rather than to fight for it. However, the use of water as a bridge-builder and a source of cooperation require visionary thinking. It entails enhancing awareness. It should be kept in mind that water is a social problem and therefore the value of water and its limited availability should be put in the mind of the people.

As regards transboundary waters, Turkey is an upstream as well as a downstream country. Given the high altitude of Turkey which is 1100 meters on average (world's average altitude is 900 meters) it has fast running rivers with irregular natural flows. They should be regulated for their efficient use and flood control. The Tigris and the Euphrates are a case in point.

Turkey's transboundary waters policy has always been consistent and transparent. This very fact is acknowledged by international experts. Turkey's policy is aimed to efficiently utilize and share the benefits of water resources through cooperation among riparian States. Contrary to certain allegations Turkey has never overlooked the needs of the downstream riparian States even during the drought periods. For example, 1988 and 1989 were the driest years of the last half century. At the height of the summer, the flow of the Euphrates was around 100 cubic meters per second. In spite of the unexpected low natural flow Turkey was able to go on releasing water to downstream neighbors more than 500 cubic meters per second. It follows that Syria and Iraq benefits from the water infrastructures that Turkey has built on the Euphrates.

In view of the economic crisis faced in the aftermath of the Gulf War and the ensuing budget measures recommended by the IMF Turkey has unfortunately not been able either to build the Ilisu Dam on the Tigris river which is essential to regulate the flow or to complete the planned irrigation systems.

Turkey is for the utilization of the waters of the Euphrates and the Tigris rivers in an equitable, reasonable and optimal manner. In my view, the combined water potential of the Tigris and Euphrates

rivers in Turkey's view is sufficient to meet the needs of the three riparian States to achieve sustainable development provided that water is used in an efficient way and the benefits are maximized through new irrigation systems and technologies throughout the basin, Syria and Iraq included.

By the same token, the riparian States should adopt a comprehensive approach to the matter. Such an approach calls for determination to discuss all water-related issues in a transboundary context. It entails sharing of responsibility as well as the benefits. Cooperation between riparian States should take into consideration the existence of "two rivers and a single basin" as well as the variations in the natural hydrological conditions of the basin.

Moreover, efficient use of water in a transboundary context requires proper and detailed information exchange between the riparian States. Such an exchange is also essential for a sound integrated basin management. In the case of the Tigris-Euphrates Basin, the three riparian States should, as a starting point, express their political will at the highest level to engage in a meaningful cooperation.

CONFIDENCE BUILDING MEASURES (CBMS) IN THE CONTEXT OF TRANSBOUNDARY RIVER BASINS

As stated earlier, water issues are not only of technical nature but also have certain political and social aspects. It follows that among riparian States and their people they can not be resolved without building mutual trust and confidence among riparian States. Parties concerned should first and foremost free themselves from nationalist rhetoric, clichés, emotions and prejudices.

Confidence building measures should be taken in order to dispel mistrust and create the appropriate environment for meaningful cooperation.

Information and data should be shared at basin level. Riparian States should have the political will to engage in genuine cooperation. Such cooperation could lead to reaching a common understanding on the utilization of the water of transboundary basins in the interest of all.

Confidence building efforts could, in my view, be initiated through informal exchange of information and data at expert's level. Such a

dialog can be further developed by discussions on general principles to be applied in the utilization of the water resources of the basin.

Another form of CBMs could be developed in the form of sharing the benefits of water among riparian States through cross-border projects.

Another effective form of CBM in this context could be to share the benefits of water through joint projects having to do with agriculture, irrigation, hydropower generation, provision of safe drinking water and water for sanitation and last but not least projects designed to protect the environment.

In short, I agree that the issue of water in our region is complex, emotional and political and therefore it will remain with us in the decades to come. However, it should be the will of all riparian States to try to resolve the existing problems. If we cannot solve them, we should at least continue to talk and exchange information so that we could manage them by peaceful means.

WATER TRANSFER TO THE MIDDLE EAST: THE SITUATION IN THE MIDDLE EAST

The Middle East is historically a water-stressed region. It becomes clear that sustainable supply of clean water is a major issue of social, economic and even political dimension in the Middle East. The Jordan River basin suffers serious water shortage in particular and the situation is expected to worsen in the near future.

According to Dr. Abdel Rahman Sultan, a representative of an NGO called Friends of the Earth Middle East (FOEME) Jordan has water service for only 12 hours each day and most Palestinian villages do not have access to uninterrupted water supply. He adds that the growth rates of Palestinian annual population run at the level of 4 per cent on average and the corresponding figure for Israel is not less than 3.5 per cent. Therefore, the water demands of this ever-growing population in the region surpass a water supply that will grow only slightly in spite of a main thrust to build desalination plants. Furthermore, the level of the Dead Sea is going down by a meter each year.

Given its economic and industrial potential and the regional economic cooperation projects it has so far developed, Turkey has the potential to play an important, constructive and beneficial role in the region.

THE MANAVGAT RIVER WATER SUPPLY PROJECT

In view of the anticipated water shortage in the Middle East in the near future, Turkey introduced the concept of water transfer by sea to water stressed countries from its national rivers flowing to the Mediterranean where there is for the time being a surplus of fresh water.

The Manavgat Water Supply Project on the Manavgat river has been developed with a view to providing fresh water to the Mediterranean countries. The water treatment capacity of the Manavgat Water Supply Project was designed to supply high quality bulk water. The capacity of the facility is 180 million cubic meters per annum (500.000 cubic meters daily), 90 million cubic meters of which is treated water.

The Manavgat Water Supply Facilities are at the estuary of the Manavgat River, 80 km east of Antalya on the Mediterranean coast, is 600 km (324 sea miles) from Israel's Ashkelon port, to which the water is planned to be shipped. Water will be shipped to Israel by purpose-built tankers. A shipping company has yet to be chosen while Israel will equip its ports with a suitable water storage facility. A trilateral agreement between the two governments and the eventual shipping company will be negotiated at a later stage.

The water extracted from this river is carried by means of steel pipelines all the way to the treatment plant. Half of the water extracted from the river, (250.000 cubic meters daily), is treated in the treatment facilities fully equipped with aeration, coagulation, filtration and disinfection units to internationally accepted standards. The Manavgat River has an annual water potential of 3.6 billion cubic meters. It follows that more water could be drawn from the river by increasing the capacity of the installations, when necessary.

Following treatment, the water will be carried to the two Single-Point Mooring (SPM) loading terminals situated three kilometers off-shore

by the pipes laid on the sea bottom. Each terminal is able to load simultaneously two tankers with capacities of up to 250.000 dwt

WATER SALE TO ISRAEL FROM THE MANAVGAT RIVER

Israel has been the only country to date which expressed its political will to purchase treated water from the Manavgat River.

Water shortage in Israel was more visible two years ago. The drought experienced in the Jordan River Basin as well as other considerations led to the expression of the political will by the Prime Minister of Israel to purchase water from Turkey despite opposition from the Ministry of Finance and the desalination lobby. Accordingly, the Prime Minister of Israel, H. E. Ariel Sharon and the Former Minister of Energy and National Resources of Turkey, H. E. Zeki Çakan held a meeting on 6 August 2002. in Jerusalem in order to discuss the Manavgat Water Supply Project to Israel.

During the meeting, the Israeli side expressed its interest in purchasing 50 million cubic meters of treated water per year from Turkey for a period of 20 years. A “Joint Committee for the Manavgat Water Supply Project to Israel” was established.

The First Joint Committee Meeting was held in Ankara on 14 October 2002. During the Joint Committee Meeting, various shipping companies from Turkey, Israel and third countries presented their projects on the transportation of water from Manavgat to Israel by tankers. It became clear during the meeting that treated water cannot be transported by converted oil tankers and that purpose-built tankers have to be used in order to maintain the quality of the water.

The Israeli experts have also included the amount to be imported from Turkey in their water budget. It was made public during the Stockholm Water Week in August 2003.

Finally, an intergovernmental agreement (IGA) between Turkey and Israel was signed. Under the agreement, Israel will buy 50 million cubic meters of treated-water a year from Turkey for a period of 20 years. That would account for about three percent of Israel’s annual freshwater consumption of 1.5 billion cubic meters. The most

important aspect of the agreement is the recognition by the two States of water as an internationally traded commercial commodity.

However, given the very good precipitation of last winter and spring and the rising water level of the Dead Sea which usually dictates the behavior of Israeli water authorities who have been reluctant to speed up the process regards water imports from Turkey. In other words, it seems that there is no sense of urgency on the part of Israeli side to conclude the necessary trilateral agreement without which the signed framework agreement shall not enter into force.

The Israeli authorities should in my view engage in long-term planning and open an international tender without further delay in consultation with Turkey in order to nominate the company or group of companies which will undertake the transport of the water.

This project, will, in our view, contribute to efforts deployed toward enhancing peace and stability in the Middle East as well as to the socio-economic development of the region. Turkey's unused waters flowing into the Mediterranean could contribute to reducing the tensions on this politically sensitive resource by way of making it possible for Israel to share more water with the Palestinians and possibly Jordan, especially in the context of a comprehensive and durable settlement in the region. Water sale from Turkey to Israel could help the efforts that are deployed towards ironing out the water problems experienced by Israel, Jordan, Syria and the Palestinians in the Jordan River basin.

It could be argued that desalination may be an alternative for supplying of additional fresh water to the region. However, the quality of water of Manavgat River is far superior to desalinated water in terms of mineral content and other qualities. In addition, it is environment friendly contrary to desalination plants which use various chemicals and release mountains of salt.

Consequently, Turkey and Israel have signed an agreement on 4 March 2004 regarding water purchase by Israel from Turkey. This agreement shall enter into force upon the signing of a tri-lateral agreement between Turkey, Israel and the winner of a contract of which the subject matter will be the transportation of water of Manavgat to Israel.

It has been decided that Manavgat Water Treatment and Loading Facilities will be privatized. The Manavgat Water Supply Project has the capacity to supply water to other needy countries and it is Turkey's hope that it will eventually be possible to supply water to other Mediterranean countries suffering from water shortage, including Syria, Jordan and Greece.

WATER TRANSFER TO THE REPUBLIC OF NORTHERN CYPRUS

Water transfer by plastic bags to TRNC

In view of the water shortage experienced a protocol was signed between the Ministry of State responsible for Cyprus Affairs, Ministry of Energy and Natural Resources of Turkey and the Ministry of Interior and Rural Affairs of the TRNC with a view to supplying water to the northern part of the island from Turkey in 1997.

A project was developed to feed the water network grid established among Güzelyurt-Lefkoşa-Gazimagosa from an outside source and to meet the drinking water requirements of Lefkoşa and Gazimagosa in the total amount of 7 million cubic meters per year by way of transportation of water from Turkey.

In the framework of the abovementioned protocol, the Ministry of Interior and Rural Affairs signed an agreement and made a contract for a period of 10 years with a company established and titled "Mediterranean Water Distributor" by the "Nordic Water Supply", the Norwegian producer of navigable plastic bags, in Turkey in 1997. The price of water was determined as 55 cents per cubic meter in accordance with the provisions of the said agreement. However, the operation started by Nordic Water Supply in 1998 lasted only 4 years having managed to transport a total of only 4 million cubic meters due to technical deficiencies experienced under rough sea conditions in that duration. The contact of the Nordic Water Supply has been cancelled because of the failure in fulfilling of the commitment.

Consequently, it has been announced that the Ministry of Interior and Rural Affairs of the TRNC signed the "Agreement of Water Transportation to the Turkish Republic of Northern Cyprus from Turkey" with "Inbar Water Distribution Company", an Israeli

company on 24 October 2003. The price to be paid to the Israeli company has been determined as 60 cents per cubic meter according to the agreement. DSI officials have declared that the agreement has been concluded under their domain of knowledge and they have been informed that the Israeli company would utilize a new technology to transport the water.

Water Transfer by Pipeline from Turkey to the TRNC

The project of water transfer by pipeline from Turkey to North Cyprus was approved by the Government decree No. 98/11202 dated 27 May 1998, as bound with three conditions first of which foresees the realization of the said project covering facilities for the extraction, transportation and the storage of water to be implemented as a turn-key project by a consortium comprised of domestic and foreign companies under the leadership of Alsim-Alarko A.Ş.

Alsim-Alarko prepared the feasibility report which was approved by the DSI on 1999 of DSI. According to the feasibility report, it is foreseen to draw 75 million cubic meters of water per year from the lake of Alaköprü Dam which is to be constructed on the Soğuksu (Coldwater) Creek in close proximity of the Anamur district. The water is to be transferred by a high density polyethylene (HDPE) pipe having a diameter of 1,600mm (1,6 meter) to be laid down in natural-flow undersea conduit up to a special storage facility which is planned to be rehabilitated to impound the water in Geçitköy near Girne.

Almost 21 per cent or 15 million cubic meters out of 75 million is planned to be earmarked to be treated at a water treatment facility to be built near Lefkosa and the said amount will be used as drinking water. The rest 60 million cubic meters are to be directed to the irrigation systems of the Mesarya Plain which covers an area of 7,650 hectares that would provide the Turkish Cypriot islanders with the fruitful opportunities of irrigated agriculture slashing out the burden of dry farming they had to endure for decades to no avail.

The Mesarya Plain is the largest and the most valuable agricultural land of the Turkish Republic of Northern Cyprus (TRNC). The value of agricultural output of the current processes of dry farming amounts to 2.3 million US Dollars per year.

The total cost of the project, including the construction of Alaköprü Dam in Turkey, Geçitköprü storage facility in TRNC, natural-flow conduit undersea pipeline, other storage facilities, the necessary nationalization and the total interest to be charged within the duration of the works, is 340 million US Dollars

The text of the agreement regarding the engineering services of the project as well as the proposal of the financial package have been concluded by DSİ and approved by the Ministry of Energy and Natural Resources in May 2002. The foreign-based credit of the engineering services has received the approval of the Under secretariat of Treasury. The cost of the engineering services which is foreseen to be provided for a period of 18 months is estimated to be 9.5 million US Dollars.

DSİ officials have made it clear that they would open an international tender with a view to meeting the need to determine a consulting company to survey and control the underwater conduit pipeline construction. They added that the total cost of the project could amount to 500 million US Dollars covering the construction of the loading facilities on the Soğuksu Creek, the underwater conduit pipeline, the habilitation of the storage structure and water treatment plant in Geçitkale, the construction of the irrigation systems in Mesarya Plain and the necessary drinking water network.

PEACE PIPELINE PROJECT

Introduction

The Middle East and the Gulf countries in particular are likely to suffer most from the anticipated water crisis. According to a study recently completed the Gulf countries will have to spend a total amount of 35 billion US Dollars during the next 10 years in order to meet their increasing water demands and related infrastructure. The situation in the Jordan River Basin mat continue to worsen during the same period.

The Peace-Pipeline Project seeks to provide a supply of water available from sources of excess in Turkey and deliver a firm supply to regions of need in Syria, Jordan, Saudi Arabia, and other Arabian Gulf States. A Feasibility Study is proposed to enable a thorough

technical and economic analysis to ensure that such a project can be brought to full realization.

The water delivered through the Peace Pipeline is not intended to replace, but rather supplement, existing water supplies in the countries served.

Water Supply

Water for the project will be obtained from excess water in the Seyhan and Ceyhan rivers. DSI have developed master plans for the ultimate use of the waters of both rivers and have made calculations on the quantity of the surplus water that will flow into the Mediterranean after all projected agricultural, industrial and domestic utilization has been satisfied. Major irrigation projects exist and are planned in the Adana area with inter-basin transfers of water from the Seyhan River to the Ceyhan River via a tunnel from the Asagi Catalan dam. Inter-basin transfer of the Ceyhan River is also planned for the Menzelet Irrigation Project.

DSI have calculated that the average flow in the Seyhan and Ceyhan rivers is 39,17 million cubic meters per day. The planned use of this water in Turkey is approximately 23,04 million cubic meters per day. Thus, an average of 16,1 million cubic meters of water per day remains available for other humanitarian uses. Extensive development in the watersheds of the two rivers has already occurred and many dams have been constructed. More dams are planned for construction and others are under construction at the present time.

Water Quality

DSI has recorded water quality in the Seyhan & Ceyhan Rivers since 1978. These records show the availability of good quality water. At the present time the extent of water treatment (if any) has not been determined, but this question will be investigated in the Feasibility Study.

PIPELINE ROUTES

Western Pipeline

The Western Pipeline, involves the diversion of water from the Seyhan River downstream of the existing Seyhan Dam near Adana and the diversion of water from the Ceyhan River downstream of the

existing Aslantas Dam near Ceyhan. The water will be pumped via pipeline following the existing railroad route from Ceyhan to Osmoniye, crossing over the Nur Mountains via a tunnel, at elevation 700 metres, through a mountain pass near the town of Bahce. The route continues south passing near the towns of Aleppo, Hama, and Hams, water flows by gravity from the Bahce Pass to Homs. From Homs the topography gradually rises from elevation 300 meters to 900 meters above sea level on the plateau between Damascus, and Amman. Beyond Amman, the route continues via Tabuk to Medina, Saudi Arabia. A major mountain range separates Medina from the coastal centers of Yanbu and Jeddah and pump stations will lift the water via a pipeline and tunnel through these mountains. Water would then flow by gravity to Mecca, Jeddah and Yanbu. There is a potential for recovery of some of the pump station energy by the installation of a hydroelectric facility on the Red sea side of the mountain range to utilize excess head. The total route length of the Western Pipeline is approximately 2650 kilometers.

Gulf Pipeline

The Gulf Pipeline follows the same route as the Western Pipeline to Hama where it diverges from the Western Pipeline. Water is pumped from Hama to elevation 900 meters, crossing the high plateau of Eastern Jordan parallel to the Iraq-Jordan border until it intersects the route of the existing Trans-Arabian Oil Pipeline (TAPLINE). The water then flows by gravity along a route that continues along the TAPLINE alignment to the Arabian Gulf coast and then along the coastline of the Arabian Gulf to Ras Al Khaimah. Should water be required to be delivered to Muscat in Oman, a small pumping station would be required to cross mountains separating the Gulf of Oman from the Arabian Gulf. The total route length of the Gulf Pipeline is approximately 3900 kilometers.

WATER QUANTITY

The technical Feasibility Study was based on a flow of 3,500,000 cubic meters per day for the Western Pipeline and a flow of 2,500,000 cubic meters per day for the Gulf Pipeline. This water was distributed to the main population centers along each route by assigning flows in approximate proportion to their respective populations. After discussions with each country these water delivery quantities will be revised to suit their requirements and hydraulic design varied accordingly.

PIPE SIZE AND TYPE

The main pipeline routes will require pipe that varies in size from 3 meters to 4 meters. Branches into the various points of delivery will vary from 1 meter to 2 meters in diameter. A more detailed evaluation of the pipe diameter, length, and pipe material will be made during the Feasibility Study when more information has been developed on the topography, pumping station locations, water storage locations, geology and other route constraints.

The type of pipe varies from steel fabricated pipe in the high pressure pumped sections of the pipeline, to pre-stressed concrete cylinder pipe in the gravity and low pressure pumped sections and ductile iron, concrete and rolled steel pipe in the small diameter branches. The major portion of the pipeline will be buried about 2 meters below the ground level or located in tunnels in the mountain areas.

COST ESTIMATE

The Western Pipeline has been estimated to cost approximately \$8,500,000,000 U.S. Dollars and the Gulf Pipeline has been estimated to cost approximately \$ 12,500,000,000 U.S. Dollars. All costs are based on 1986 dollars. The construction period is estimated to be approximately from 8 to 10 years.

The construction cost estimate and the unit cost of water will be further refined during the Feasibility Study as more data becomes available.

FEASIBILITY STUDY

The Feasibility Study will evaluate key technical criteria relative to the pipeline route location, hydraulics, sourcing, and delivery of the water and other elements of the Peace Pipeline Project. The study will develop the project costs and provide the information necessary to authorities in the participating countries to make informed judgments as to the economic, and technical viability of the Peace Pipeline Project.

Brown & Root was requested by the Turkish Government to evaluate the technical feasibility of transporting water from the Seyhan and Ceyhan Rivers to the Arabian Peninsula in 1986. Because of the

project's technical and economic merits, Brown & Root has developed several concepts and analyses to a point that it is convinced that a formal, more detailed Feasibility Study report is necessary.

In short, we believe that Turkey has the capacity to contribute to the establishment of an enabling environment by means of realization of abovementioned two projects for socio-economic development of the people of the Middle East which in turn could enhance peace and security in the region. We also hold the opinion that the water supply could create interdependency between the countries of the region and eventually enhance economic and commercial relations in the interest of all.

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