The Great Man-Made River of Libya

It was an awesome moment to stand on an arid plain near Sirt on the Mediterranean coastline (see accompanying map) and drink fresh water that was transported over 1,000 kilometres from Tazerbo in a pipeline four meters in diameter. This water was produced from deep wells drilled in the sandstone aquifers of the Great Sahara in southern Libya. The wells, pipelines, control systems, etc. constitute the greatest civil engineering project in this century. Yet, this Great Man-Made River Project remains unknown outside Libya.

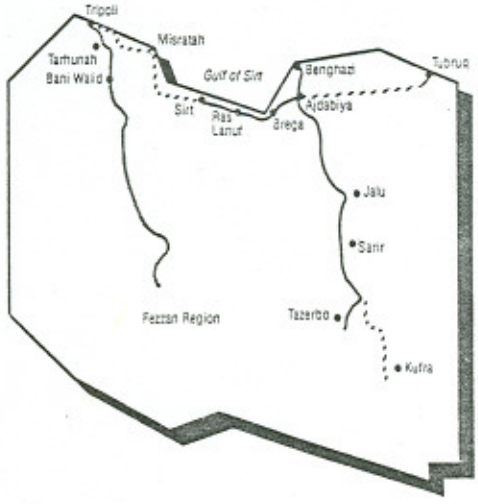
The Great Man-Made River (GMR) is a project of fossile groundwater mining, which will provide water to a large part of the Libyan littoral. Geological prospecting proved that large volumes of groundwater are contained in the Saharan aquifer of southern Libya. Severe climatic conditions and poor soil do not permit the use of this resource where it was discovered. Therefore, the Libyan authorities decided to extract groundwater from the aquifer and transport it by conduits to the littoral zone, where climatic conditions are favourable and manpower is available for industrial and agricultural development. The project will ultimately supply 5.5 million cubic metres of water per day to the prospective users. Twenty-five percent of the water will be used for human consumption and 75 percent will be used in agriculture aimed at food self-sufficiency.

The vast reservoirs of proven groundwater are estimated to be in excess of 35,000 cubic kilometres. These resources are concentrated in three major basins: (1) The Kufra Basin in southeast Libya with a storage capacity of 20,000 cubic kilometres; (2) the Sirt Basin with 10,000 cubic kilometres of water; (3) the Murzuk Basin, south of Jabal Fezzan with 5,000 cubic kilometres of water.

The first phase of the project is almost complete. Two well fields are being developed at Sarir and Tazerbo, each with a daily production of one million cubic metres of water. The water is conveyed by two pipelines of four metres in diameter to the distribution network. Two storage reservoirs are being prepared to received water at the well fields, one at Ajdabya and to others at the end of the supply system at Benghazi and Sirt. A large number of turn-outs, control and aeration valves, etc. will control the gravity flow of the water from the higher ground at the well fields to the coastal zone. The system will be operated form a central control room in Benghazi and local control rooms at the two well fields. It will be supported by autonomous power generation and facilities needed for efficient operation and maintenance.

In the second phase, which has already been contracted by the GMR Authority, the system will be extended by four additional well-fields in Tripolitania (at Jabal Fezzan), each with the capacity of 0.5 million cubic metres per day. A third phase is also foreseen to develop the aquifer south of Kufra to produce an additional 1.5 million cubic metres of water per day. The final phase will connect the coastal zone from Tobruq in the east to Tripoli in the west.

The quantity of material to be utilized in this project is staggering. For example, the GMR system requires 574,000 pieces of pipeline and 6,500 manholes. To produce this, the follow-



ing materials are required: 5,200,000 metric tons of cement, 24,000,000 metric tons of aggregate, 4,300,000 kilometres of prestressed wire, 43,000,000 square metres of steel sheeting. Since the pipeline is buried in seven-metre-deep trenches, it requires the excavation of over 155 million cubic metres of earth.

The scale and complexity of the Project puts heavy demands on the management for assuring efficient operation and maintenance of the system which has to operate smoothly, without interruption. Failures, drop-outs of parts of the system have to be instantly repaired. Fully automatized, computer-supported monitoring and control is therefore foreseen, with expedient manual intervention as needed.

The GMR Authority signed an agreement with UNESCO in 1990 for cooperation in the training of project personnel. Several programmes have been developed under this cooperation including: training courses for civil and mechanical engineers in Delft, Netherlands (at the International Institute of Hydraulic and Environmental Engineering and Delft University of Technology), a course for senior project engineers at the University of Exeter, U.K., local training for engineers, technicians and operators, and the setting up of a documentation and information centre in Benghazi.

As a member of the Advisory Council of UNESCO, I participated in its first meeting in Paris 28-31 May 1991. The council reviewed the plans and established the training needs. It was clear from the deliberations that the GMR Project is an example to be followed in the economic development of Third World countries. Its scale dwarfs other projects, even in the developed world. The project proves that with vision, will and determination, a desert country can develop its own resources, particularly those leading to food self-sufficiency. ◆

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