

**WATER DEMAND MANAGEMENT IN THE MIDDLE EAST AND NORTH AFRICA:
OBSERVATIONS FROM THE IDRC FORUMS AND LESSONS FOR THE FUTURE**

**David B. Brooks
Lorra Thompson
and
Lamia El Fattal**

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ABSTRACT

In 2002 and 2003, Canada's International Development Research Centre, in partnership with other donors, organized four regional Forums to facilitate the exchange of information, results and lessons learned on water demand management (WDM) in the Middle East and North Africa (MENA). Over 500 decision-makers and water practitioners from 11 countries participated in Forums on wastewater reuse, water valuation, private-public partnerships, and decentralization. A large amount of valuable information on the above topics was gathered, and is available by entering www.idrc.ca/wadimena and clicking on WDM Forums.

The WDM Forums demonstrated that water demand management is occurring in MENA, but without the breadth or strength that is required by the increasingly difficult water situation throughout the region. There is therefore great scope for further analytical work on water demand management and even greater scope for work on ways to promote its adoption in all nations and sectors. This review extracts lessons from the Forums, and suggests short- and long-term entry points for research and practice. The most striking conclusion is that *in no MENA nation is WDM the main impetus for action*. With wastewater the need to deal with growing volumes of sewage is the main force, and with the other three forums it is the need to reduce government budgets. Future work to promote water demand management in MENA must be oriented to identifying and strengthening linkages to other water policies or programs, notably by distinguishing the role of WDM as a tool for greater water use efficiency from its role as a tool for greater water use equity. Equally important will be efforts to strengthen multi-stakeholder participation, transparency and accountability in policy-making processes and to promote dialogue with water-users, particularly women and the rural poor.

Keywords

Water demand management
Middle East and North Africa (MENA)
or West Asia and North Africa (WANA)
Water Use
Water Conservation
Water Efficiency
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With the exception of the last few decades, during which petroleum has played such a prominent role, fresh water has been the natural resource that has preoccupied and guided the thinking of governments and peoples for the three millennia of recorded history in the Middle East and North Africa (MENA). Though some regions of the world are drier than MENA, and others have higher populations or larger economies, no other region of the world embraces such a large area with so many people striving so hard for economic growth on the basis of so little water: MENA has 5% of the world's population but only 1% of its fresh water. Excluding island and city states, there are only 20 nations with internal renewable fresh water availability below 1000 cubic metres per capita (UNESCO, 2003); 15 of them are found in MENA. Not surprisingly, much of the history and the culture of this region reflects the dominant role of water as the limiting factor in development (Rogers and Lydon, 1994; Biswas *et al.* 1997; Amery and Wolf, 2000), as well as the source of many of its conflicts (Shapland, 1997; Haddadin, 2001).

The apparent imbalance of active population and economic growth in a region chronically short of water is explained by two forces, one mainly geographic in origin and the other mainly anthropogenic. First, lying south and east of the Mediterranean Sea, which provided a means for transportation and communication, and including the Nile and the Tigris-Euphrates, which permitted extensive irrigation, MENA has long been a centre of urban development to support commercial and trade activities and of rural development to produce food for local use and for export.

Second, historical evidence indicates that water has been managed, typically by some central authority, to ensure that the quantity supplied comes close, at least in most years, to the quantity demanded. Dams and wells are hardly new to the region, and they have been supplemented by canals, tunnels and other conduits that go by a variety of local terms. The irrigation systems of the Sumerians in Mesopotamia are legendary, as are the pipes that brought water to Palmyra in Syria. They were the forerunners of modern megaprojects, such as *les grandes perimetres* for irrigation in Morocco and the Aswan Dam in Egypt.

Ultimately, however, this mainly supply-oriented approach to water management began to reach economic and even physical limits. In recent years, as population grew exponentially, attention began to turn toward the opportunities to moderate, or even reduce, the demand for fresh water. Starting mainly in the mid-1990s, articles and reports began to appear on water demand management (WDM) under scarce water conditions, with emphasis on pricing to reflect the actual costs of water delivery, wastewater reuse, and greater efforts at water conservation in all sectors. As well, institutional changes were considered to permit, on the one hand, quasi-independent

water agencies, and, on the other hand, decentralized community management – in either case with responsibility not just for water delivery but also for efficiency of use and pollution control.

It was in this context of a growing interest in water demand management that, in 2002 and 2003, Canada's International Development Research Centre (in partnership with other donors) conducted four Forums on Water Demand Management for countries in the Middle East and North Africa. (IDRC is a Canadian crown corporation that helps developing countries develop the research capacity needed to find practical, long-term solutions to the social, economic and environmental problems they face.) The purpose of the Forum project was to enhance dialogue on the key WDM issues, and to assess the extent to which WDM is being adopted in the region. Workshops were also held to allow participants to share knowledge and exchange ideas.

Participants from Algeria, Egypt, Jordan, Lebanon, Morocco, Palestine, Syria, Tunisia and Yemen represented water practitioners and mid- to top-level government agencies and ministries. Those with extensive experience on a particular issue were asked to prepare case studies outlining their specific situation. International and regional organizations also contributed to the individual Forums.

The Forum topics were designed on the basis of a regional survey conducted among decision-makers to identify the priority issues in WDM facing the region. The following four regional Forums were held:

- Wastewater Reuse (Rabat, Morocco; March 2002)
- Water Valuation (Beirut, Lebanon; June 2002)
- Public-Private Partnerships (Amman, Jordan; October 2002)
- Participatory Irrigation Management (Cairo, Egypt; February 2003).

Materials, including country case studies, were all reproduced in Arabic, English and French, and they were both placed on a CD (the supply is now exhausted) and on the www.idrc.ca/wadimena website. (Click on WDM Forums.) In addition, a booklet that reviews the forums has been prepared (Baroudy *et al.* 2005). The growing attention to water demand management in MENA was also reflected in the International Water Demand Management Conference, which was held in Jordan in the summer of 2004. (The proceedings are available at: www.mwi.gov.jo/IWDMCP/index/MON.htm)

On their own terms, the Forums were remarkably effective, and they very likely had positive effects on future government policies. However, review of all the outputs from the Forums, including statements by participants, leads to the conclusion that, at the start of the 21st century, *the main objective of WDM efforts by governments in MENA is to cut budgetary costs, not to save water or to make water-use more efficient or equitable*. Effects on water use were generally assumed but rarely demonstrated and, even less often, quantified. Little attempt was made to establish linkages to poverty reduction and environmental protection. However much emphasis is placed on water management in MENA, a targeted focus on water *demand* management remains to be fully developed.

This paper begins with an overview of outputs from the Forums, as presented by researchers and decision-makers and water specialists. It goes on to draw lessons from their documents and discussions, as well as from the gaps. The paper then suggests entry points for future WDM work that can improve future research, policy and practice in MENA.

Selected Results from the Forums

IDRC's main goal in conducting the four Forums was to share knowledge among key decision-makers and to extend knowledge of successful WDM applications in ways that might push the approach higher on government agendas. The case studies, prepared by and for decision-makers, were intended to highlight the experience of specific countries in applying particular components of a WDM strategy with emphasis on the economic, environmental and social benefits of those strategies. Though they contained a wealth of information, the intention of the case studies was not always realized. They provide a good picture of *What is*. They do not, however, indicate *What might have been*, much less *What should be*.

In part, this emphasis on the retrospective rather than the prospective was predictable. Most of the presentations were prepared by senior staff in the relevant water ministry, which imposed obvious constraints. Even so, the authors were remarkably frank and honest about conditions as they saw them. The materials presented at the Forums were strong on the technical, with a nod to economics, but weak on anything related to social issues such as gender, or cultural and behavioural issues – something that may in part be a result of the tendency of water ministries to employ mainly male engineers, rather than including professionals from social sciences or other disciplines. For example, in the Forum on decentralization and participatory irrigation management, there was little attention to communities, families, kinship relationships, or women. Economic issues focussed on transfers from governments to water users' associations, with no direct evidence about impacts on women's work, or on maternal and child health. In retrospect, no one should have been surprised that discussions about bottom-up management were mainly from a top-down perspective.

Brief summaries of key results from the four Forums, as reflected in case studies, national presentations and participant discussions, follow. All these materials appear on the website, so citations here are limited to places where the reader might experience difficulty finding a specific source. Monetary units have been adjusted to US dollars at its 2002 value.

Forum on Water Reuse

Wastewater reuse is really a form of supply management, but one that is closely related to water demand management when it replaces freshwater that would, in its absence, be used to achieve any particular task, or when it permits the use of lower quality water

for specific purposes. Most nations in MENA recognize that they have major sanitation problems, particularly in urban areas, and the need for new strategies to provide for growing populations is at least as much a driving force for the increasing use of wastewater as are shortages of fresh water. Exceptions occur in coastal cities where it is easy to dump sewage into the sea.

Though wastewater is treated in some urban areas, relatively little is actually reused. In locations where facilities do exist, the main use for treated wastewater is irrigation. Though most nations permit treated wastewater to be used for food crops, some have adopted restrictions on its use depending upon the level of treatment. Other uses include recharging aquifers, creating green belts, fixing sand dunes, watering golf courses, and providing cooling water for industry. None of the participating MENA countries suggests treatment to the level that would permit wastewater to be used inside the house.

All countries are acutely aware of the adverse environmental and health effects of poorly treated wastewater. Jordan, for example, is emphatic about maintaining water quality standards for use of treated wastewater, and the Ministry of Health destroys crops from farms that violate the regulations. Lebanon also emphasizes quality control in aquifer recharging projects.

Economic information about wastewater reuse was disappointingly scarce at the Forums. The little information presented was not sufficiently detailed to distinguish capital from operating costs, nor to indicate how costs vary with volume, treatment level, and other variables. Though Jordanian data presented in its wastewater case study show that centralized sewage treatment is cheaper (per household) than individual cesspools, and Moroccan data, that farm output benefits from reuse, there are few measures of the *marginal* cost of wastewater reuse compared with normal wastewater treatment and release into wadis, or the *marginal* benefit for farmers from purchasing recycled as opposed to fresh water. The Tunisian wastewater case study does state that tertiary treatment of wastewater adds 15 to 20% to the cost of secondary treatment, but that the total cost is still 30% below that of water from a new dam.

Both prices and pricing policies for treated wastewater vary widely from place to place, and typically they are based on political choice rather than actual cost. For example, golf courses in Morocco pay four times as much per cubic metre as farmers. In those cases where cost is considered, it is treated from an accounting perspective rather than recognizing that failure to treat wastewater imposes its own health and social costs. In general, pricing aims to keep the cost of treated wastewater to the farmer below that of fresh water, and, as necessary, governments provide subsidies to maintain that difference.

In summary, though reuse of treated wastewater may still be less rather than more common in MENA, the technology is coming of age, at least in urban areas where sewage tends to receive tertiary treatment. Rural areas lag behind; sewage typically

receives little or no treatment, and many farmers continue to use raw wastewater for irrigation, particularly in peri-urban areas. Because it *is* growing in importance, the health effects of wastewater reuse need to be further discussed in the region, particularly with respect to the farmer who comes in regular contact with the water.

Forum on Water Valuation

No one disputes that water should be valued in MENA, and that a price should be imposed on the user to recover the costs of the service for the supply of water. Difficulties arise mainly from the wide range of objectives sought from water pricing. Though most of those objectives are valid to one degree or another, there is no purely rational way to determine the appropriate balance among them.

All but absent from all the discussion about valuation is the critical concept of price elasticity of demand. Without some idea of elasticity, there is no analytical way to estimate the effect of price changes on consumption. The common assumption – at least for household water – is that most consumers are operating in a relatively inelastic portion of the demand curve, so that price increases will not much affect consumption. However, where attempts have been made to identify impacts, there does seem to be a direct and substantial link between water tariffs and water savings. Tunisia, one of the few nations to measure elasticity, reports in its drinking water case study a price elasticity of 1.0 for high water-using households. Similarly, its report on irrigation water notes that, as prices for irrigation water were gradually raised, Tunisian farmers sensibly shifted to higher value crops, notably vegetables and fruit trees, and away from cereals. The same studies suggest that the income elasticity of demand is positive, and this justifies the policy of increasing block rates. Though not perfect, because, for example, higher rates could penalize the poor for growing their own food in the city, there is a case to be made that water use will drop more rapidly for higher rather than for lower income people.

Discussions at the Forum made it abundantly clear that the main objective of raising water prices was solvency of the utility, not saving water and certainly not economic efficiency. The three goals are related, but they are not the same. Tariff structures designed to cut use could be quite different from those to recover costs. And, given that the Jordanian domestic case study states that new water supply costs about \$1 per cubic metre but is valued at over \$5, tariff structures to allow for economic efficiency would be very much different. Of course, it is far easier for a politician (or anyone else!) to explain why prices should cover the full cost than why it should equal marginal value.

The increasing costs of supplying water to populations that are growing in size and income are widely recognized. Maintenance of equitable access to water tends to work against forces for conservation. At \$1 per cubic metre, and with consumption of about 150 litres per capita-day, a typical Jordanian family would pay more than \$80 per capita-year or nearly 5% of average household income. Thus, it is not surprising that prices for household water remain below costs in most sectors in all countries, and very much

below costs in some. In contrast, those sectors that operate fully in the market system – notably tourism and industry – commonly pay full costs (or more) for water.

There is universal acceptance of the need to provide some amount of water at low or no cost to the poor for household and subsistence uses. This goal is accomplished by what is often called a “social tariff” for the first block of consumption – perhaps 25 cubic metres per household each quarter, which amounts to about 50 litres per person-day for a six-person family. (The volume is not generally adjusted for family size.) Most presentations express concern about the cost of the social tariff, and note that rich and poor families alike benefit from the high subsidy for the first block. Tunisia is tackling the problem by retaining the social block, and having those who consume in excess of that amount pay at the higher rate for the full, not the marginal, volume. Subsequent blocks are priced marginally.

Finally, the broad question as to whether water management agencies should play any role in social policy and poverty alleviation was raised at the Forum. An analyst with the World Bank argued forcefully for keeping water management and poverty alleviation separate (Saghir, 20024). Whether or not one agrees with his position, the debate itself is worthwhile, and could lead to useful reforms. Indeed, the emphasis now placed on Millennium Development Goals suggests that most people see a relationship between the two.

These efforts to reform water pricing are being pursued primarily in urban areas. Most countries are moving more slowly in the agricultural sector, where water is heavily subsidized. This approach is understandable from a political perspective, but questionable economically and ecologically given the dominant share of water in MENA that goes to irrigation. Few nations in MENA wish to develop a market system for transfer of water rights among farmers, or between agricultural and urban areas, but they do want to recover more of the costs of providing water. New pricing policies are particularly difficult to implement when brought to bear on farmers who are used to getting water for free. Egypt sensibly tries to soften the impact with parallel programs that subsidize investments to improve water-use efficiency and crop productivity. None of the various pricing options (by volume of water, by crop type or by area) is ideal, but, when dealing with literally thousands of small, traditional farmers, pricing by area farmed is said to be easiest to administer. Finally, efforts to introduce or increase prices for irrigation water must be coupled with: a) removal of price caps on the crops that use irrigation water, so that farmers can earn adequate returns; and b) controls on drilling and pumping, so that farmers will not simply shift from a priced to an unpriced source.

In summary, discussions at the Forum on valuation of water indicate that decision makers in MENA have experience with various forms of valuation, and that they are ready to think a few paces “outside the box.” For example, some of the participants urge that water agencies involve stakeholders including water users in the decision making process – something that is rare (not just in MENA). They also urge water management agencies to encourage NGOs and to empower women and other

voiceless or marginalized people to play an active role in rural development and programs to save water. The evident conclusion is that participants believe that good delivery of water services and public willingness to pay for water are mutually reinforcing. At the same time, their comments imply doubt that the political will exists to put such recommendations into effect.

Forum on Public-Private Partnerships

This Forum explored the potential for improving water services through Public-Private Partnerships (PPP), almost all of which focus on urban areas and the provision of drinking water and sanitation services. As emphasized by Grover (2002), there is little incentive for PPP to develop in the agricultural sector so long as farmers receive water at very low prices. Because the term PPP was used throughout the Forum, it is also used here. However, it might have been more appropriate to think in terms of PSP – private sector participation – as there seemed to be no suggestion of an equal partnership between the private sector and government.

Case studies from Jordan and Morocco show that PPP seems to be “working” in two senses: government expenditures are down, and more people have access to water more of the time than was the case under public operation. However, the only strong link between PPP and WDM is reduction in unaccounted for water. This link is hardly surprising as it has a direct effect on revenue. The Tunisian drinking water case study states that its water management company reports short-term benefit-cost ratios as high as 5:1 from programs to reduce losses in its operations. Both Jordan and Morocco established goals in their contracts or concessions for reducing losses in unaccounted for water, and, with some exceptions, those goals have been met.

Contracts in Jordan also require private companies to install and maintain many more water metres, which is an important prerequisite for WDM. Billing has also been made more transparent, and collection systems computerized. Otherwise, nothing suggests that the private partners are any better in their efforts to promote water efficiency and encourage conservation than governments. This does not deny the possibility that involving the private sector may make water service delivery more efficient, but it is not clear why private companies would want to encourage water saving.

Forum on Participatory Irrigation Management (PIM)

From an historical perspective, rural water management in MENA has always had both centralized and decentralized components. What is new is the neglect of the latter in the post-World War II era of economic development when governments (commonly in collaboration with donor agencies) concluded that modern irrigation management was just too complex for peasant farmers in rural areas. Subsequently, with the failure of top-down management to achieve its objectives, those same governments and donors re-discovered the benefits of participatory or local water management, mainly through Water Users Associations (WUAs).

The single most important theme in this Forum was the need for institutions that do not just permit but also promote local water management. In too many cases, governments give nominal support to decentralization, but do not provide incentives, mechanisms or, as necessary, regulations to allow local management to flourish. The gap may not be accidental; some governments are less enthusiastic about local water management than they claim. Other governments fail to recognize that PIM involves more than just the local level; it depends upon complementary interventions at every level. Service delivery (water in the right amounts at the right times) and farmer support (contributions of labour and payment of fees) are mutually supporting. As stated in the paper by Van Hofwegen of the World Water Council (2003), the whole approach of decentralizing management of water implies a shift in emphasis “from infrastructure investment-based projects to institutional development – investment projects, thus, become structural components of longer-term programs.”

Beyond question, PIM works as a WDM tool. In each case study, water-use efficiency went up by 30 to 50% and energy use for pumping was cut in half. The increase in water efficiency does not necessarily imply a reduction in water use; more commonly, it means that tail-enders on the water system now get water regularly – *ie*, greater equity and efficiency, but not less water use. Over time, the number of WUAs increased significantly and, in most cases, the size of the areas managed and the responsibilities given to local groups also expanded (but only moderately).

There is no “right” model of PIM. To the contrary, there are as many models from which to choose, depending upon the specific context. Among the few characteristics common to all (successful) WUAs are:

- focus on a single area with common physical characteristics
- elected, not appointed, leadership
- election of a general secretary for administration, and an accountant for finances
- well-defined linkages upward to make requests and to obtain information.

Clearly defined goals and areas of responsibility (or a “service agreement”) also seem to be important, as is independence of the WUA from the bureaucratic structure responsible for water at higher levels of government. And, of course, benefits to farmers in terms of increased income and more stable livelihoods must be substantial; otherwise they will lose interest in the WUA.

Despite the benefits of PIM, evidence from the Forums makes clear that, just as with water pricing and water reuse, governments have encouraged decentralization more for reasons of economy than for reasons of principle. Words such as “new vision” and “new spirit of cooperation” appear, and technical efforts to improve irrigation efficiency and capacity building in organizational development are typically included in the scheme. However, the primary goal remains that of budgetary savings. Therefore, it is hardly surprising that “success” of a WUA is defined largely in terms of its ability to cover operations and maintenance costs, the narrowest possible criterion.

If WUAs work – indeed, they are all but essential – at the local level, what about higher levels? Egypt has extended the concept of PIM from the lowest level of irrigation upwards to include responsibility for branch canals and drainage systems, which does not seem to require much adjustment. However, Egypt is also trying to extend the WUA concept to Water Boards, which manage feeder and district canals, and have enforcement powers with the ability to tax, borrow and invest. Turkey, in contrast, moved to decentralise management of larger areas, but did not change management structures at higher levels. Tunisia is going much further by proposing to let stakeholders contribute to the technical "selection" of a project and possibly to the management of aquifers and reservoirs.

As indicated by the case studies, progress with these experiments has been slow, and success is difficult to measure. The hurdle from private property and management by farmer consensus or social pressure at the distribution (tertiary) level to public property and management by formal regulations at the branch and feeder (secondary) canal level is difficult to surmount. Problems become even greater as private lands increase in number and parcels become smaller and smaller. Stakeholders at higher levels of management are no longer exclusively farmers with a common culture and common interests. Processing industries, villages, and commercial interests want some say as well. The constituency of a Water Board includes the WUAs they serve, which may mean that farmer participants on the Board have a conflict of interest – if indeed they even have the time and energy to participate. More powerful stakeholders could co-opt the process to their own benefit. Training and capacity development will clearly be needed, but what kinds and for whom? If the nature of these changes is not explicitly recognized and support provided, the devolution process is almost sure to fail. However, current experiments (mostly donor-supported) have been sufficiently promising that they are likely to be maintained and even expanded.

Lessons from the IDRC Forums

The third part of this analysis stretches outward to suggest options to promote water demand management in MENA that stem more or less directly from the Forum topics. We see these options as "entry points" to guide the next generation of research, policy and practices in WDM based upon lessons learned.

The first two points cut across all aspects of water demand management, and indeed are critical to achieving further analytical and operational gains. They are followed by entry points from specific forums. No claim is made that the following list is exhaustive, nor is any ranking implied by the order in which they are listed.

Water Demand Management and Saving Water

Throughout much of the Forum process, there was an implicit assumption that WDM reduces water use. Though this is not a good assumption, neither is it a criticism. The WDM approach is necessary to improve the efficiency of management of water resources, to protect water quality (more broadly of the environment), and to improve

equity and access for marginalized groups. In many but not all cases, it will also save water. For example, we find great complementarity between PIM and WDM, but much less between PIM and water savings. Water use becomes more efficient under PIM, but all available irrigation water will probably still be used – typically by farmers further along the canal who previously got too little water. Therefore, linkages between WDM and saving water must be made explicit; they cannot be assumed. Fortunately, this is not an area in which precision is required; it is only necessary that one be certain of the direction of the effect, along with a rough idea of its size.

Institutional Design for Water Demand Management

Almost all case studies criticize the institutions managing water. Harsh words, such as *mismanagement*, *obsolete*, *outdated*, *anarchic*, and *lack of motivation*, frequently appear. Commentary is somewhat less critical of quasi-independent agencies, as with those that manage the Litani and the Jordan River valleys. However, apart from a common separation of the institutions for drinking water from those for irrigation, and from a tendency to centralize direction and decentralize operations, views on appropriate institutional design vary widely. It is not clear which tasks should or should not be assigned to the central agency, nor where agencies for WDM should be placed and should rank in bureaucratic hierarchies.

If WDM is to succeed in MENA, it is essential to learn more about the ways in which institutions for WDM work (and do not work). We need to shift attention from how agencies with responsibility for water demand management currently work:

- how well they work
- why they work that way, and
- how they could be designed to work better.

The key focus of institutional analysis should be to determine what is critical to success (or conducive to failure) at both policy and operational levels for specific areas of WDM. Though we can be sure that there is no one best way to organize for WDM, discussions at the Forums are very suggestive. Separation of responsibility for billing for water from responsibility to develop and manage water systems, for example, appears not to work. Greater success is apparent when responsibility for wastewater disposal is within the same structure as responsibility for fresh water supply (and when billings for the two are linked). Economic incentives that return funds to the agency have also worked in some cases. And yet some distance from and some level of independence from central government seem to help. In fact, workshop participants recommended *against* “direct management” by the state (certainly of valuation systems, but of what else is not clear), and *for* decentralized management by such groups as water users associations and mixed (public-private) institutions. In short, we have a lot to learn about institutional design, and about the ability of different designs to integrate social considerations, for effective WDM.

Entry Points Suggested by Specific Forums

Each of the four Forums identified a large number of possible areas for further investigation of the near-term potential for WDM in MENA. Among the most promising of those entry points are the following:

- The range of policies and practices for pricing treated wastewater is very wide. A study is needed that would determine both economically ideal pricing patterns (taking account, among other things, for avoided damages) and common practices around the world. A complementary study should identify the impact on disadvantaged groups of pricing treated wastewater.
- Though technologies for collection and treatment of wastewater are well known in MENA, major gaps remain about what sort of institutional structure can ensure the appropriate balance among goals for: a) maximum use of wastewater; b) protection of soil quality; and c) protection of health for farmers and consumers. It is far from clear whether all of these functions should be given to one agency, or whether the desire for efficiency should be over-riden by the need for a balance of power.
- Research on price and income elasticities of demand for water in MENA should be brought together and compared with other quantitative information on price-quantity relationships. What is needed is as definitive a statement as possible about elasticities of demand in each of the major sectors of use and for each income group.
- It has been proposed that governments stop giving water at subsidized prices to poor people but instead to subsidize their access to water. This is an intriguing idea, but the question is how (apart from reduced connection fees) it can be implemented.
- Though a number of lists have been prepared of key characteristics of successful water users associations, they are not well documented. More definitive conclusions are needed, particularly about “soft” issues, such as family health and gender and social equity. A further objective for this work should be a set of criteria by which to judge “success” of a WUA, something that is still measured mainly by the narrow criterion of cost recovery.
- Making multi-stakeholder participation work over greater geographic areas and at higher management levels requires a thorough review of the concept. Can the WUA model, for example, be stretched from the tertiary distribution level for irrigation water to operate feeder and district canals without breaking? And, if it has to break, what model might replace it?
- One of the few things that can be predicted with confidence in the Middle East and North Africa is the persistence of climatological patterns that include not just one year of drought but a series of drought years. WDM strategies could make MENA more resilient to drought, but significant study would be needed to determine which measures, and how and when they should be applied.

Dealing with the Tough Cases

An alternative approach to future entry points would focus not on an issue but on the most difficult national cases in MENA. Given some reasonable scenarios for demographic and economic growth and for climate, what are the management options for Jordan, Tunisia and Yemen? The purpose of these explorations is not to show that these countries are in trouble because of scarce water. That conclusion is the starting point. Rather, the purpose is to define the range of options that are available to these countries given their particular histories, economies, cultures and hydro-geological characteristics. Relevant material exists, as with Al-Kharabsheh and Ta'any (2005) on Jordan, Matoussi (1999) on Tunisia, and Abutaleb (2002) on Yemen. However, the options and scenarios to be explored must go further to incorporate possible actions in the institutional and socio-economic spheres as well as in the technical. Inevitably, some of the options will be highly political. No matter how efficient these nations may become, there is a positive relationship between water use, on the one hand, and population, economic growth, and the extent of irrigated agriculture, on the other, so those issues will, sooner or later, have to be considered.

Extending the WDM Program for MENA – *WaDimena*

The Forums and previous research have taught us that our next move should be to narrow the knowledge and capacity gaps in WDM, to translate awareness into action, and to extend participation and widen the sphere of influence. The fundamental problem is that, while countries are beginning to see WDM as a necessary alternative to supply-driven approaches, their steps are occurring without the breadth or strength necessary to match the current water crisis in MENA. There is a need to facilitate the links between research, policy and practices, and to promote positive experiences to encourage dynamic learning, knowledge exchange, and capacity development.

The follow-up project from the Water Demand Management Forums, entitled the Regional Water Demand Initiative (*WaDimena*), aims to promote effective water governance by enhancing water-use efficiency, equity and sustainability in the countries of the MENA region. The overall goal of the project is to facilitate the adoption and implementation of water demand management strategies and tools to influence policy processes in the region.

A fundamental first step has been to assess what has been learned in the Forums and to analyze the extent of knowledge and experience that governments have on the value and impacts of specific water demand management tools. We note for example, that, though private sector participation is a desired outcome for governments to improve water service delivery and save costs, it does not necessarily improve water-use efficiency or equity. However, water users associations, water valuation and reusing wastewater are effective water demand management strategies as their uses promote

water savings, contribute to efficient water-use, and improve the capabilities of previously disadvantaged groups to access water.

The objectives of *WaDImena* are to improve the research in WDM and its associated challenges, opportunities and incentives for *practical* application in specific contexts. The project will also strengthen the skill-sets and capacities of individuals and institutions to positively affect WDM-implementation. A network has already been established with the participants from the Forums; it will shortly be augmented to include the research and policy communities, NGOs, and civil society groups that are key water users. Special attention will be given to those groups representing the rural poor and women. Finally, *WaDImena* aims to strengthen relationships and collaborative arrangements with national, regional and international water governance programmes to motivate the WDM agenda.

Conclusions

We already know more about the technologies for water demand management than we apply, and we are also reasonably knowledgeable about the cost effectiveness of various WDM techniques in specific applications (though we tend to ignore many of its benefits, such as reducing the volume of wastewater that has to be treated). What we do not know very well is how best to promote changes in habits and behaviour at the local level nor do we know enough about changing programs and policies at national levels. The gaps do not lie with technology and economics; they lie with political direction and human behaviour. Therefore, to paraphrase Homer-Dixon (2003; he was writing about renewable energy in Canada), the obstacles to water demand management in MENA are mainly social, and the ingenuity we must supply to overcome them is also therefore mainly social.

The situation in MENA is only somewhat different from that elsewhere in the world. Over the years, water demand management has received far less attention than water supply management. However, WDM is a critical component of water management, no matter how water rich or how economically rich the region may be. For the Middle East and North Africa, a region which includes nearly three-fourths of the nations in the world with internal renewable fresh water resources below 1000 cubic metres per capita, and which also contains a third of the world's children whose growth is stunted by malnutrition, the need for demand management is all that much greater. The MENA region may be able to find examples of good practice from other places in the world, but ultimately it must become a world leader in demonstrating how water demand management can bring about major improvements in the quality of life and in the standard of living for all its citizens.

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About the Authors

David B. Brooks is currently the Director of Research for Friends of the Earth Canada. He formerly worked for 14 years at IDRC and more recently has served as a consultant for the WDM Forums on water demand management for IDRC.

Lorra Thompson is the Project Coordinator for the Regional Water Demand Initiative (*WaDimena*), which, as with the former Water Demand Management Forum, is based at IDRC's Middle East/North Africa Regional Office in Cairo, Egypt.

Lamia El Fattal is the Environment and Natural Resources Senior Programme Officer at IDRC's Middle East/North Africa Regional Office in Cairo, Egypt.

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