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Water Demand Management as a Governance Issue:

Lessons from the WDM Forums for the Middle East and North Africa

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EXECUTIVE SUMMARY

In 2002 and 2003, IDRC (in collaboration with other donors) conducted four Forums to explore the application of water demand management (WDM) in the Middle East and North Africa (MENA) and, building on that base, to identify knowledge gaps that may be limiting greater application of WDM in the region. The four Forums were as follows:

- Wastewater Re-Use (Rabat; March 2002)
- Water Valuation (Beirut; June 2002)
- Public-Private Partnerships (Amman; October 2002)
- Decentralization & Participatory Irrigation Management (Cairo; February 2003).

A large amount of valuable information on the four topics was gathered at the Forums, and is now available on one CD-ROM. However, the great bulk of that information is descriptive of "What Is." Little comment, and even less analysis, on "What Could be" or "What Should be" is provided. This review extracts lessons from the four Forums, and suggests nearer term and longer term entry points for research and for policy.

Perhaps the most striking conclusion for future policy development was that: *In no case was WDM the main impetus for action*. With Wastewater Re-Use the need to deal with growing volumes of sewage is the main force, and with the other three the need to reduce government budgets is the main force. This is not to deny that a link to WDM does exist and that some water is saved, but it is to say that neither greater water efficiency nor water conservation is the major impetus for decisions.

Despite this conclusion, MENA nations are making advances in each of the four areas:

- Gains in the extent and safety of wastewater re-use are being made across the region.
- Almost every nation has revised its water valuation system both to reduce subsidies and to penalize larger users. At the same time, the social need to provide free or cheap water to low-income consumers is also accepted.
- Experience with Public-Private Partnerships is limited to just a few nations, and to urban water supply, but those in place exhibit lower water losses and improved service.
- Decentralization is increasingly common for irrigation, where local farmers' organizations have been given responsibility for final distribution canals. Only a few have managed to cover all costs, but water use efficiency has increased and pumping costs have fallen.

What the Forums therefore demonstrate is that water management is advancing rapidly in MENA. What they do not demonstrate is that water *demand* management is also advancing, at least not at the same rate. In order to extend its role, we need better understanding of water demand management. For present purposes, WDM can be defined as any measure that will:

- Improve the efficiency of water used to achieve a specific "task"
- Adjust the nature of the task or the way it is accomplished so that it can be achieved with less water or with lower quality water

- Reduce losses in quantity or quality as water flows from source through use to disposal
- Shift the timing of water use from peak to off-peak periods.
- Increase the ability of the system to deliver during times when water is in short supply.

Though each component of the definition implies saving water, or at least better quality water, in developing nations much of the "saved" water will immediately be used in households or on farms that had, until then, less water than they needed for their lives and their livelihoods. Equity and efficiency will improve, but no less water will be used.

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 defining when and where WDM does save water. Other studies can fill in gaps in knowledge suggested by the Forums. For example:

- Water Re-Use: Studies on appropriate pricing for treated wastewater; and on long-term effects of using treated wastewater on agricultural soils.
- Water Valuation: Studies on price and income elasticities of demand; on ways to subsidize access rather than consumption; and reducing the extent to which the social tariff is subsidizing richer rather than poorer households.
- Public-Private Partnerships: Documenting success stories; identifying ways in which water services are unique; and finding ways to limit private drilling of wells.
- Decentralization: Improving the efficiency of small irrigators; determining the factors inducive to success with water users organizations; and learning how to adapt stakeholder participation to higher levels of management.

Cutting across all four Forums, institutional analysis is needed to determine why most of the water agencies in MENA are regarded by their own staff and by water analysts as performing so badly, and how to improve their performance.

Finally, there are gaps in knowledge that go beyond the concepts discussed in the four Forums, and could be entry points for further work on WDM. For example:

- Drought management
- Rainwater harvesting and supplemental irrigation
- Dealing with the tough cases (Jordan, Tunisia, Yemen)
- Groundwater management
- Adaptive management
- Ecological needs for water
- Industrial water and wastewater

In summary, the four Forums showed that water demand management is occurring in MENA, but without the breadth or strength that is required by the increasingly difficult water situation occurring 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. What is needed above all is to treat water demand management not just as a technology to apply or a program to deliver but as a form of governance – indeed, a form that is critical to improving social, economic and environmental conditions through the Middle East and North Africa.

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Over the course of 2002 and 2003, IDRC (in collaboration with other donors) conducted four Forums on Water Demand Management (WDM) for nations in the Middle East and North Africa (MENA). The purpose was to assess the extent to which WDM is being applied and adopted in the region and to identify gaps in knowledge about WDM. This report begins with an overview of the conclusions of the Forums, but goes on to suggest entry points for future WDM work in the region with emphasis on entry points that stem directly from the Forums and others that go beyond. The former can be seen as options for immediate next steps on WDM in MENA, and the latter as options for the coming five or so years.

Nine nations from the region participated in the Forums: Algeria, Egypt, Jordan, Lebanon, Morocco, Palestine, Syria, Tunisia and Yemen. Crimea and Turkey also participated in the final Forum on Decentralization. Most of the inputs to and all of the outputs from the Forums appear on a tri-lingual (Arabic, English and French) CD-ROM entitled *Water Demand Management Forum – Middle East and North Africa: Advocating Alternatives to Supply Management of Water Resources.*

This review is a retrospective of lessons learned from the Forums as well as a prospective of how we can build upon them. It is divided into five sections:

1. The first section asks what we mean by Water Demand Management, particularly given the context of water supply and demand in MENA. This discussion is not intended to be definitive but rather to provide a platform for further research and policy implementation.

2. The second (and longest) section reviews key results from each of the four Forums (in the order in which they were held). This section provides the reader with a summary of key lessons for both research and policy, but not much background to those lessons nor about the discussions that supported them.

3. The third section identifies WDM research and policy opportunities that flow directly from discussions at the four Forums, and that could be adopted relatively quickly.

4. The fourth section suggests options for WDM research and policy that go beyond those discussed at the Forums or that represent options that cut across the Forums. Most of these options would take a few years to adopt.

5. Finally, the fifth section offers some concluding comments about approaching WDM as governance rather than as technology or economics.

One general conclusion from the Forums must be presented up front because it reflects on everything to follow. Regardless of the Forum topic, it became clear that the main objective of government-funded WDM programs in MENA is to cut budgetary costs, not to save water. 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. In other words, the Forums demonstrated that, even if water management is a primary focus for research and policy in MENA, a more specific focus on water *demand* management research and policy remains to be fully developed.

DEFINING WATER DEMAND MANAGEMENT FOR MENA

What do we mean by "Water Demand Management" or WDM? In its simplest sense, water demand management means getting the most from the water we have. In somewhat more elaborated form, WDM includes any action that reduces the amount of fresh water we need, or that keeps water cleaner than it otherwise would be. The important point is the breadth of the concept, which remains the same regardless of whether it is less water per unit of output or service, or less water because of lower growth, different technical choices, or changes in habits. It is the same whether talking about surface water or ground water. It is the same whether talking about average or peak demand. In essence, *water demand management is a governance concept*. It is about governing (in both senses: implying moderation and managing) our requirements for good quality fresh water.

Water demand management as governance ranges from education and information at one end to regulation and sanctions at the other; from individual actions to repair leaky valves to national policies to regulate water-intensive industries; from local community organizations to national institutions and international treaties. It is based on scientific knowledge of water resources and on engineering but, in almost every aspect, human desires and actions play a strong role. As a result, our definition of WDM must go back to the tasks for which we use water, tasks as varied as flushing a toilet or growing food or cooling a motor.

Therefore, in somewhat more formal terms than earlier, water demand management can be defined as any method -- whether technical, economic, administrative, financial or social -- that will do one of the following three things:

a) Improve the efficiency of water used to accomplish a specific task;

b) Adjust the nature of the task or the way it is undertaken so that it can be accomplished with less water or with lower quality water;

c) Minimize the loss in quantity or quality of water as it flows from source through use to disposal.

In addition, because water is conveyed to us by systems with capacity limitations, and because system efficiencies generally decrease as capacity is strained, water demand management also includes actions that will:

d) Shift the timing of use from peak to off-peak periods.

Finally, in areas where water supply is highly seasonal or where droughts occur regularly, demand management also includes methods that:

e) Increase the ability of the water system to continue to serve society during times when water is in short supply.

Each of the five components of the definition implies the goal of saving water, or at least higher quality water. However, given the nature of developing nations, much of the "saved" water will immediately be used by women or by farmers that had, until then, less water than they needed for their lives and their

livelihoods. Such shifts in water use patterns are forms of water demand management even if they do not result in less water use.
The most distinctive characteristic of demand management, and the one that most sharply separates demand management from supply management, is that implementation is extraordinarily decentralized. In many cases, it involves literally every household or firm or activity that uses water, and this in turn implies that it involves as much attention to behaviour as to technology. For these reasons, success with demand management often depends less on decisions themselves than on the ways in which those decisions are made – not on what is decided but on how it is decided.

Finally, water demand management is commonly supportive of other socio-political goals, even when it does not inherently include them. Most measures in support of water demand management also contribute to or permit:

- Improvements in equity
- Wider participation in decision-making
- Reduced environmental impacts.

However, the extent to which any proposed measure for water demand management is compatible with these other goals cannot be assumed. Rather, linkages must be verified, and, if appropriate, the measure adjusted to permit (or, better yet, promote) greater equity, greater participation or reduced environmental damage.

WHAT DID WE LEARN FROM THE FORUMS?

IDRC's main goal in conducting the four Forums was to extend the reach of research results and successful applications in order to move Water Demand Management higher on the agendas of decision makers. Technical outputs appear in the form of case studies and national presentations (the former invited; the latter contributed), workshop discussions, and "expert" papers.

The case studies and national presentations were intended to highlight the experience of specific countries in applying particular components of a WDM strategy. They were also supposed to emphasize the economic, environmental and social benefits of those strategies, and to highlight their advantages or disadvantages in specific circumstances. Unfortunately, these intentions were realized in only a few of the case studies. This does not mean that they lack information. To the contrary, they provide a good picture of ***What is*** in specific nations. They do not, however, indicate ***What might have been***, much less ***What should be.***

To be fair, the emphasis on retrospective rather than prospective in the case studies and other national presentations was not surprising. Most were prepared by senior staff in the relevant water ministries, or in a few cases by corporate staff working with those same ministries. This fact alone imposed obvious constraints. Indeed, it is remarkable that their material was as frank as it was. The likelihood that their materials had to be prepared under severe time constraints only adds to the tendency to look backwards rather than forwards. Happily, when the constraints were relaxed, as they could be in the workshops held as part of the Forums, discussion became much more provocative and tended to go well beyond the case studies in posing questions and challenging received wisdom.

Less happily, some constraints could not be so easily relaxed. A large proportion of the participants and an even larger proportion of presenters were male and had been trained as engineers. The result was that the materials at the Forums were strong on technique and on economics, but weak on anything related to gender, kinship, ethnicity and other such considerations. These gaps do not detract from what is said in the Forums, but they do represent gaps that qualify conclusions and recommendations.

Brief summaries of the results of each of the four Forums follow. References to the CD-ROM are limited to places where the reader might want to check the source of a particular statement. Monetary units are US dollars at its value in the year 2002.

Forum 1: Water Re-Use

Re-use of wastewater is not just under study but is standard practice or under active development in many MENA nations. The goals of this Forum were to define projected use rates, costs and standards for wastewater, and to identify the implications of treatment methods, in particular for crops destined for export. Among the broad conclusions:

- Most nations in MENA recognize that they have major sanitation problems, and the need for new strategies 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.

- The main use for treated wastewater is irrigation. Though most permit treated wastewater to be used for food crops, some nations have adopted restrictions on its use depending upon the level of treatment (and, in the case of Jordan, go so far as to destroy crops violating those restrictions). Farmers themselves are sometimes cautious about the use of treated wastewater for food crops, though not for watering orchards. Fortunately, because of the low level of industrial development, MENA nations need have little concern for the heavy metals and chemicals that bedevil use of treated wastewater in industrial economies.

- Despite shortages of drinking water, none of the participating nations suggests treatment to the level that would permit wastewater to be used in households. Other uses include recharging aquifers, creating green belts, fixing sand dunes, watering golf courses, and providing cooling water for industry.

- Water officials are aware of the adverse effects of untreated or poorly treated wastewater, but much less so about the need to control use of treated wastewater. Some MENA nations adapt WHO standards and US Environmental Protection Agency guidelines for treated wastewater, but many do not. Even those that do enforce standards seem more concerned about adverse effects on consumers of the crops than on farm workers in the field.

Economic information about wastewater re-use is disappointingly scarce. The little information that is published is 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 show that centralized sewage treatment is cheaper (per household) than individual cesspools, and Moroccan data show farm output benefits from re-use, there are few measures of the *marginal* cost of wastewater re-use 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 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. The Algerian presentation suggests marginal costs of about 10 cents per cubic metre beyond those necessary for treatment and discharge.

Both prices and pricing policies for treated wastewater vary widely from place to place, and typically they are based on political choice rather than cost. For example, golf courses in Morocco pay four times as much per cubic metre as do farmers. Even where cost is a factor, it is treated from the perspective of accounting rather than any recognition that failure to treat wastewater imposes its own costs, whereas appropriate treatment and re-use can support economic development of certain sectors of the economy, such as tourism. 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.

There are a few – but just a few – signs of the need to work more closely with local communities. As stated in the Moroccan case study:

> The failure of certain processing projects because of the inadequacy of addressing the socio-economic context of the concerned regions made it possible to better understand the problem of wastewater.

Unfortunately, while emphasizing the need for direction from senior ministries and adequate financing, little information emerged about appropriate institutional design to both promote and manage wastewater treatment and re-use (a tricky balance at best).

In summary, re-use of treated wastewater may still be less rather than more common in MENA, but the technology is coming of age. More cautiously, it is coming of age for treatment plants located in urban areas where sewage tends to receive tertiary treatment. Lagging behind are for rural areas where sewage receives secondary treatment at best, and commonly no treatment at all. Regrettably, as several presentations note, many farmers continue to use raw wastewater for irrigation, particularly in peri-urban areas.

Forum 2: Water Valuation

The main goal of this Forum was to inform decision makers on linkages between WDM and water valuation. And, in fact, the most important single conclusion to be drawn from this Forum is that *the case for valuation has been won.* No one is arguing against valuation, and no one opposes prices that recover more if not all the costs of supply. Though some aspects of water pricing are controversial, this Forum shows that there is far more on which we agree than disagree. Difficulties arise mainly from the wide range of objectives sought from water valuation. Though most are valid to one degree or another, there is no purely rational way to determine the appropriate balance among them.

If valuation is now accepted, more rationale ways to move from valuation to pricing are still tentative:

- 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; less so for other uses – is that water is in such short supply that most nations 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.[1] As prices for irrigation water were gradually raised in Tunisia, farmers sensibly shifted to higher value crops, notably vegetables and fruit trees, and away from cereals.[2] The same studies suggest that the income elasticity of demand is positive, and this justifies the policy of increasing block rates. Though not perfect – for example, higher rates could penalize poor people growing their own food in the city – the assumption that water use will drop more rapidly for higher than for lower income people is a good starting point. The question is by how much.

- The main objective of raising 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 new water supply in Jordan costs about $1 per cubic metre but is valued at over $5,[3] tariffs to achieve economic efficiency would be very much different. Of course, it is far easier for a politician (or anyone else!) to explain why price should cover full cost than why it should equal marginal value. An intermediate step is to ensure that price tracks not just average but marginal cost, which is rising almost everywhere in MENA.

- Finally, there is the broad question as to whether water management agencies should play any role in social policy and economic development.[4] Though fundamental to all water management policy in MENA, some argue that such agencies have not been very effective until now in fulfilling these roles. Perhaps it would be preferable for them to operate on purely financial principles. Whether or not one agrees with this position, the debate itself is worthwhile, and may lead to useful reforms.

The increasing costs of supplying populations that are growing in size and income with water is widely recognized. Maintenance of equitable access to water tends to work against forces for conservation. For example, the cost to develop new water in Jordan is about US$1 per cubic metre, and, with consumption of about 150 litres per capita-day, the cost just for household water is over $80 per capita-year or nearly 5% of average household income. Compare this with the national goal of keeping water and sanitation costs below 1% of household income.

Institutional moves toward more rational pricing of fresh water and wastewater are impressive. Not only have many of the nations reporting to the Forum revised their water valuation systems within the last decade, but most of them did so on the basis of economic and social studies (marginal value; willingness to pay; etc.) to guide them in their decision making. Even so, prices remain below costs in most sectors in all countries, and very much below costs in some.[5] Further efforts to reform water valuation are being

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[1] Tunisia reports a price elasticity of 1.0 for high water using households; p. 11. The Tunisian Wastewater study notes that their internal studies show that people react more to the average than to the marginal price of water. Saghir's presentation states just the reverse. The difference is important as it has implications for pricing policies aimed at reducing water use.

[2] Tunisia Agricultural Study, p. 10. For some reason, instead of simply accepting the logic of the market, the Tunisian government intervened with preferential water rates for farmers that grow cereal crops. The logic of this policy is questionable in the extreme. Even if one is worried about deficiencies in supply, it would be cheaper to store a few week's supply of cereals.

[3] Jordan Domestic Study, p. 16.

[4] This position is most clearly expressed in the presentation of Jamal Saghir of the World Bank.

[5] Saghir shows that urban water prices in MENA are well below those in Europe. My own data show that they are about equal to those in Canada.

pursued in urban areas, but most nations are moving more slowly in the agricultural sector. This approach is understandable from a political perspective, but questionable economically and ecologically given the share of water in MENA that goes to irrigation.

Several other general trends are also clear from the case studies and presentations:

- A trend is evident for those sectors that operate fully in the market system – notably tourism and industry – to pay full costs (or more!), for water and sanitation services.

- There is universal recognition of the need to provide some amount of water at low or no cost to the poor for household 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.[6] (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.[7] Subsequent blocks are priced marginally.

- Wide support exists for increasing block pricing for the domestic sector. Most systems follow one of two patterns: either just two blocks, with the lower intended to provide for low-income people, or a half dozen or so blocks with costs rising gradually with each block. In only a few nations do costs rise sharply enough to maximize the conservation effect.

- Efforts are being made to make billing for water use uniform and effective. One step is to make the (typically quarterly) bills more transparent. This is not just for administrative efficiency; it is also part of the process of encouraging people to pay their bills.

- Not surprisingly, illegal drilling of boreholes and digging of wells thrive when government structures are weak or disorganized. Comparison of reports from Jordan, where few exist, and from Lebanon, where they are common, is instructive.

Pricing of agricultural water exhibits some additional complications:

- Many nations are trying to extend irrigation to new areas, and to adjust water prices to take account of differences in conditions. Except to the extent that they allow for differences in socio-economic conditions (*ie*, a form of rural development), such differential valuation is questionable. Differences in productivity or distance from market should influence farming systems and crop selection, not levels of subsidy.

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[6] Fifty litres per person-day is a suggested amount for drinking, cooking, washing and sanitation. About half the water has to be potable. Peter Gleick, The Human Right to Water, in Peter Gleick (editor), *The World's Water: 2000-2001* (Washington, DC: Island Press, 2000).

[7] Tunisia Drinking Water study, p. 7. Later, on p. 21, the author writes: "The Tunisian tariff system has brought pressure to bear on major consumers only, while sparing to a great extent the small and average consumers. The latter have been invoiced at tariffs lower than water costing. Moreover, major consumers . . . cannot continue to subsidize the small and average consumers." My response is: Why not? It is a small price to pay for social stability and a healthier population.

- Bringing price to bear on farmers who are used to getting water free raises additional problems. Egypt couples price increases with programs for subsidizing 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 all following similar farming methods, pricing by area farmed is said to be easiest to administer.
- 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; and b) controls on drilling and pumping, lest farmers simply shift from the priced to the unpriced source.

- Even where illegal, informal markets in agricultural water are common. Though difficult, study of these markets should provide good clues to the value of water and to potential efficiency in use when faced with a real price for water. However, few nations in MENA wish to develop a market system for transfer of water rights.

Costs for municipal wastewater collection and treatment are on the same order of magnitude as, or even higher than, that for new water supply. Both benefit almost equally from WDM, but the savings in wastewater costs are seldom included in financial calculations about benefits of WDM measures, which are therefore significantly undervalued. Charges for sanitation services range from nil in many cities through a fix percentage added to the cost of water deliveries (the most common approach) to progressive pricing formulae that take account of several variables (rare but used in Morocco). Not surprisingly, constraints on raising tariffs for wastewater disposal are greater than on those for fresh water supply. It is easier to convince people to pay more for better water supply than for better wastewater disposal.

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." Among other things, they distinguish "economic" from "financial" objectives, and they go on to say, correctly, that cost recovery is one thing but price is another. Even more remarkably, some of the participants urge that water agencies involve stakeholders including water users in the decision making process – something that is rare (and not just in MENA). They also urge water management agencies to encourage NGO's and to empower women to play an active role in rural development and to save water at an affordable price. (These statements are a good example of the tendency, noted at the start, for the workshops to go beyond case studies and presentations.) *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, they are realistic. They doubt that the political will exists to put these recommendations into effect, which is probably correct.

Forum 3: Public-Private Partnerships

The goal of this Forum was to explore 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. There is little incentive for PPP to develop in the agricultural sector so long as farmers expect to receive water at low prices. Nor, apart from small experiments in Morocco, is there any inclination in MENA to emulate the role the private sector plays in allocating agricultural water in Chile. Other conclusions include the following:

- Nothing in any of the materials presented to this Forum suggests that water resources themselves be transferred to private ownership. The highly publicized bad experience with PPP in Cochabamba, Bolivia, has little relevance for MENA.

- Case studies from Jordan and Morocco show that PPP seems to be "working" in both nations. Working in what ways? Mainly because government expenditures are down and performance of the water utility has improved so far as consumers are concerned. More people have access to water more of the time, and more wastewater has been removed and treated, than was the case under public operation.

- Despite its success in other aspects of water management, 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 water management company reports high payoff from programs to reduce losses in its operations, with short-term benefit-cost ratios as high as 5:1.[8] Both Jordan and Morocco established goals for reduction of losses in their contracts or concessions that, with some exceptions, have been met. If these gains continue to be made, the cities in MENA under PPP management will end with levels of Unaccounted For Water that are as low as best practice in many richer nations in the world.

- Contracts in Jordan do 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, however, the private partners are expected to promote efficiency and encourage water conservation, but nothing suggests that their programs are any better than those of governments. Not even the World Bank sees WDM as a major objective of PPP.[9]

- The first item on the agenda of any discussion about PPP is water prices. In simple terms, governments have two alternatives: continue with price subsidies and provide the private firms with funds to cover those losses (as in Jordan); or allow prices to rise (typically at some agreed-upon rate) until they cover full costs (as in Morocco). All sorts of mixes between these poles are possible. In Jordan, citizens of Amman are paying close to full costs (and the private firm is making a profit), but citizens elsewhere in the nation are still subsidized (and private firms have to be paid). The difference in these choices explains in part the choice for management contracts in Jordan and concessions in Morocco. Jordan's approach has allowed it to maintain more control over directions for water policy but at the expense of having to cover more of the costs. Morocco has been able to avoid many of those costs, but has had to give up some control. Put another way, Jordan has opted for private sector participation or PSP, whereas Morocco has opted for PPP. Both agree that, as indicated above, water is in some ways a social good, and, notwithstanding the emphasis on pricing and profits, some water has to be made available to the poorest people, regardless of ability to pay.

- One element of concern was that, as prices for water began to increase (for all blocks above the lowest), larger and wealthier consumers began bypassing the system by drilling their own wells (at least for uses other than drinking water).

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[8] Tunisia Drinking Water Study, p. 17.
[9] Grover, Overview, Domestic Sector, p. 11.

The Forum on PPP covered many other aspects of water management, including the reasons behind the Jordanian choice of management contracts and the Moroccan choice of concessions. Because those aspects of the Forum are less relevant to WDM, they are not presented here.

In summary, discussions about PPP at the Forum were very matter-of-fact with little or none of the emotion the topic creates in other regions. Most emphasis went to reviewing the range of options for PPP, each with its own advantages and disadvantages. Though participants were clearly looking to a future that included PPP (or PSP) as an option, discussions were not very different from those that would take place about selecting any partner at any level in any operation. Differences in governance for PPP as opposed to public management were not evident. No one suggested that water might have unique aspects that should be considered in selecting a management system – a gap that liked stemmed from the fact that most participants were decision-makers, not water users.

Forum 4: Decentralization and Participatory Irrigation Management (PIM)

The goal of this Forum was to stimulate decision-makers to give more attention to potential gains from farmer participation in water management. (Though decentralization in urban areas is noted on occasion, the Forum focussed largely on irrigation.) From an historical perspective, 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. Subsequently, with the greater or lesser failures of top-down management to achieve its objectives, the same governments and donors re-discovered the benefits of local water management, mainly through Water Users Associations (WUAs).

The single most important theme in the Forum on Decentralization and Participatory Irrigation Management was the need for institutions that not just permit but promote local water management. In too many cases, governments give nominal support to decentralization, but have not provided incentives, mechanisms and, as necessary, regulations that allow local management to flourish. The gap may not be accidental; some governments are less enthusiastic about local water management than they claim.

- Beyond question, PIM works. 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). Other (but less well documented) benefits include reduction in conflict and a sense of empowerment that is said to improve family health and well being.[10]

- There is no "right" model of PIM. To the contrary, there are as many models as there are regions in which to experiment. Among the few characteristics common to all (successful) WUAs are:

  - focus on a single area with common physical characteristics
  - elected, not appointed, leadership

[10] See Box 3 in Brooks, *Local Water Management, op. cit.* See also paper by Slama in the section of the CD on this Forum.

- 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. (Local governance means just that!) 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.

- PIM cannot involve just the local level. It must be matched by complementary interventions at each higher level. More than a few that governments in MENA have recognized the virtues of PIM, but have yet to make the necessary changes for its full implementation, particularly at the field 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. Perhaps most importantly, 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."[11]

There are wide variations in what PIM means and how it has developed in different nations, but they are still typically constrained to local operations and maintenance. Only tentatively has the concept been adjusted to allow greater responsibilities. Tunisia aims to include a wide range of responsibilities including planning and design. And in Turkey it is not just WUAs but also municipalities, villages and cooperatives that can take responsibility, depending upon the nature of the command area.

From a government perspective, what comes across most strongly is that agricultural agencies *have encouraged decentralization more for reasons of economy in government 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 were included in the program from about 1990 on. However, the primary goal remained that of cost reduction. Therefore, it is hardly surprising that "success" of a WUA is defined largely in terms of its ability to cover O&M costs, the narrowest possible criterion.

If WUAs work – indeed, are all but essential – at the local level, what about higher levels? Some experiments to devolve more responsibility began just before the end of the century. Notably, Egypt 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.

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. Stakeholders at higher levels of management are no longer exclusively farmers

[11] Paul Van Hofwegen, World Water Council, paper delivered to Forum, p. 9.

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. It would hardly be the first time. Training and capacity building 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 there are professed indications to maintain and even expand them.

Finally, one element was notable for its absence from discussions at the Forum. Decentralization suggests a focus on communities, and, given conditions in rural MENA, that implies a focus on families, kinship relationships, and women, none of which received much attention. Economic issues focussed on transfers from governments to WUAs, with no direct evidence about improved incomes and better quality of life. Impacts on women's work, or on maternal and child health, were never mentioned, nor was there any reference to ethnicity (some of the Turkish WUAs are located in Kurdish areas). Put another way, discussions about bottom-up management were mainly from a top-down perspective.

WHAT ARE THE NEXT STEPS?

Part Three of this review stretches outward to suggest options to promote water demand management in MENA that stem more or less directly from the four. No claim is made that the following list of entry points is exhaustive, nor is any ranking implied by the order in which entry points are listed.

Cross-Cutting Entry Points

Two entry points cut across all aspects of water demand management, and indeed are critical to achieving further analytical and operational gains.

Water Demand Management and Saving Water

Throughout much of the Forum process, there is an implicit assumption that WDM will reduce water use. This is not a good assumption, but neither is it a criticism. WDM is essential for a variety of reasons including efficiency of management, protection of water quality (more broadly of the environment), and improved equity. 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 is still used. Moreover, if that water is used by tail-end farmers who previously got too little water, there could be a significant effect on equity and poverty reduction.

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 be determined, along with a rough idea of its size.

Institutional Design for Water Demand Management

Almost all case studies and national presentations criticize the institutions managing water. If this is not remarkable in itself, the strength of the criticism is. 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, but neither are they exempt from criticism. 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 and which 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 to:

- 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 water demand management. 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 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 worked in some cases. And some distance from and some level of independence from central government seems 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 for effective WDM.

Wastewater Re-Use Forum

The technology for collection and treatment of wastewater, and to a considerable degree for its re-use is well known in MENA. So too are the health problems from use of untreated or only poorly treated water. The major gaps in knowledge are institutional, not technical. It is far from clear 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. Nor is it clear whether all of these functions should be given to one agency, or whether the desire for efficiency should be over-ridden by the need to balance power.

Pricing Treated Wastewater

The range of policies and practices for pricing treated wastewater is very wide. A study is needed that would identify both economically ideal pricing patterns (taking account, among other things, for avoided damages) and common practices around the world. Related work would also determine more closely the cost and the value of sanitation services – that is, the removal and treatment of wastewater regardless of whether the water will be re-used. In either case, valuation of the service and pricing patterns for the service must be considered separately in order balance among efficiency, equity and social and environmental goals. Experiments with actual pricing systems will be necessary to test political acceptability.

Long-Term Effects on Agricultural Soils

One technical area that does deserve further study is the long-term effect of continued use of treated wastewater on soil quality and productivity. (Excessive salinity and nitrates, along with soil structure, are the main concerns.) Study should start with a thorough literature review. If the literature review identifies gaps in knowledge particularly relevant to MENA, field studies can then be undertaken. Ultimately guidelines for agricultural agencies and farmers should be developed.

Water Valuation Forum

The rich discussion at the Water Valuation Forum showed that decision-makers are well aware of the need to reform water pricing practices, but they see that need primarily from the perspective of reducing government budgets and balancing utility books. How can we make better linkages between valuation and water demand management?

Price and Income Elasticities of Demand

In the Forums, a great deal was made of the importance of "getting prices right," which generally means full cost pricing. The implicit assumption was that, as prices rise, consumption decreases. This is a good assumption but the relevant question is: By how much? In order to estimate the consumption effect, it is necessary to review price and income (or, in the case of industry, scale) elasticities. Considerable research on elasticity has been undertaken in MENA, and these materials should be brought together by combining a literature review of global experience with quantitative information on price-quantity relationships in MENA. What is needed is as definitive a statement as possible about elasticity of demand in each of the major sectors of use.

Social Tariffs

Social tariffs (for piped water) or free water (from stand points) typify the approach of MENA nations to providing for the needs of low-income people. These social tariffs should be studied to determine how much they are costing society as a whole, how they affect consumption patterns, and the proportion of the subsidy that goes to higher income people.

Subsidizing Access, Not Consumption

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.

Public-Private Partnerships Forum

Given the recognition of the marginal relationship between PPP and WDM, it is almost contradictory to suggest key entry points for further work. Therefore, the following suggestions are mainly aimed at elucidating what is working (*and why!*) in MENA.

Learning from Experience

Both Jordan and Morocco have gone from their first management contracts and concessions, respectively, to later ones, and both claim to have learned lessons. However, the nature of those lessons is not explicit. What have they learned, and how have later contracts and concessions differed from earlier ones?

Are Water Services Unique?
What is different (if anything) about the management of water compared with other natural resources that have a social dimension? Any distinctions between public utilities and private corporations are probably less important than those between water and other services. But what are those distinctions, and in what ways do they affect the choice of management strategies?

Private Drilling of Wells
Groundwater use is largely uncontrolled in many MENA nation. The ability of larger and richer consumers and corporations to drill their own wells compromises the ability of water agencies to recover costs and to manage efficiently. In the worst cases, private wells reduce aquifer pressure and degrade water quality. The research question is not *whether* to control well drilling, but *how to do so*.

Decentralization and Participatory Irrigation Management Forum

The over-riding question is how to adapt traditional systems so they better suit modern technologies, open markets, and environmental concerns, and, at the same time, retain those elements of centralization that are critical to sustainable and equitable development.

Improving the Efficiency of Small Irrigators
Many distortions in pricing of agricultural water are rationalized on the basis of support to small or remote farmers, who operate with tiny margins. One way to promoting WDM would be to focus research on the smaller farmers in MENA with an eye to avoid the distortions that are intended for their benefit. The goal of such research will be water-use efficiency (and thus poverty reduction); it will not necessarily result in reduced water use.

What Makes for Success with WUAs
Though a number of lists have been prepared of key characteristics of successful WUAs, they are not well documented. More definitive conclusions are needed, particularly about "soft" issues, such as family health and gender 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.

Institutional Structures for PIM
Experimentation is needed to construct institutions that not just permit but promote local water management. The design of senior agencies is equally as important as that of WUAs. No one model can possibly suit the wide range of opportunities in the region, so guidelines are needed for matching higher and lower levels of authority, with particular attention to farming practices, cultural patterns, and hydro-agricultural conditions.

Extending PIM to Higher Levels
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 system to operate feeder and district canals without breaking? And, if it has to break, what model might replace it? Can local farmers be involved in Water Boards with powers to enforce and to impose sanctions, without driving wedges into the community?

BEYOND THE FORUMS…

The previous section suggested ways of building on the four Forums as possible entry points to advance water demand management in MENA. This section suggests additional entry points without the constraint of those Forums. However, suggestions are limited to those involving water itself. Such macro issues as rates of demographic and economic growth, and changes in industrial structure, are not considered. Nor is any claim made that this list is exhaustive.

Drought Management

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. Global climate change models suggest strongly that the region will experience more frequent and longer droughts in the future. Water demand management 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. Some nations draw "Red Lines" on topographic or geologic maps or models to indicate levels below which the lake, river, or aquifer must not be allowed to fall. However, there is no general method for determining where such lines should be drawn, nor any to indicate under what conditions they could (temporarily) be violated.

Rainwater Harvesting

Rainwater harvesting in both of its common forms – rooftop harvesting, mainly for the collection of drinking water; and field harvesting, mainly for irrigation or stock watering – is a venerable approach that emerged widely as human beings began settled life in various areas of the world. Though really a supply technology, rainwater harvesting is so inherently a part of local management, and works so much better when operated in conjunction with strategies to moderate demand – notably supplemental rather than full irrigation – that it is conveniently considered as part of WDM. Moreover, it is a "sleeper" technology, with much greater impact than generally recognized.

What is needed today are much better investigations and demonstrations of ways to adjust the highly diverse methods of rainwater harvesting in order to enhance the efficiency of collection and use. Equally important are studies of how such changes might affect local patterns of water management by the family and the community. Further, though rainwater harvesting is a relatively mature technology, analysis must go beyond it to ask how policies can either promote (or inhibit) its role in water management at household and community levels.

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. It has to be expected *a priori* that the resulting options will involve strong actions in socio-economic as well as in technical directions, and for that reason some of the options will be highly political. No matter how efficient these nations may become, there is some positive relationship between water use, on the one hand, and population and economic growth, on the other, so those two issues will, sooner or later, have to be considered. So too will local power structures, notably those with a big stake in large, irrigated farms.

Groundwater Management

By and large, the Forum presentations treated surface and ground water as equivalent, and to a considerable extent this was appropriate. However, groundwater is definitely a subject of interest for water demand management. It is growing rapidly as a source of supply in MENA, but inappropriate drilling and over-pumping can result in significant losses of water. In most cases, the key mechanism is loss of pressure, which can leave large volumes of water beyond the economic reach of pumping, or permit intrusion of enough saline water to make the groundwater unusable. Competitive drilling across a national border or by neighbouring farmers will deplete and degrade a groundwater body much faster than with cooperative drilling.

Recent work on the Great Lakes Basin in Canada and the United States suggests the extent of work needed in MENA to define the research issues for groundwater management from a WDM perspective:[12]

- Surface and groundwater resources are part of a single hydrologic system, and must be dealt with as a unified whole in ways that take into account water quantity, quality and ecosystem integrity.
- There should be a bias in favour of retaining water in the system and using it more efficiently and effectively.
- There should be an obligation to apply best conservation and demand management practices to reduce water use and consumptive losses.
- Decisions must involve all governments, stakeholders, and the citizenry at large. The process must be open to involvement and meaningful participation by all.

Adaptive Management

Adaptive management is an over-used term that has recently been given a new meaning for water. It refers to developing policies and technologies that begin from the assumption that uncertainty is inherent for reasons ranging from the complexity of ecosystems through the instability of markets to the social and political dynamism in many communities. Conventional approaches, including notably integrated river basin development, might in principle be able to cope (or to learn to cope), but the institutional and political reforms that would be required are major barriers. Yet, in the absence of integrated development, conventional approaches can give the wrong answer, as shown by many failed flood control structures and abandoned irrigation systems.

Adaptive management for water, and more specifically for water demand management, is a strategy based on the old slogan that, *if you can't beat 'em, join 'em*. It tries to achieve its twin goals, sustainable livelihoods and ecosystem integrity, by adapting to hydrological variability and ongoing socio-economic change. The goal of an adaptive management strategy is to identify points of leverage for reducing human and ecological vulnerability by working with variability and change rather than trying to control or limit them. Nomadism and recessional rice planting are good examples of traditional adaptive management systems. Many of the most important points of leverage are likely to be found not in the water system itself but in the institutions people build for their livelihoods.

Adaptive management has been under active development in South Asia, mainly for dealing with drought and flood conditions. How would it be applied to WDM? The full answer is not at all clear, and indeed that is what new analysis would try to investigate. Certainly, approaches such as supplemental irrigation

[12] Gerald Galloway and Ralph Pentland, *Managing Groundwater Resources in the Great Lakes Basin: Security Our Future – Draft Vision and Principles*, Working Paper #2 (Toronto: Munk Centre for International Studies, University of Toronto, 2003), pp. vi and 20-21.

would be part of the answer. But so too would adaptation of common property management so it does not collapse under pressure from change. The broad goal is to develop shorter and longer term measures for reducing water use, or for sharing shortages, in ways that improve the likelihood that livelihoods will be sustainable. A coping study would be an ideal way to initiate the process and to determine whether more detailed work in the context of WDM is likely to prove useful for MENA.

Ecological (Flow) Reserves

One of the least understood sectors of water use in MENA is the ecological. How much water needs to be left in rivers, lakes and aquifers for functions that can only be provided by water *in situ*? This is not an easy topic for study. The intellectual basis for determining quantities and qualities is still poorly developed, and, despite occasional statements, no nation in the region has created, as has South Africa for example, explicit criteria for maximum quantities that can be withdrawn from specific water bodies.[13]

One way to approach this topic is to identify the services provided by water beyond that used in households, agriculture and industry. Some *in-situ* services, as with transportation, tourism and fishing, are reflected in markets from which values can be derived. For example, the three riparian nations on the Dead Sea are finding that water flowing into the Sea for tourism has a higher value than abstracting it for agriculture prior to reaching the sea. But what of the values beyond those reflected in a market? An attempt to define them has been undertaken by researchers at the International Food Policy Research Institute.[14] They identify three other services provided by water:

- Regulatory functions for essential ecological processes and life support systems
- Habitat functions to maintain biological and genetic diversity
- Information, aesthetic and spiritual functions.

Current analytical techniques will be pushed to the limit if these services are to be valued, but the preservation of these services is so important to regional well-being and economic sustainability that the effort must be made.

Industrial Water and Wastewater

Though still relatively small, industrial water use is growing in MENA. The tendency, as reported in the Valuation Forum, is to push prices up until industries are paying the full cost (though not full value) of the water they use. There is less force behind the equally important goal of controlling the large volumes of polluting effluent released by industry. (Regulations on the quality of effluent released would likely be more effective than higher prices for input water or wastewater.) However, even with higher prices, water remains such a small component of cost for most industries that the effect will not be large. Industries that draw and return cooling water seldom want to pay anything for use.

Beyond the acknowledged need to monitor water inflows and outflows from each operation, it is difficult to go further with international approaches to industrial water demand management. Experience with industrial energy conservation show that broad attempts to foster greater efficiency tend to falter for two

[13] Case studies of evaluation of in situ values of water have recently been published, and they might prove to be a useful model for work in MENA. Megan Dyson, editor, *Flow – The Essentials of Enviornmental Flows* (Gland, Switzerland: IUCN, 2003).

[14] Elroy Bos and Ger Bergkamp, Water and the Environment, in Ruth S. Meinzen-Dick and Mark W. Rosegrant, *Overcoming Water Scarcity and Quality Constraints*, Focus Series 9 (Washington, DC: International Food Policy Research Institute, 2001).

reasons: First, each industry and indeed each plant is unique in design and location, so it is easy for management to dismiss suggestions and hard for government to institute regulations. Second, results depend overwhelmingly on the attitudes of senior management – what they reward and what they do not. The single best entry point is to exert pressure on senior executives. Even if their engineers know how to save water, they typically are given neither the incentive nor the investment funds to do so. (Despite the illogic, rewards go to those who find ways of increasing output, not those who cut costs, much less reduce pollution.) For both reasons, efforts to promote industrial WDM must come from national authorities. What is possible beyond pricing water is to emphasize best practice and to make available information on water saving techniques.

CONCLUSION – WDM AS A GOVERNANCE ISSUE

When IDRC began funding research on WDM in the early 1990s, the concept was not well known in MENA.[15] This does not mean that people in MENA were inefficient in their use of water, or that governments were unaware of the need for greater water efficiency. However, it does mean that households, farms, and industries were not so efficient as they needed to be given the increasingly severe constraints on fresh water in the region. And it does mean that governments did not regard WDM as a concept worthy of direct attention on its own. To the extent that messages about the need for greater water use efficiency are now widespread, and that governments are aware of WDM as a concept, gains have been made. It is at the levels of application and implementation, and at ensuring that efforts to improve efficiency also improve equity and ecological sustainability, that work is now needed

We already know more about the technologies for water demand management than we apply, and we are also quite 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 senior levels. The gaps do not lie with technology and economics; they lie with political direction and human behaviour. Therefore, to paraphrase Homer-Dixon (who 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.[16]

If our problems are social, and must be solved be social measures, it follows that Water Demand Management has to be seen from the perspective of governance – governance at all levels, from national and international through provincial and municipal to corporate, communal and individual. Not just in the Middle East and North Africa, but everywhere in the world, we need a much more activist stance to promote WDM as a larger – indeed, much larger – part of water management. Recent materials in the literature on WDM are beginning to recognize the need for more emphasis on governance and decision-

[15] Eglal Rached, Eva Rathgeber, and David Brooks, *Water Management in Africa and the Middle East: Challenges and Opportunities* (Ottawa: IDRC Books, 1996). David B. Brooks, Eglal Rached, and Maurice Saade, *Management of Water Demand in Africa and the Middle East: Current Practices and Future Needs* (Ottawa: IDRC Books, 1997).

[16] Thomas Homer-Dixon, Bringing Ingenuity to Energy, in *Fueling the Future*, Andrew Heintzman and Evan Solomon, editors (Toronto: House of Anansi Press, 2003), p. 19.

making along with continuing support for technical and economic advances. As stated in a report on local water management and conservation in India and Nepal:[17]

> Water problems and water management options are as much a product of the social, economic and institutional context as they are of the technical factors governing local hydrological conditions.

This challenge implicit in this quotation needs to be picked up and answered. Yes, there are technical issues to be solved; and, yes, we should learn how to incorporate some of the "softer" aspects of WDM in our economic evaluations, but above all we should work toward establishing attitudes, incentives, institutions and policies that, individually and collectively, work toward water demand management as both means and ends for improving social, economic and environmental conditions in MENA.

It is no small matter to urge greater focus on governance for water demand management. As indicated at the start, governance comprises the technical, economic, administrative, financial and social aspects. Not too difficult to act on any one of these elements, but just as we need some mixture of integrated river basin management and adaptive management from a hydrological perspective, so too do we need them from an institutional perspective. Of course, with either perspective "integration" and "adaptation" are ideals that we never fully attain. The real questions, therefore, are what kinds of actions in those various areas move us in the right directions, which work well one with the other, and which will be acceptable to governments on the one hand and to water users on the other. Indeed, the ultimate social question is probably less about effectiveness or efficiency, however important they may be as prerequisites, than about political acceptability.

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.

[17] Marcus Moench, Ajaya Dixit, S. Janakarajan, M. S. Rathore; and Srinivas Mudrakartha, *The Fluid Mosaic: Water Governance in the Context of Variability, Uncertainty, and Change* (Kathmandu: Nepal Water Conservation Foundation, 2003), pp. 2 - 3.