

FROM SCARCITY TO SECURITY

Averting a Water Crisis in the Middle East and North Africa

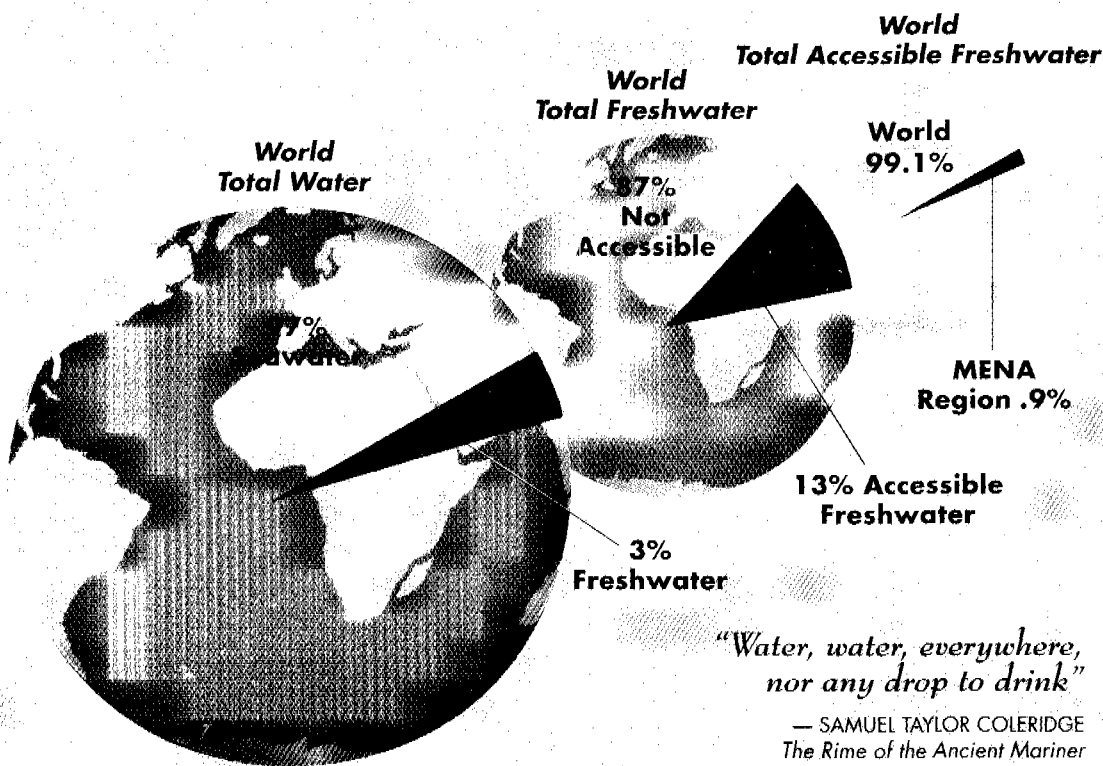


WATER: NATURE'S UNIQUE ELEMENT

Water is the world's most abundant resource. Yet most water is unusable; the rest is a precious commodity that must be preserved and protected. Water is essential for life. The value of water changes according to its use, location, time of availability and quality.

Water is widely distributed around the globe. In fact,

- Over 70 percent of the earth's surface is covered with water.
- 97 percent of all water is in the world's oceans as unusable salt water.
- Of the remaining 3 percent freshwater:
 - 87 percent is locked in ice caps, glaciers, the atmosphere, soil, or deep aquifers;
 - only about 13 percent (0.4 percent of all water) is usable.
- And of that, less than 1 percent is in the Middle East and North Africa.



The Middle East and North Africa (MENA) region refers to the countries and territories of Algeria, Bahrain, Egypt, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, Yemen, and the West Bank and Gaza.

This booklet expands on the concepts in the World Bank report *A Strategy for Managing Water in the Middle East and North Africa*, 1994. Copies of the report and this booklet may be obtained from the External Affairs Unit, Middle East and North Africa Region, The World Bank, 1818 H Street, NW, Washington, DC 20433, USA.

This publication has been prepared by staff of the Agriculture and Water Resources Management Unit of the Technical Department, Middle East and North Africa Region.

FOREWORD

The countries of the Middle East and North Africa (MENA) region are home to five percent of the world's people, but have less than one percent of the world's renewable fresh water. Inexorable population growth and associated water usage by farmers, firms and families have reduced the region's limited per-capita supply to only one-third of its 1960 level. Per-capita water availability is expected to halve over the next 30 years, exposing all but one or two countries to severe problems of water scarcity. Unless there are fundamental changes in the way water resources are managed and used, the region as a whole will experience a worsening crisis of water scarcity and economic decline. A vicious circle will set in whereby harsh water shortages adversely affect economic growth, and slower growth in turn constrains the investment needed to improve water availability. This downward spiral would spell disaster for the region.

But MENA's looming water crisis and its consequences can be averted. The strategy outlined in this booklet presents a way of breaking the vicious circle, and offers prospects for a virtuous spiral whereby "Water for Growth" policies today can lay the foundations for "Growth for Water" policies tomorrow. The strategy proposes priority initiatives to be undertaken by governments in partnership with domestic users and external sources of financial and technical support. They include: *mobilizing governments and peoples* to promote national and local partnerships and participatory approaches for using water wisely; *integrating water resources management* to recon-

cile competing claims on limited supplies; *using water more efficiently* to get the most value from it; *seeking alternative sources of water* to free countries from reliance on finite freshwater; and, *promoting regional and international partnerships* to foster technical and financial cooperation on water issues.

Designing the policies and raising the funds for implementing the strategy, in line with country-specific circumstances and priorities, must be the primary responsibility of national governments. But I believe that the international community, including the World Bank, must also play its part in this effort. To this end, the booklet includes proposals for a targeted, costed, time-bound *MENA Water Partnership and Action Program*, to be launched at a *Regional Water Conference* in 1997. The Conference would provide a forum for definition of, and commitment to, country-level programs and partnerships by governments and donors. We at the Bank stand ready to increase substantially our financial and technical assistance to support countries in implementing strategies and action plans in line with their own individual needs. It is my hope that publication of this booklet will help stimulate the important preparatory work for the Conference and the wider objective it is intended to serve — long-term water security, essential for realizing prosperity and peace throughout the MENA region.

CAIO KOCII-WIESER, Vice President,
Middle East and North Africa Region,
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TABLE OF CONTENTS

I. MENA'S LOOMING WATER CRISIS	5
II. FROM SCARCITY TO SECURITY: OPTIONS AND OPPORTUNITIES	11
III. THE MENA WATER PARTNERSHIP: A PLAN FOR ACTION	23

REFERENCES

World Resources Institute; Worldwatch; Pacific Institute for Studies in Development, Environment and Security; Stockholm Environment Institute; *Water in Crisis*, Peter Gleick (1993); German Development Institute; World Bank: *World Development Report* (1995); *Water Resources Management Policy Paper* (1993); *A Strategy for Managing Water in the Middle East and North Africa* (1994); *Middle East and North Africa Environmental Strategy* (1995); and other World Bank reports and estimates. Most data are for the 1990s. Other information, such as "renewable water resources" may date back earlier, but changes since then are believed to be minimal. US dollars and cents are used throughout.

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I. MENA'S LOOMING WATER CRISIS

Water shortages are a global problem. The world is rapidly moving toward shortages of freshwater. Global water use has increased fivefold this century, and today's per-capita availability is predicted to decline by a third over the next generation. Water shortages are rapidly emerging even in water-rich countries from the United States to China; recent droughts in Europe and North Africa have emphasized the precarious balance between water supply and demand.

The MENA region is the driest in the world. The region is poorly endowed with natural freshwater supplies [Illustration 1].

Three-quarters of the land mass is arid. And more than a third of the river supply flows from countries outside the region. Rainfall is low, erratic, and poorly distributed and droughts and deserts define the region.

Water demand in the region is growing fast. MENA countries, home to 5 percent of the world's people, contain less than 1 percent of the world's annual renewable freshwater. The population, having more than doubled in the past 30 years to about 280 million, could double again in the next 30 years. Cities growing at more than 4 percent a year, already contain 60 percent of the region's people. Water demand for

1. Worldwide Net Renewable Water Distribution by Region and Per Capita

	Net Annual Renewable Water Resources (billions of cubic meters)	Population (millions)	Per Capita (cubic meters)
Oceania	769	21	36,619
Latin America	10,766	466	23,103
North America	5,379	287	18,742
Eastern Europe and Central Asia (ECA)	7,256	495	14,659
Africa	4,184	559	7,485
Western Europe	1,985	383	5,183
Asia	9,985	3,041	3,283
MENA*	355	284	1,250

*Totals may not add due to rounding.

Sources: *World Development Report, 1995*; *World Resources, 1992-93*; Pacific Institute for Studies in Development, Environment and Security - Stockholm Environment Institute; and World Bank estimates, 1995.

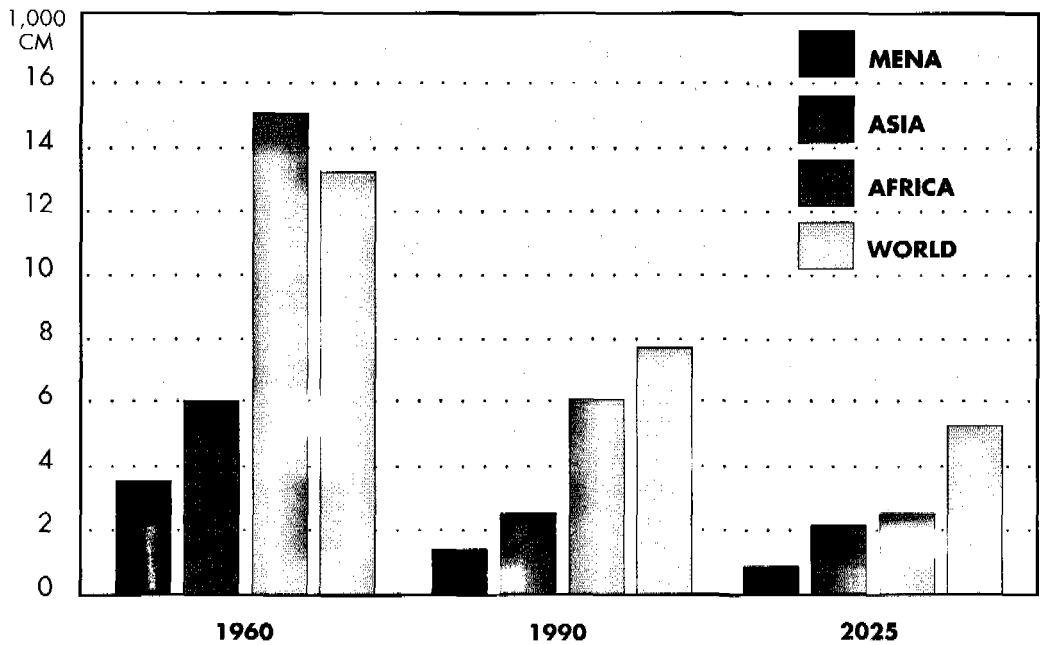
domestic and industrial uses has exploded in recent decades. At the same time, tubewell technology and the development of agriculture have increased water use in rural areas.

Water availability is falling to crisis levels. About 45 million of the region's people — 16 percent — lack safe water, and more than 80 million lack safe sanitation. As populations have grown against a background of finite freshwater resources, so the water available to individuals has fallen dramatically. Annual per-capita availability, about 3,300 cubic meters in 1960, has fallen by 60 percent to about 1,250 cubic meters today, the lowest in the world and it is predicted to fall by another 50 percent to about 650 cubic meters by 2025 [Illustration 2]. This average covers all human activities — domestic, industrial and agricultural —

and masks extreme local variability. For example, in Yemen and the West Bank and Gaza, per-capita availability today is less than 180 cubic meters, already far below the projected regional average 30 years from now [Illustration 3].

Some countries are destroying their capital, mining groundwater. Groundwater resources throughout the region are overexploited [Illustration 3]. Jordan and Yemen withdraw 25 to 30 percent more from aquifers than is being replenished, and in Gaza aquifers are being mined even faster. Such over-exploitation risks further damage to underground water reserves through the intrusion of seawater or the leaking of pollutants. Though not yet as dramatic, shortages due to over-extraction of groundwater are imminent in the Maghreb countries.

2. Projected Renewable Resources Per Capita by Major Region - Year 2025



Source: World Resources 1992-93

3. Water Availability and Usage in MENA Countries

Country	Annual Renewable Resources BCM	Annual Withdrawals		Per-capita Renewable Availability in 1995 (CM)	Water Usage (%)		
		BCM	As a % of Annual Renewable Resources		Domestic	Industry	Agriculture
Algeria	18.4	3.0	16	655	22	4	74
Egypt	58.0	56.3	97	1005	7	5	88
Bahrain	n.a.	0.2	—	—	60	36	4
Iran	118.3	46.5	39	1826	4	9	87
Iraq	104.0	43.9	42	4952	3	5	92
Israel	2.1	1.9	90	375	16	5	79
Jordan	0.8	1.0	125	213	20	5	75
Kuwait	—	—	—	—	64	32	4
Lebanon	4.8	0.8	17	1200	11	4	85
Libya	0.7	2.8	400	130	15	10	75
Malta	0.03	0.02	67	—	76	8	16
Morocco	30.0	11.0	37	1083	6	3	91
Oman	2.0	1.3	65	1053	3	3	94
Qatar	0.02	0.15	750	—	36	26	38
Saudi Arabia	2.2	3.6	164	118	45	8	47
Syria	5.5	3.3	60	385	7	10	83
Tunisia	4.4	3.0	68	489	13	7	80
UAE	0.3	0.4	133	167	11	9	80
Yemen	3.0	3.9	130	176	5	2	93
¹ West Bank and Gaza	0.2	0.2	100	105	12	13	75
Total MENA	355	183	52	1250	6	7	87

1. As allocated between Israel and Gaza (1991), currently under negotiation.

Sources: *World Resources 1992-93*; Pacific Institute for Studies in Development, Environment and Security; Stockholm Environment Institute; and World Bank estimates, 1990-1995.

Shortages are compounded by pollution. Contamination by fertilizers and pesticides, dumping of municipal and industrial wastewater into rivers and lakes, solid waste deposits along river banks, and uncontrolled seepage from unsanitary landfills — all these factors are degrading freshwater resources and imposing health risks, especially for children, the primary victims of waterborne diseases. Morocco's most important river, the Sebou, has become a waste dump for the cities along its banks. Tunisia's largest reservoir, the Sidi Salem, and Algeria's Mitidja and Saida aquifers are threatened by pollution from cities, industrial effluents and agricultural runoffs. The Nile waters in

Egypt are contaminated by uncontrolled industrial and agricultural discharges.

Too much water is going to low-value agriculture, not enough to cities and people. Much of the water crisis is caused by the way water is used. In MENA, 87 percent of water withdrawn is allocated to irrigation and only 13 percent to municipal and industrial uses, compared with 69 percent and 31 percent worldwide. Agriculture is thus a crucial area in future water-use management. Irrigation efficiency is extremely low in most countries. In flood irrigation, only about 30 percent of the water reaches the crops. Urban water systems are also inefficient, losing an average of 50 percent of available supply as "unaccounted-for" water. Poor maintenance, inappropriate technology, and weak technical and financial management are the problems.



Efforts to improve the water situation are uncoordinated. Local, national and international initiatives are underway to overcome the water crises. Frequently, however, the benefits are small. The reasons: national institutions do not work together; plans and programs are often duplicative and sometimes contradictory; donor involvement is fragmented and unfocused; and water is generally heavily subsidized, providing no incentives for conservation.

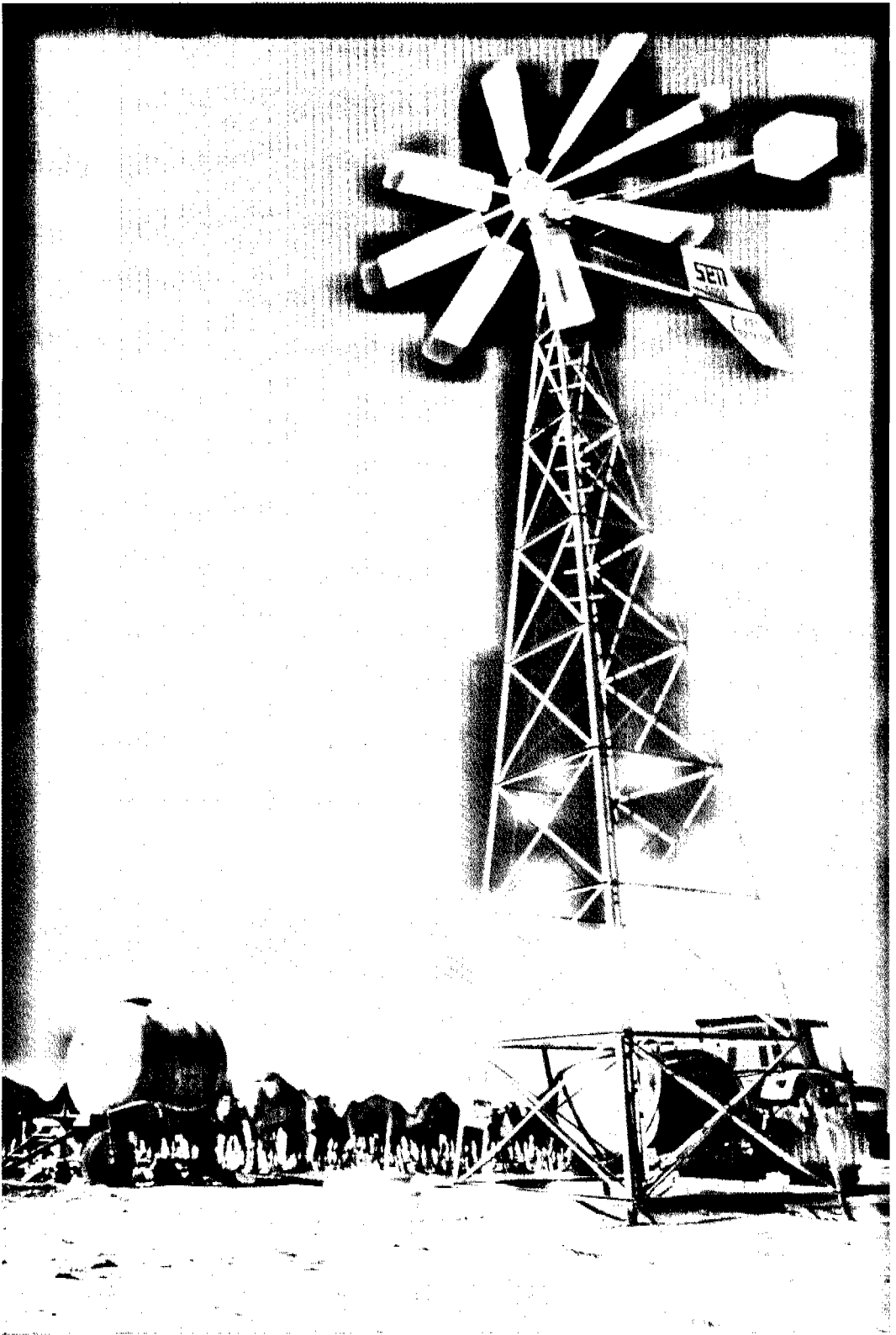
For years, great efforts have been made to keep pace with the burgeoning demand for more water. Massive investments have brought water supplies and safe sanitation to millions of people and have similarly enabled agriculture to remain a major contributor to the economy of the region. Nevertheless, water demand increasingly outstrips supply throughout the region. This worsening



imbalance between supply and demand has brought many countries to the brink of crisis.

The water crisis is imminent but can be averted. Continuing current practices will plunge the region deeper into crisis, creating conditions where conflict over scarce resources at local and national levels becomes inevitable. Yet this crisis can be averted by a fundamental change in direction that

involves mobilizing popular support for water saving; integrating water resources management and reconciling competing claims on limited resources; allocating water to highest-value uses; conserving water and preventing pollution; and focusing international support for water initiatives on priority areas. The **MENA Water Partnership** proposed here would be a decisive step in such a change in direction. ■



II. FROM SCARCITY TO SECURITY: OPTIONS AND OPPORTUNITIES

AVERTING THE CRISIS

The critical water situation throughout the MENA region calls for immediate action by governments, water users and donors working in partnership. The fragmented, supply-oriented approach to water development must give way to integrated water management with emphasis on a partnership of water suppliers and water users and on the conservation both of quantity and quality.

National efforts should be directed at:

- **Mobilizing country efforts, including private participation** — to develop partnerships at national and local levels.

- **Integrating water resources management** — to reconcile competing demands for water.

- **Using water more efficiently and reducing pollution** — to get the most value from it.

- **Seeking alternative sources of water** — to free countries from reliance on finite freshwater supplies.

International efforts should be directed at:

- **Promoting partnerships at regional and international levels** — to maximize technical and financial cooperation.





MOBILIZING COUNTRY EFFORTS

Many communities are now reaching socio-politically sensitive limits of water availability, where the cost of managing shortages is becoming a constraint on the lives of individuals and on the economy. Averting a full-scale crisis will require changing attitudes at all levels and making the mental shift from asking how much more water is needed to deciding what activities can be best afforded with the water available. That shift in thinking will result in water development being tackled in a coherent, integrated manner, by a combination of strong public and private sector institutions, and with a vision that looks beyond the boundaries of individual countries.

Public awareness campaigns help change behavior. People in the MENA region are well aware of local water scarcity. But governments rarely enforce conservation measures or inform the public why economic incentives are needed to conserve water and shift it to highest-value uses. Appeals through schools and media-based public education campaigns are, thus, needed to help change behavior.

Participation breeds success. In the past, decision-making on water affairs tended to be divorced from local communities, which not surprisingly felt little ownership of, or commitment to, water services. Participation in water sector decisions, through national water advisory councils with representatives from governments and water users, should increase community acceptance. Social assessments of traditional water users and uses, especially in rural areas, should help define participatory programs to enable holders of traditional water rights to maintain their livelihood, while reallocating water to higher-value uses.

Water user associations provide better services. Community-based associations that take responsibility for water delivery and system maintenance can improve services and help recover costs. In Tunisia, such associations have been functioning effectively since colonial times, and today they control practically all tubewell irrigation schemes.

INTEGRATING WATER RESOURCES MANAGEMENT

The adoption of a comprehensive policy framework and the treatment of water as an economic good, combined with decentralized management and delivery structures, is the basis for integrated water resources management. So long as water is abundant and of good quality, interaction between different water users and stakeholders may not be essential, and water projects can be implemented with little regard to their impact elsewhere. But as pressures mount, so does the need for such interaction. Users compete for the same resource and water quality is modified in ways that may affect water's value to other users. Fragmented approaches that fail to account for these factors can incur rapidly rising costs in

terms of water quality degradation, water allocation to low-value uses and actual water losses. Therefore, governments need to establish a policy framework that takes a long-term perspective for the management of water demand and supply, to ensure that water developments today do not compromise the environment tomorrow.

Central policy making and decentralized management is necessary. An integrated strategy for managing water as a common resource ensuring its rational use is urgently needed. Traditionally, a myriad of water sector institutions have overlapping tasks; and competing users in agriculture, municipalities and industry fragment the sector further, making the coordination of resource planning and management by a central institution critical. Some form of national



water authority should be responsible for designing and implementing the national water strategy. The mandate of the national water authority, and the sector's organization as a whole, should be described in a water law that defines water as a public good, recognizes water rights and creates autonomous and decentralized managerial units; as well as setting water quality standards, pollution control and conservation guidelines. Water delivery, by contrast, should be *decentralized*, to be the responsibility of river basin and regional irrigation authorities,

water and sewerage utilities, and rural communities. Morocco is one of the first countries in the region to adopt such an integrated approach [Illustration 4]. Also Algeria is already moving toward creating river basin authorities modeled on the French system, a first step toward a decentralized integrated management approach.

4. Morocco - Toward Integrated Water Management

Morocco faces a growing challenge in managing its water resources. Demands from expanding irrigated areas and a growing urban population are running up against the rapid depletion and pollution of accessible resources. Sanitation infrastructure and drinking water supply have not kept pace with demand. Only 15 percent of the rural population has access to potable water. Contaminated water is the major cause of disease in rural areas. Municipal, agricultural and industrial effluents, as well as unsanitary solid waste deposits, contribute to pollution of surface and groundwater.

Past government strategies emphasized the development of additional water resources, an approach reaching technical and economic limits. The government has now committed itself to an integrated water resources management approach, based on a long-term national strategy, including a national water law that defines water quality standards, water conservation and cost recovery policies. Under this approach, Morocco plans to develop autonomous river basin agencies that will be responsible for regulating and monitoring the use and safe disposal of water, as well as for planning and funding related investments.

Morocco has embarked on a program of integrated water management supported by a Water Sector Investment Loan, covering the Oum Er R'bia, a major river basin. The project, essentially a slice of the public investment program, is supporting a number of key policy reforms, institutional strengthening and selected investments, to conserve water and control pollution of surface and groundwater resources. The principal components of Morocco's integrated program are:

Water Demand Management:

- cost recovery
- water-saving irrigation technologies
- rehabilitation of small and medium-scale irrigation

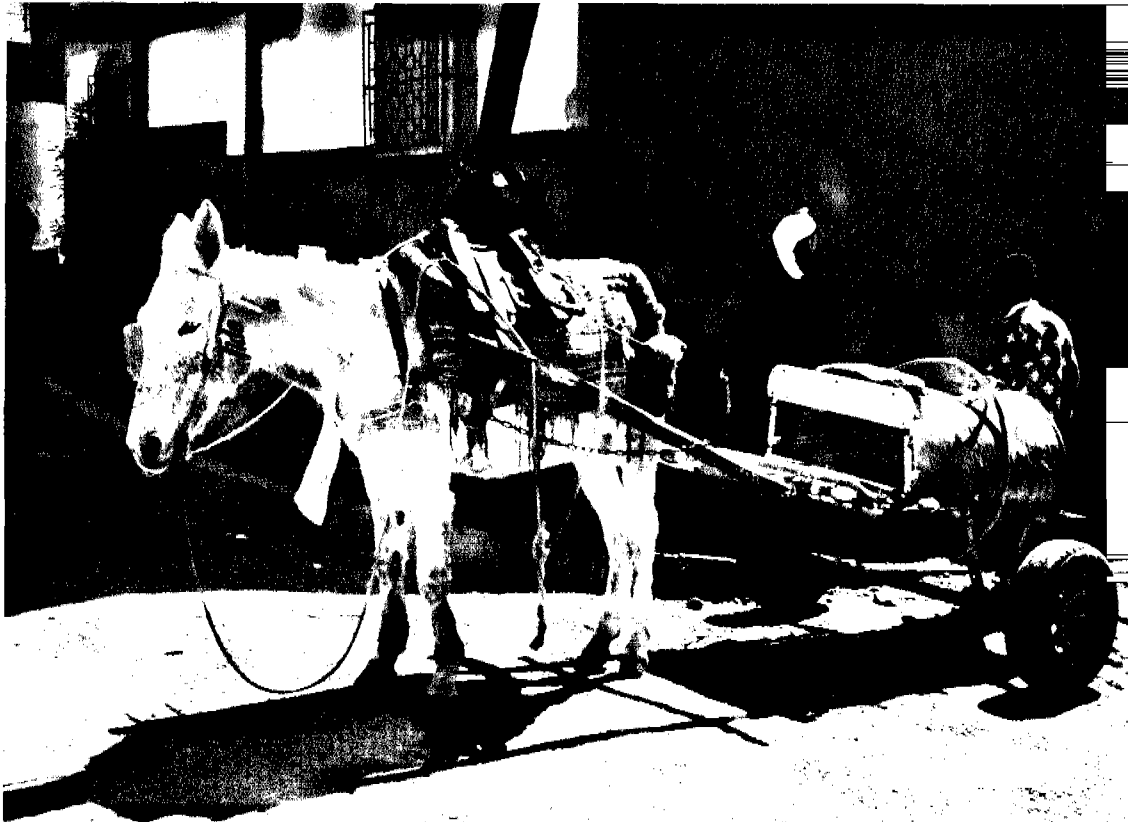
Water Supply Enhancement:

- aquifer recharge
- reuse of treated wastewater/recycling
- flood protection and prevention

Water Quality Improvement:

- wastewater treatment
- pollution prevention and control
- watershed protection
- public awareness campaigns

Multilateral and bilateral donors are fully cooperating with this approach.



USING WATER MORE EFFICIENTLY AND REDUCING POLLUTION

Reducing the demand for water by reducing the subsidies. Water has a financial cost as well as an opportunity cost, the latter representing its highest achievable value. Almost nowhere do users connected to the supply network pay anything near the financial cost of water, let alone its opportunity cost. Thus, huge subsidies are needed to support water services. In Jordan, subsidies to water utilities are equivalent to 1 percent of GDP; and financial transfers to the irrigation authority are ten times the fees recovered from farmers.

Pricing water appropriately is often thought to be unpopular, but this need not be so. Studies worldwide show that people will pay the real cost of water, if they receive reliable service. Currently, the poor, who often receive no water and sanitation services, pay many times the municipal rates to private water vendors. In Amman, water traders charge US\$ 3 a cubic meter and in Taiz almost US\$ 5 a cubic meter. If reliable network services were available, people would willingly pay for their upkeep. Willingness-to-pay studies with user participation can help design tariff structures that cover service costs while keeping lifeline use affordable to the poor.

Budgetary financing of water investments is highly inefficient because it exposes large multi-year projects to the vagaries of annual variations in available funds, and frequent financing gaps result in time- and cost-overruns. Furthermore, it promotes a culture in the water-operating agencies in which capital is perceived to be free and assets do not have to be maintained. At a minimum, governments have to set prices to cover operation and maintenance costs. In the medium term, tariffs and other fees should aim at recovering the full cost of water services. *Illustration 5* provides a few examples of countries at various stages of cost recovery.

Private involvement is vital. Under government control, the water sector has a track record of inefficiency and poor cost recovery. But given the right incentives, private interests can improve the efficiency of water agencies. Reducing the number of staff per water connection in usually over-staffed utilities and improving tariff collection will raise cost recovery rates, reduce tariff increases, and generate investment funds. This combination of increased efficiency and greater revenues is essential if systems are to

catch up with past deficits and investment shortfalls.

Transferring responsibility from public to private entities is traditionally unpopular and will not take place overnight. The first step to efficiency is to commercialize operations, as most European public utilities have done successfully. For example, in the Gaza Strip, the Palestinian authorities are preparing a performance-based management operating contract to improve the drinking water supply and wastewater treatment and disposal systems. In addition to reducing water losses and increasing cost recovery, the operator would also provide management support for an intensive investment program and eventually assist the authorities to merge the different municipal water departments under a public water and wastewater company, managed according to commercial principles, for the Gaza region. Lebanon is also moving toward contracting private operators for water utilities.

More advanced alternatives for involving the private sector include management, lease, and concession contracts [*Illustration 6*] to run utilities; or private companies to provide

5. Typical Water Tariffs in the MENA Region

In **Morocco**, current urban water tariffs range from 44 cents to \$1.35 a cubic meter. They are expected to increase progressively, so that by 1998 they will cover operation and maintenance charges, as well as interest payments for capital investments. In irrigation, the average tariff is about 2 cents a cubic meter. In **Tunisia**, farmers pay about 5 cents a cubic meter for irrigation water, whereas the total cost for production and distribution is about 7 times higher. In **Jordan**, municipal water charges average

about 38 cents a cubic meter — about one-third of total costs; and in 1995 the irrigation water tariff was increased from about 1 cent to 2.5 cents a cubic meter — about half of average O and M costs incurred over the past ten years. In **Israel**, the average tariff for urban drinking water is \$1 a cubic meter, fully recovering the total cost, plus partly subsidizing agricultural water, sold on average for 40 cents a cubic meter. Agricultural water also received subsidies from the state budget.

6. Private Sector Alternatives		
Contract	Applications	Incentives
<i>Service</i>	Meter reading, billing and collection, and maintenance of private connections.	Permits competition among multiple providers, each with short-term and specific contracts.
<i>Management</i>	Operation and maintenance of the water supply system or major sub-system.	Contract renewed every one to three years, and remuneration based on physical parameters, such as volume of water produced and improvement in collection rates.
<i>Lease</i>	Extended operational contract.	Contract bidding, with contract duration of about ten years; provider assumes operational risk and generates revenue.
<i>Concession</i>	All features of the lease contract, plus financing of some fixed assets.	Contract bidding, with contract period up to thirty years; provider assumes operational and investment risk.

Source: World Bank, 1993.



bottled drinking water, a solution for small towns without any access to drinking water, or where drinking water supply is subject to the vagaries and leakages of old, deteriorated distribution networks that require major costly rehabilitation or replacement [Illustration 7].

Increase the efficiency of irrigation.

Throughout the region, only about a third of water applied in irrigation reaches the crops, and many of them have low value. The technical efficiency of irrigation can be improved. Drip irrigation, plastic houses and lining of canals to reduce evaporation and leakages can cut water use by 50 percent per hectare and more than double crop yields, showing that less can actually produce more. Meanwhile, agricultural value added can be increased by a better selection of crops. For example, a single hectare of bananas requires at least 20,000 cubic meters of water per year — for a crop value of about 44 cents per cubic meter of water. Similarly, it takes up to 1,500 cubic meters of water to produce one ton of wheat, valued at less than US\$ 300 — a crop value of less than 20 cents per cubic meter. By contrast, Jordan produces irrigated flowers for local markets

at prices that allow the farmers to pay US\$ 1 per cubic meter of water.

Irrigation water is usually priced at a fraction of its cost — little more than 2 cents a cubic meter in the Jordan Valley — providing little or no incentive for efficient use. Even small transfers of water out of agriculture can make a big difference. A 15 percent reduction in agricultural use in the region would double the water available to households and industry. In Morocco, a 10 percent transfer from irrigation would provide enough water for all additional domestic use for more than a decade. Water-scarce economies such as Singapore, Hong Kong and Malta have successfully built their economies on trading, finance, and tourism. Gaza might follow suit and embark on a growth path centered on manufacturing and services.

Reallocate water from low-value irrigation by trading water rights. Farmers generally have entrenched rights to large volumes of irrigation water, while nearby cities experience water shortages. Shifting water from agriculture is socially and politically sensitive, especially for rural communities, which see the risks but not the potential benefits. In

7. Working with the Private Sector in Egypt

The Egyptian Government is taking steps to involve the private sector in providing drinking water and in conservation. In a village of 5,000 inhabitants with no drinking water, a private company has been contracted to purify water and sell it in bottles at US\$ 2.50 a cubic meter — covering capital and operating costs. If the experiment is successful, purification plants will be established locally and the system will be extended to other villages.

Under a USAID-financed scheme, a NGO and a private Egyptian company are working in three governorates — Cairo, Suez and Ismailia — to detect and repair leakages in houses and government buildings, install water meters and carry out social assessments to draw lessons from the scheme.

some instances, informal markets have developed — around Amman, Jordan, farmers truck water to the city — but these transactions are uncoordinated and inefficient. Farming communities across the region should pay the real cost of water; they can then be shown the opportunities for growing water-efficient crops and selling the water saved in a formal water market. Shifting water from farms to cities is already done in many parts of the world — for example, in China, Mexico and the United States (the “water banks” of California). But introducing farmers to this “win-win” situation will require participatory approaches involving local leaders in demonstration schemes.

Reduce the volume of “missing” water.

About half the water pumped into municipal distribution systems in MENA is unaccounted for. Compounding this loss are high operating costs and low tariff-recovery rates due to poor maintenance and weak management. Household devices often use water wastefully. The installation of efficient, low-cost alternatives — water saving faucets, low-volume flush toilets, low-flow shower heads — can help improve the efficiency of water use. In all this, the key is for people and governments to understand water’s value.

Control groundwater extraction. Sustainable groundwater use must be central to any national water strategy. At present rates of withdrawal, the Sana’a basin will be completely dry within twelve years, unthinkable for a nation’s capital. The highland aquifers in Jordan and Yemen and the coastal aquifer of Gaza are also being depleted. A national strategy should regulate, monitor, and control groundwater extraction through pumping taxes, extraction fees, and withdrawal quotas.



Improving water quality is critical. Environmental safeguards to protect aquifers and keep surface water clean are essential. Countries should prepare environmental sanitation strategies, establish water quality standards, and rigorously enforce them. For example, most of the region’s wastewater treatment plants are inadequately designed and poorly operated, and untreated wastewater contaminates both land and water. To salvage the large sums invested and forestall further environment degradation, governments should embark on programs to rehabilitate wastewater treatment plants, and provide adequate incentives and training to ensure proper operation and maintenance.

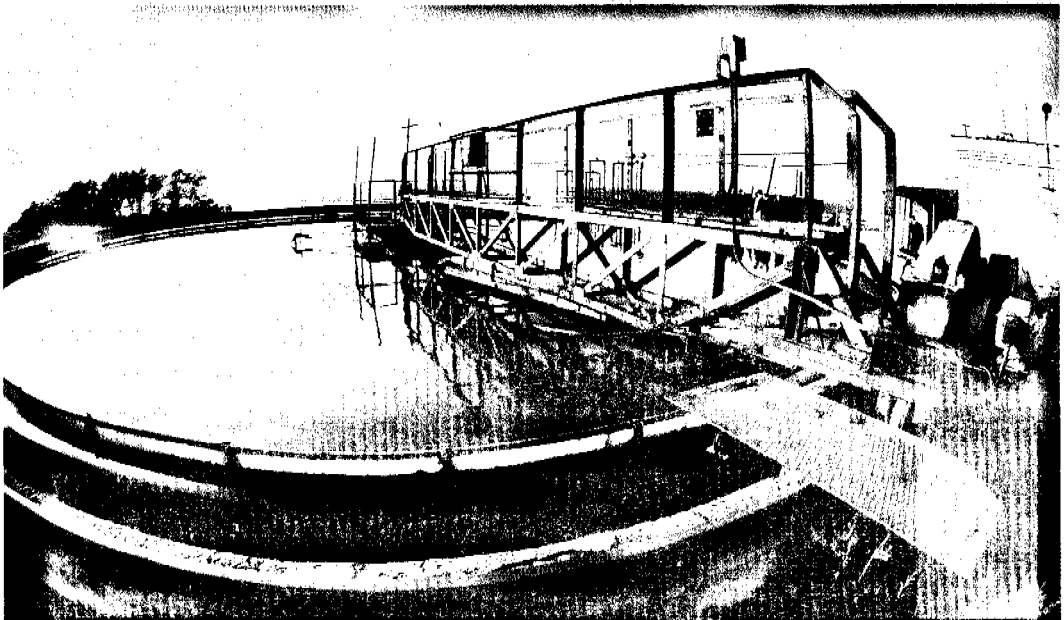
8. Cost of Options for Enhancing Water Resources

	Estimated Costs in US Cents/Cubic Meter
Reducing end-user demand (recirculation, low water-use technologies) and leakage repair	5 - 50
Treatment of wastewater for irrigation	30 - 60
Desalination of brackish water	45 - 70
Development of marginal resources	55 - 85
Desalination of seawater	100 - 150

Source: World Bank Estimates, 1995.

Reuse wastewater to augment supply and reduce pollution. Disposing of untreated wastewater is causing serious environmental problems, as well as polluting surface and groundwater. Treating and reusing wastewater can conserve resources and reduce resource pollution. Particularly in agriculture, the reuse of treated wastewater and drainage water can release freshwater for higher-value use and reduce fertilizer consumption. The cost of treating wastewater for irrigation averages about 45 cents per cubic meter, significantly less than developing many alternative sources of supply

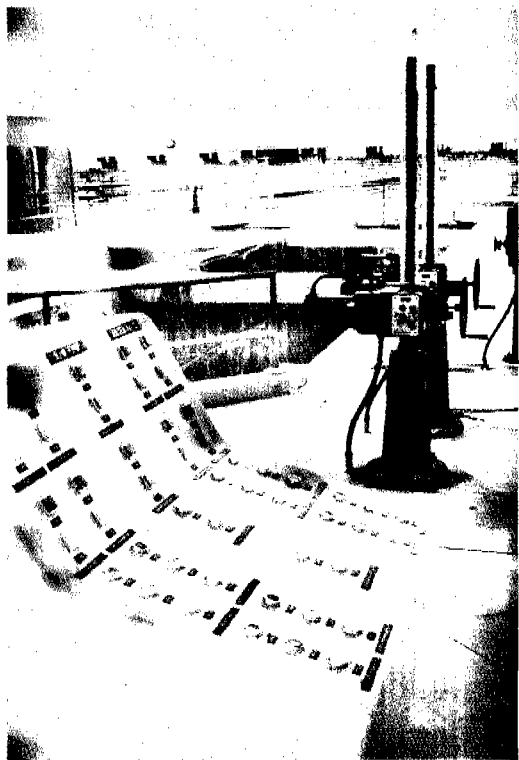
[Illustration 8]. Egypt recycles about 3.4 billion cubic meters of agricultural drainage water and may double what it recycles by the year 2000. Tunisia is currently irrigating 3,000 hectares with 18 million cubic meters of treated wastewater per year and hopes to increase the wastewater-irrigated surface tenfold by 2000. However, reuse is mostly haphazard and presents significant health risks, especially where untreated wastewater is used to irrigate vegetables as is the case in almost all MENA countries. To avoid the spread of disease, water should be suitably treated for the type of crop to be irrigated.



SEEKING ALTERNATIVE SOURCES OF WATER

New water supplies will have to be identified. Despite all conservation measures, demand will eventually outpace supply and new sources of water will be needed. Desalination is a technical option available to countries whose economies can bear the cost. The most promising alternative supply options are international, regional, and local water markets for transferring water from surplus to deficit areas using canals, pipelines, and tankers. Canals and pipelines are technically feasible but bear the risks attached to monopoly suppliers and political interference. A more recent option, giant floating bags for transporting water by sea, is currently under study. Estimated transport prices across the Mediterranean range from 15 cents to 35 cents per cubic meter for several million cubic meters per year. These prices, however, do not include the costs for terminals, inland transport, or purification.

Desalination was once confined to the wealthiest countries, but costs have fallen from more than US\$ 4 a cubic meter to between US\$ 1 and US\$ 1.50 today, and locating plants close to coastal population centers can keep distribution costs low. Meanwhile, rapidly escalating costs of new freshwater are eroding the price difference between conventional and desalination projects, with desalination fast becoming an option for many countries. Malta shows how a country can reorient its economy, adjust to water shortages, and afford the cost of desalination [Illustration 9].



9. Malta – Successful Desalination

For a country with a strong economy, desalination is a reasonable source of additional freshwater, especially if a large proportion of the population is located at or near the sea. Thirty years ago, Malta had a small, agriculture-based economy with a yearly per-capita income of only about US\$ 500. The country has renewable water resources of only 80 cubic meters per capita per year. Fueled by its service-oriented economy, it has raised incomes to US\$ 6,000 per person. Recognizing the imperative of overcoming its *water constraint*, Malta started desalination in the 1960s and today supplies 70 percent of its water needs, about 85,000 out of 120,000 cubic meters per day from desalination, at a cost of US\$ 1.20 per cubic meter (mostly financed by user charges). Malta's economy can afford the cost of desalination, and water supply has ceased to be a constraint for economic development.

PROMOTING PARTNERSHIPS AT REGIONAL AND INTERNATIONAL LEVELS

More than a third of MENA's renewable water resources come from outside the region, so MENA countries need water strategies that look beyond their borders. As water scarcity becomes more acute, regional perspectives and initiatives will become more important, and national and international partnerships will be key to successful regional water management. To harmonize policies and coordinate development approaches, such partnerships will need to address joint planning of river basins, sharing water data, and establishing effective networks for the exchange of information on water development and management. Early examples of such partnership arrangements include the following:

- **Regional and river basin planning.** To manage the water flow between riparian countries, the ongoing Jordan River Basin study — involving a partnership of German Technical Assistance and the World Bank, supporting local teams of water experts — is carrying out an in-depth analysis of the Basin with a 50-year perspective. Similarly, the *Jordan Rift Valley Development* study, which emerged from the signing of the Peace Treaty between Israel and Jordan, considers water, now largely absent from the Rift Valley, as the main element determining the scale of future economic development.
- **Data collection and exchange.** Based on a concept developed by the World Meteorological Organization and the World Bank, the *Mediterranean Hydrological Cycle Observing System (MED-HYCOS)* is in its first stage of regionwide hydrometeorological

monitoring and automated data collection, transmitted by satellite to receiving stations in participating countries. The system will provide countries of the Mediterranean Basin with a powerful tool for water planning and management.

- **Institutional networks.** The *Mediterranean Water Agencies Network (MEDWAN)* is fostering technical assistance and exchange of information between water agencies in the region. Focusing on integrated water resources management and the development of project proposals in the water sector, it was created jointly by the Mediterranean Environment Technical Assistance Program (METAP), which supports innovation in water management, and the Marseille-based Institut Méditerranéen de l'Eau.

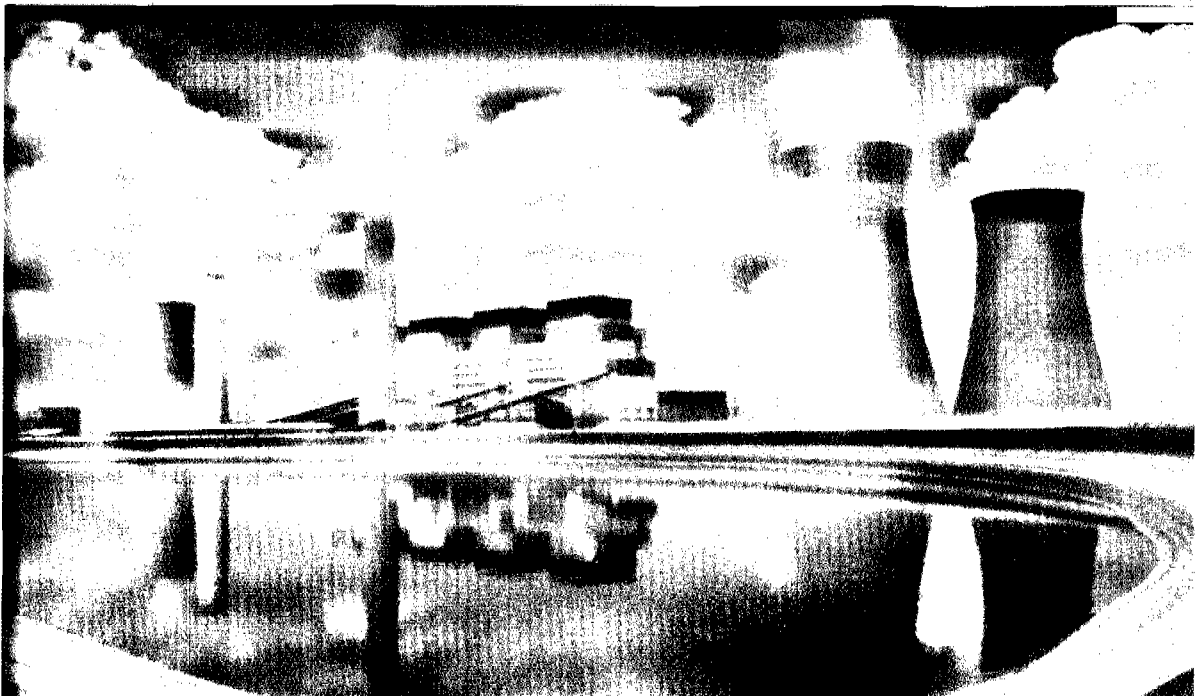
- **Innovative water development initiatives.** To shift to sustainable, participatory approaches employing low-cost technologies — and to test new methodologies and persuade people and decision-makers of their viability — small demonstrations are needed as precursors of larger projects. The World Bank, in partnership with donors, will seek financing to provide grants for such innovations.

Donor Liaison and Partnerships. To implement the partnership and in response to MENA countries' revised national water strategies, donors will need to define new technical assistance and financing priorities. The creation of *donor liaison groups* could be a first step to help coordinate and facilitate the process of change in the countries. ■

III. THE MENA WATER PARTNERSHIP: A PLAN FOR ACTION

Concerted actions are necessary. Although past individual projects and programs had some local impact, the overriding result has been fragmentation of effort at local and government levels, as well as among donors. This has led to duplication, inefficient use of resources and overall frustration. To help alleviate these problems, the World Bank proposes to launch a MENA Water Partnership that would energize and harmonize government and donor efforts in the sector. The Partnership would define and implement a coordinated Plan of Action which would depend on people, sector institutions, governments, and donors, all working together. This chapter suggests an outline for the Plan of Action which would operate

on two levels. The *first level* would be implemented in countries, among and between people, government and sector institutions. People's perception that their needs are being heard and addressed, and their participation in the process, are essential for sustainable development. Cooperation among sector institutions is crucial to reconcile competing demands for water. The *second level* would be implemented internationally, between governments and donors, and among donors themselves. A concerted approach between different donors and individual governments will be essential for a coherent and effective approach to water management. The partnership approach would be specified and agreed at a MENA Water Conference, where



10. World Bank Commitment to The MENA Water Partnership

Since 1960 the World Bank Group has lent US\$ 35 billion globally for water projects. About US\$ 4.5 billion (13 percent) has gone to MENA countries, US\$ 2.5 billion for water and sewerage projects and US\$ 2.0 billion for irrigation. For the past five years Bank lending for water projects in the MENA region has averaged about US\$ 220 million a year.

In 1993, the Bank issued its Policy Paper on Water Resources Management, calling for the integrated planning, financing and management of water resources, followed by *A Strategy for Managing Water in the Middle East & North Africa* which related the new policy to MENA countries. The main elements of this strategy are reflected in the **MENA Water Partnership**. Countries that develop effective strategies will be supported by the donor community, including the World Bank, which intends to double its lending for water. Future Bank water operations will assist MENA countries in their implementation of the Partnership.

In addition, the World Bank will:

- Significantly strengthen its capacity to help countries develop their water plans, with particular emphasis on river basin planning, creating water markets and using social and environmental assessments and participatory approaches to ensure the sustainability of water programs.
- Deploy water staff in the Region and mobilize local expertise to provide a full range of needed services.
- Develop with countries a joint program of water staff and management training, including a coordinated program of in-country and regional workshops.
- Promote regional awareness of water programs and issues, participate in donor liaison groups, and jointly sponsor a triennial MENA Water Conference.
- Seek, together with other donors, financing to provide grants for innovative projects and approaches.

national and international interests would come together to harmonize their sector development plans and policies. The European Union, other regional donors and several countries have already expressed interest in joining the partnership and in helping to organize the Conference in 1997.

At the Stockholm Water Symposium in August 1995, the World Bank announced the creation of a Global Water Partnership (GWP) that would bring together key participants in integrated water resources management, to pool their efforts for more effective country-level programs. Building on the GWP, the MENA Partnership delineates actions that countries and their

international partners could take over the next five years. The Plan of Action needs to be adapted to the institutional arrangements and stage of water development in each country. For countries already gearing up for change, start-up actions can be completed by the end of 1997 with medium-term goals to be attained by 2000. Even for these countries, successful completion of the program may take a decade. So starting now is vital.

The World Bank is a partner. Committed to this partnership, the World Bank will expand its technical assistance, credits, and loan guarantees, and will work in close collaboration with other donors in mobilizing resources for the sector [Illustration 10]. The

African Development Bank, the European Investment Bank, the European Union, Arab Funds, as well as a large number of bilateral donors, have made significant investments in the water sector. These donors and MENA countries are invited to play a major role in the proposed partnership, to seek sustainable and coherent ways to avert the water crisis.

GOALS AND EXPECTED RESULTS

The long-term goals of the MENA Water Partnership are to:

- Improve the efficiency and allocation of water use, thus reducing the overall per-capita extraction of raw water to sustainable levels.
- Make the water sector self-financing.

- Ensure consistent water supply to the largest possible number of consumers.

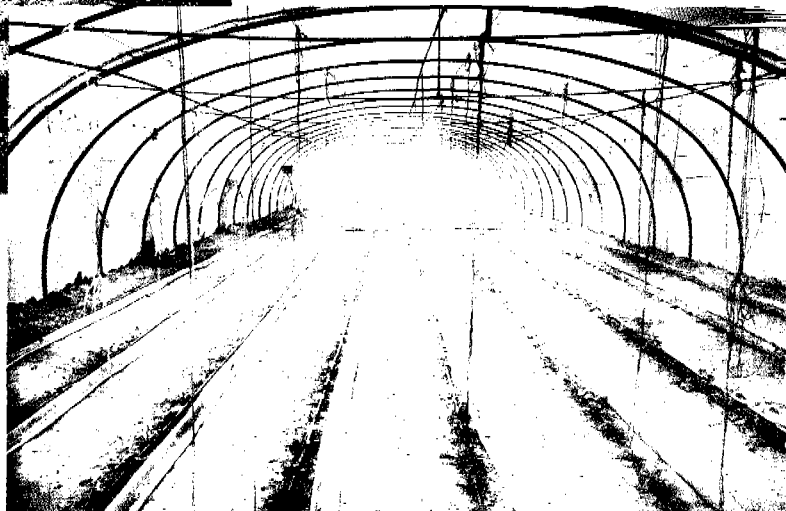
INVESTMENT COSTS

Averting the water crisis in the MENA region will not be possible through the traditional supply-side approach. Instead, it will require a reorientation and expansion of investment, designed to rehabilitate and extend distribution and transfer networks, to modernize irrigation systems, to greatly expand wastewater collection and treatment, and to preserve water quality through solid waste management and river and aquifer protection.

Recent investment data are available for the seven countries in the region that have actively borrowed from the World Bank for



The old and the new



**11. Estimates of MENA Region
Water Investment Requirements, 1996 - 2005**

	US\$ Billion
Increasing Water Use Efficiency: (irrigation upgrading and reallocation networks)	20 - 24
Sanitation and Wastewater Treatment: (collection, treatment, disposal; target 80% service coverage)	10 - 15
Conservation and Water Supply: (rehabilitation and expansion of distribution networks; target 90% service coverage)	5 - 6
Environmental Protection: (solid waste management, river clean-up, control of agricultural run-offs)	10 - 15
<hr/> Estimated Ten-Year Total	<hr/> 45 - 60

Source: World Bank estimates, 1995.

the water sector *in the last three years* — Algeria, Egypt, Jordan, Lebanon, Morocco, Tunisia and Yemen. These seven countries have together invested about US\$ 1.5 billion annually in water development, of which about US\$ 1 billion came from official development assistance. This represents on average 1 percent of their combined GDP. Other countries in the region have also invested significantly in water.

In the next ten years, to raise regionwide service coverage from 84 percent to 90 percent for water supply, from 72 percent to 80 percent for sewerage and sanitation, and to substantially increase water-use efficiency and environmental protection, the MENA region's annual investments need to increase to about US\$ 4.5 to US\$ 6 billion [Illustration 11]. The above seven countries and Iran, Iraq, Syria and the West Bank and Gaza, have most of the unserved people, and therefore will need to invest the bulk of these funds. This will be a major endeavor in

which several countries will need to invest up to 2 percent of their GDP. In addition, about 5 to 10 percent of asset values should be generated for sustainable operation and maintenance.

FINANCING PLAN

An indicative regional financing plan [Illustration 12] shows that the majority of future investments — about 70 percent, compared with about 30 percent in the past — must come from governments, mostly through water-user charges. The international donor community would contribute about 25 percent of the total investment cost, about one and a half times the current level. The private sector, whose participation is currently almost nil, is expected to have about a 5 percent stake in the sector by 2005.

To afford the tremendous increase in annual investment requirements and to improve the

low overall cost-recovery rate of 10 percent at best, governments need to drastically increase the sector's cash generation. This can be done through tariff increases, particularly for irrigation water, along with an active drive to mobilize private funding. World Bank guarantees can facilitate access to, or improve the terms of this financing [Illustration 13]. Such guarantees are being considered for two major bulk water supply systems, Jordan's Amman pipeline and Lebanon's

Awali-Beirut conveyer. Both would expand water supply in the two capital cities.

The large investment program will severely strain current implementation capacity in MENA countries. The World Bank and other donors will help countries to expand their institutional and human resources base with technical assistance, training programs and best practice seminars. ■

12. Indicative 10-Year Financing Plan for Water Investments

	US\$ Billion
Governments, mostly through user fees (70 percent)	30 - 42
Donors (25 percent)	13 - 15
Private sector financiers (5 percent)	2 - 3
Total	45 - 60

Source: World Bank estimates, 1995.

13. Guarantees Can Make Private Financing of Water Projects Possible

Countries that have an established track record in regulating private infrastructure entities fairly can secure private financing for viable projects at reasonable terms. For countries that lack this experience, however, it is often difficult to attract private interest for the first few projects needed to build market confidence. This difficulty is especially present in the water sector, which is characterized by large investments with long payback periods and extensive government regulation. The Bank's partial risk guarantees can help countries overcome this obstacle.

The guarantees cover payments to commercial lenders in the case of defaults resulting from non-performance of contractual obligations undertaken by governments or public agencies. For water or wastewater projects, such obligations may include:

- maintaining an agreed-upon regulatory framework, including tariff formulas;
- delivering inputs, such as electricity supply to a pumping station;
- paying for outputs, such as bulk water delivered to a publicly-run distribution company;
- compensating for project delays or interruptions caused by government actions or political events;
- compensating for incremental costs imposed by changes, e.g. in environmental regulations;
- central bank obligations to provide foreign exchange.

MENA WATER ACTION PLAN

Start-up Actions (by end 1997)	Medium-Term Goals (by 2000)
A. INITIATIVES AT COUNTRY LEVEL	
1. Mobilizing Country Efforts	
<p>PUBLIC AWARENESS Public information campaigns implemented in schools and community centers. Willingness-to-pay assessed through local participation.</p> <p>PARTICIPATION A national water advisory council or equivalent body to include key representatives from government, water users and cultural leaders is established to provide a forum for two-way communication between government and local communities on issues including conservation and water pricing. Develop procedures, including social assessments, for ensuring user participation in water decision-making activities.</p> <p>WATER USER ASSOCIATIONS Strategy for promoting and sustaining water users associations is prepared. Pilot schemes in operation.</p>	<p>Citizens accept and adopt new pricing and conservation measures.</p> <p>User participation fully operational; stakeholders on boards of local service agencies.</p> <p>Water user associations active and managing irrigation schemes and small water supply systems.</p>
2. Integrating Water Resources Management	
<p>STRATEGY AND INSTITUTIONS National water strategy prepared, including water law and measures to: <ul style="list-style-type: none"> promote conservation, improve sectoral allocation, recover costs, prioritize investments, investigate alternative sources of supply, and reform institutions. <p>A National Water Authority, responsible for water resource policies and planning, is established.</p> <p>National Water Authority prepares plan for decentralization and commercialization of service management.</p> </p>	<p>Strategy adopted:</p> <ul style="list-style-type: none"> • users conserving water; • higher water prices and fees shift water to high-value usage and recover costs; • priority projects implemented; • alternative water sources identified; • integrated central and decentralized service agencies operating effectively. <p>National Water Authority plans, coordinates and monitors water resource allocation and management.</p> <p>Water service management decentralized and operating on business principles by corporate utilities.</p>

Start-up Actions (by end 1997)	Medium-Term Goals (by 2000)
3. Using Scarce Water More Efficiently and Reducing Pollution	
<p><i>Plans prepared for:</i></p> <p>DEMAND MANAGEMENT</p> <ul style="list-style-type: none"> recovering operation and maintenance costs in urban and irrigation sectors. <p>IRRIGATION EFFICIENCY</p> <ul style="list-style-type: none"> reducing water use in irrigation while maintaining or increasing agricultural value added. <p>URBAN EFFICIENCY</p> <ul style="list-style-type: none"> reducing unaccounted-for water, including rehabilitation of networks, water saving by households and industry. Priority programs and investments identified. <p>SUSTAINABLE GROUNDWATER USE</p> <ul style="list-style-type: none"> restricting groundwater exploitation to sustainable levels, including regulation, monitoring, and enforcement. <p>Pilot scheme in operation.</p> <p>IMPROVING WATER QUALITY</p> <ul style="list-style-type: none"> an environmental sanitation action plan is prepared including wastewater treatment, river cleanup and groundwater protection. Water quality standards established. <p>REUSE OF TREATED WASTEWATER</p> <ul style="list-style-type: none"> substituting treated wastewater for freshwater in agriculture and industry. 	<p>Full O and M costs and 20 percent self-financing for all urban utilities are being recovered from water users.</p> <p>Significant reduction in irrigation water use.</p> <p>Unaccounted-for water significantly reduced; regional benchmark should become 30 percent or less, instead of current 50 percent.</p> <p>Groundwater regulations enforced, groundwater overdrafting restricted to temporary use of small aquifers and large-scale use of major aquifers, only after other solutions are shown to be less suitable.</p> <ul style="list-style-type: none"> wastewater treatment plant rehabilitation program being implemented; river and groundwater cleanup, focusing on "hotspots", being implemented; quality standards enforced. <p>At least half the country's wastewater being reused for economic activities.</p>
4. Seeking Alternative Sources of Water	
<p>NEW WATER SUPPLIES</p> <ul style="list-style-type: none"> evaluate the need for supplementing existing supplies with alternative resources, e.g. water imports and desalination. identify alternative supply options including desalination and assess their feasibility. 	<p>Plans analyzed and costed. Legal contracts established. Detailed feasibility studies prepared for key projects. Financing identified.</p>

Start-up Actions (by end 1997)	Medium-Term Goals (by 2000)
B. INITIATIVES AT REGIONAL AND INTERNATIONAL LEVELS	
5. Promoting Partnership at Regional and International Levels	
<p>REGIONAL INITIATIVES Jordan Rift Valley Master Plan prepared; feasibility studies of priority projects completed. Joint management structure agreed.</p> <p>Jordan River Basin Study completed. Proposal for joint water management program presented by riparians.</p> <p>DONOR LIAISON Donors, in conjunction with countries, jointly define new lending and technical assistance priorities to complement MENA countries' revised national water strategies.</p> <p>Donor water liaison group or possible consortium established to promote consistency of approach and effort.</p> <p>MENA Water Conference in 1997 to bring together donors and MENA country water representatives to agree future directions and investment priorities.</p> <p>DATA AND INSTITUTIONAL NETWORKS MED-HYCOS system in place and operational in at least five countries.</p> <p>MEDWAN program implemented.</p>	<p>Priority projects financed and under construction.</p> <p>Feasibility study for priority projects under preparation regionwide. Continued regional collaboration on development of plans and joint projects.</p> <p>Process complete. Inventory of donor water activities established.</p> <p>Donor-country partnership incorporated into countries' water planning process.</p> <p>Coordination mechanism fully operational. Liaison group meets annually to coordinate programs.</p> <p>Conference repeated in 2000 and triennially thereafter.</p> <p>MED-HYCOS system completed and operational.</p> <p>Regional technical assistance supporting priority programs.</p>

CONCLUSION

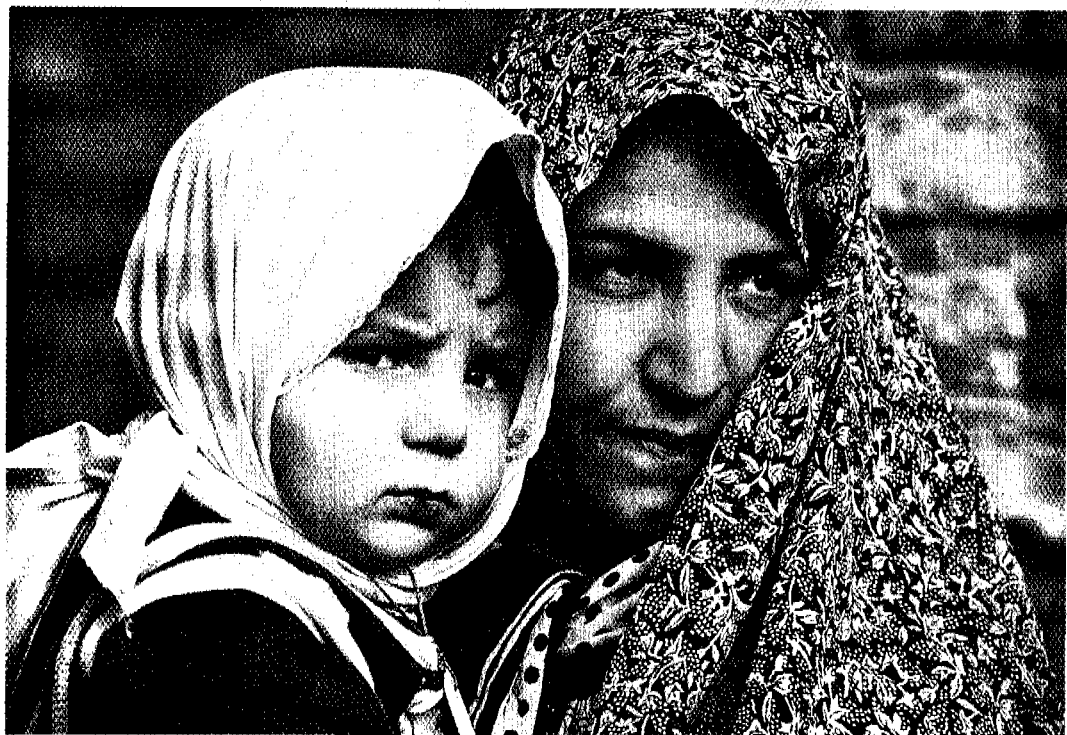
MENA's dwindling water resources are threatening people's livelihoods and the region's economic growth. Despite the extraordinary resilience of MENA countries in dealing with water scarcity, a crisis is looming. But the crisis is not inevitable; it can be averted.

The Water Action Plan proposes key steps for tackling the problem. The Plan is a guide, not a blueprint. Each country is different and should set its own targets. These will depend on its starting position and will demand the full participation of users, governments and donors.

The need for action is urgent. The agenda is large and will require a concerted and sustained effort. If countries follow the Action Plan, the region can expect to make progress within a decade toward its long-term goal of water self-sufficiency. Measurable targets of such progress could include:

- a reduction in the use of irrigation water by about 10 percent and a simultaneous increase in agricultural value added;
- a regionwide reduction in water losses of about 40 percent;
- a 50 percent increase in water availability for domestic and industrial use;
- access to drinking water for about 90 percent of the population and safe sanitation for 80 percent.

If these goals are achieved, the MENA region will be well on the path to averting the water crisis and will be moving from water scarcity to water security. ■



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