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The Desperate Search for Water A Key Problem in Arab World

Despite the wide-ranging diversity of the people living between the northwest coast of Africa and the southern tip of the Arabian Peninsula, the vast expanse of the the Arab world is plagued by one common problem: the shortage of water. Nowhere in the world is more money spent on exploration for new water sources. But the consumption in homes, farms and factories is continuing to increase. Underground availability is severely restricted. And most of the little rainfall that comes is lost through evaporation.

There are, of course, several sources of urban and agricultural water supply but in much of the area groundwater rather than surface water provides most of the supplies. In Saudi Arabia 70 percent of all water supply is derived from groundwater and only 6 percent from surface water, the remainder from desalination.

In Morocco, however, rainfall is higher than in the Gulf and only 30 percent of demand is met from groundwater sources with the remainder being obtained from surface water.

The areas of higher rainfall are to be found in the mountainous regions, which are subject to troughs of low pressure moving off the Atlantic Ocean, Mediterranean Sea and Indian Ocean. Such areas are the Rif and the Atlas in the Maghreb, the mountains of north Lebanon, the highlands of Yemen and the Asir in southern Saudi Arabia.

Most of the precipitation is in the form of rainfall but snow can fall in the highlands of Lebanon, Syria and Jordan and also further west in the Atlas where melted snow is a significant source of water in springtime.

In southern Arabia, along the southern coast of Oman, another form of precipitation, dew, is formed by moist warm winds blowing off the Indian Ocean. The quantities, however, are small. High evaporation rates always produce an arid environment and there are serious water shortages throughout the region.

There are few rivers in the Arab states. The largest rivers, the Nile and Tigris-Euphrates, originate outside the area where rainfall is high but, large as they are, they do not reach the sea because their waters are being increasingly used for agriculture.

The most common form of perennial flow is through groundwater discharge by means of springs. Within the region, there are several large natural springs issuing from the major limestone massifs, such as the Atlas mountains, the Lebanon and anti-Lebanon ranges and the Jebels Akhdar of Libya and Oman. In the Jebel Al Arab on the Jordan-Syrian border large springs issue from thick and extensive basaltic rock formations.

Coastal springs occur throughout the region – along the Lebanese coast, in the Arabian Gulf off the Hasa littoral, especially near Bahrain. In Libya there are big submarine springs from the Jebel Akhdar in Cyrenaica, representing a resource lost to the sea.

It is hard to tap reservoirs of groundwater in hard-rock strata, except at points where springs issue. The advent of drilling machines in recent times has enabled widespread abstraction from boreholes to be achieved by means of motor-driven pumps.

Today the shallow, less consolidated strata are receiving most attention since modern hydrogeological techniques usually permit the location and quantifying of resources to be relatively simple and effective. These alluvial deposits contain renewable water resources replenished by rainfall or surface run-off. They can be economically tapped on large or small scales, depending on specific requirements.

In some Arab countries alluvial basins have provided water for many years for large urban and agricultural areas. They can be categorized as: riverine – those recharged by a major river such as those alongside the Nile and Euphrates; intermontane – those fed by springs and small seasonal wadis in mountainous areas such as those which surround Sana'a, Damascus, Fez and Marrakesh; or coastal plains such as Gefeira, on which Tripoli is sited, and the Tihama plain of Yemen and Saudi Arabia along the Red Sea, all of which are recharged by run-off from the foothills of neighbouring mountains.

Over-use, however, has brought problems. Groundwater levels have fallen and there has been deterioration of water quality. In many areas agricultural needs far exceed that for domestic use and has forced many communities to seek new supplies from distant and costly sources.

The recent discovery of large sedimentary basins throughout the Arab region has excited development planners because they contain large amounts of water stored over extensive areas. Yet the fossil water they contain represents a non-renewable source which originated during a wetter climate perhaps 30,000 years ago.

The depth of some basins requires sophisticated drilling technology. The depth of boreholes can be as great as 1,500 metres, as in Riyadh where the depth also brings problems of water quality. The Riyadh water has a temperature of 70° C and has to be cooled. It is also brackish and turbid and has to be treated.

At present little is known of these basins and much work has to be done to understand the recharge mechanisms and to determine the origin of their pressure gradients. Some of the gradients may be recent or may have been formed by fossilization.

Most of the region's rivers only flow on a seasonal basis or after heavy storms. Such is the case with rivers flowing from the mountains of Asir, Yemen, Ethiopia and the North African coast.

Local supplies are still met from ancient cisterns or *hafirs*, excavated pits. Today, however, large dams have been built in several countries. Often the dams produce water supplies and hydroelectric power.

Discharge from a groundwater system may take place at an oasis or where diffuse seepages occur over a large area around mudflats or *playas*. The latter is similar to that which creates the coastal *sabkhahs* located along the Arabian Gulf, the Tihama region along the Red Sea and in many locations along the North African coast.

There are now many high-technology systems to estimate water resources, all of them requiring a wide variety of methods including aerial surveys.

In several Arab countries relatively expensive desalination plants have been built. In Saudi Arabia alone, 23 plants have been constructed.

Other expensive methods to obtain water include long pipelines such as the Great Man-Made River project in Libya, the initial stage of which will comprise a 1,900-kilometre pipeline carrying water northwards by gravity from the Kufra groundwater basin to the coast for irrigation purposes. There is the 470-kilometre link from the Jubail desalination plant to Riyadh and the proposed 600-kilometre pipeline from the Euphrates in Iraq to Amman in Jordan.

Traditionally, canals have carried irrigation water over long distances. Examples are the East Ghor canal in the Jordan valley and the Euphrates irrigation and drainage canals in Iraq. Under construction is the Jonglei canal in Sudan to carry Nile water through the Sudd marshes.

There have been proposals to freight bulk water by tanker from the United Kingdom and Canada.

Additionally, the conserving of water resources by recycling is becoming increasingly important. The most common example is the use of treated sewage effluent for irrigating trees or selected crops. There is also artificial recharge – introducing effluent or diverted surface water into the ground to prevent sea-water intrusion of aquifers or to recharge depleted groundwater reservoirs.

Probably the best means of saving water is through conservation and greater efficiency in use, however. Modern irrigation systems now use sprinkler, trickle or drip techniques which reduce the amount of water delivered to the fields.

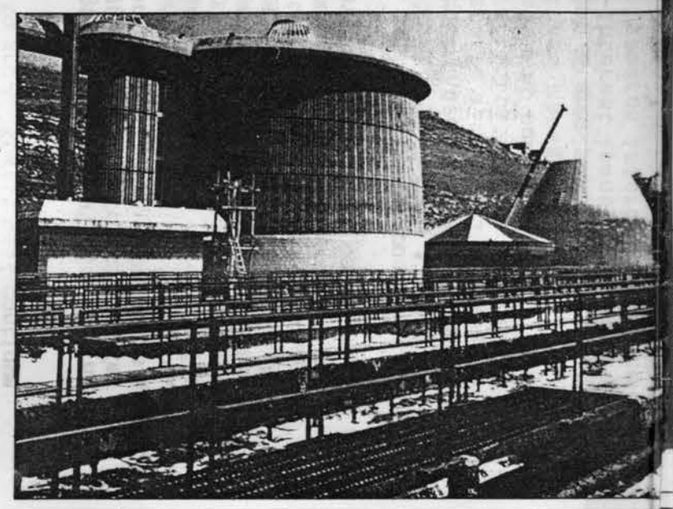
A particularly effective method of using water for growing crops is the hydroponic system where plants are grown under controlled laboratory-like conditions and fed with nutrient-rich water.

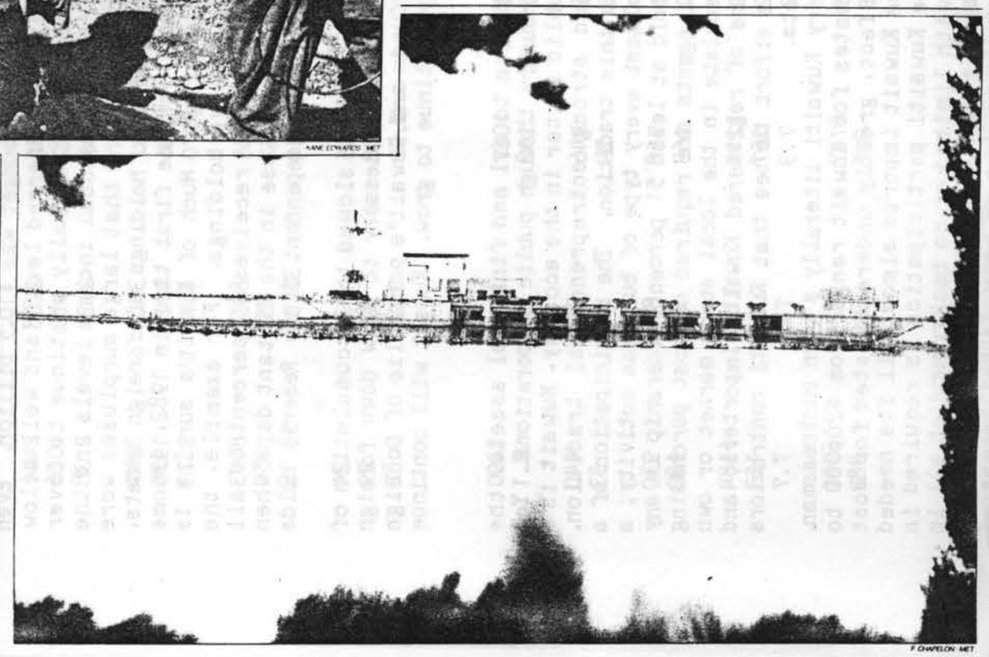
Waste control and leak detection are ways in which losses from urban water distribution systems can be reduced and savings of resources obtained. Dual water-supply systems to domestic consumers can save water and blending of fresh and brackish water can extend limited resources.

Further search for new resources is necessary in Arab countries together with careful monitoring and management of existing known resources.

The use of new scientific techniques will be essential in assessing the area's water resources and determining the best methods of exploitation. Cooperation among the Arab countries is increasing rapidly and will help greatly in obtaining understanding of the large basin resources which may be the only long-term solution to the region's increasing water demand.

This feature article was written by Middle East Times *correspondent Ralph Shaw.*





Throughout the Arab world sources of water are scarce. Clockwise from left; Children in a refugee camp in Pakistan; Al Thawran on Lake Assad, Syria; Egypt's source of life, the Nile; Bedouin fill their water bags at El Jafr settlement in Jordan; Amman's stabilization ponds for recycling wastewater for use in agriculture and fisheries.