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Water demand management in Yemen and Jordan: addressing power and interests

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This paper investigates the extent to which entrenched interests of stakeholder groups both maintain water use practice, and may be confronted. The focus is on the agricultural sectors of Yemen and Jordan, where water resource policymakers face resistance in their attempts to reduce water use to environmentally sustainable levels through implementation of water demand management (WDM) activities. Some farmers in both countries that have invested in irrigated production of high-value crops (such as *qat* and bananas) benefit from a political economy that encourages increased rather than reduced water consumption. The resultant over-exploitation of water resources affects groups in unequal measures. Stakeholder analysis demonstrates that the more 'powerful' groups (chiefly the large landowners and the political elites, as well as the ministries of irrigation over which they exert influence) are generally opposed to reform in water use, while the proponents of WDM (e.g. water resource managers, environmental ministries and NGOs, and the international donor community) are found to have minimal influence over water use policy and decisionmaking. Efforts and ideas attempted by this latter group to challenge the status quo are classified here as either (a) influencing or (b) challenging the power asymmetry, and the merits and limits of both approaches are discussed. The interpretation of evidence suggests current practice is likely to endure, but may be more effectively challenged if a long-term approach is taken with an awareness of opportunities generated by windows of opportunity and the participation of 'overlap groups'.

KEY WORDS: power, hydropolitics, Yemen, Jordan, water policy, water demand management

Greening deserts

Water resource managers throughout most of the world are concerned with meeting demand through new sources, or through more efficient use of existing sources. This is certainly true of the Middle East, where the application of physically scarce water resources to parched land is a common sight. The modern wave of 'desert bloom syndrome' (Molle *et al*. 2009) may have originated with Israeli diversions of the Lake of Tiberias (George 1979), and spread to the Toshka depression in Egypt (Wichelns 2003), and to the Disi Aquifer between Saudi Arabia and Jordan (Ferragina and Greco 2008). Middle Eastern governments on the whole have gone to remarkable lengths to meet demand for water by building diversion structures, canals, deep tubewells, and desalination plants. The extent to which they have attempted or been able to manage rather than to meet water demand, however, is less impressive.

This dominant 'supply-side' approach to water resources management is entirely rational in the political economies where it occurs. It is politically rational (and economically rewarding) when water use policy is set in a 'shadow state' (see Allan and Mirumachi 2010), where decisionmakers respond to the pressures from influential industrial agricultural

interests and other politically influential water-users benefitting from agricultural water subsidies.

Implementing policy to manage water demand in these circumstances is, by contrast, economically irrational and politically suicidal. Efforts to reduce water use directly challenge the interests invested in the established political economy. Yet managing water demand remains the single most effective way of ensuring environmentally sustainable water use, and reconsidering the obstacles to water demand management (WDM) takes on a new imperative.

This paper sheds light on the forces that sustain the rationale for supply-side management, and prevent the uptake of WDM principles and practice, in the agricultural sectors of Yemen and Jordan. Previous research into failures of WDM policy uptake has found that the established order typically favours male-dominated structures (Arafa *et al*. 2007a), or the wealthy (Tyler 2007), and is perpetuated by the fact that water resource management institutions also lack much of the ability and legitimacy required to implement change that some in local communities – and external donors – would like to see (Brooks and Wolfe 2007). This paper complements these studies, to find that the problem lies partly with the concept of WDM itself, but is mainly attributable to the power asymmetry and entrenched interests of water stakeholder groups.

Expert elicitation is complemented with published and grey literature[1] to examine the extent to which the power imbalance both maintains these interests (and thus water use practice), and may be confronted. We find that the most powerful water stakeholder groups in both Yemen and Jordan oppose attempts at WDM, and are generally successful in blocking reform. This reflects what is already well-documented by landmark studies (e.g. Lichtentaehler 2002; Courcier *et al*. 2005): that smaller farmers eke out a living at the limit of a scarce resource while the more powerful farmers benefit from non-existent or un-enforced regulation of irrigation water use. The tragedy of the 'commons' of groundwater in the highlands of Yemen or of surface water in the Jordan River Valley is not a misfortune for everybody.

The nuance that emerges from the analysis reveals a much more complex picture, however. The stakeholders are found to rely on a suite of formidable formal, informal and traditional structures with widely varying ability to uphold their interests. Interventions by governments and donors that (unwittingly) confront the power asymmetry are found to follow either of two broad approaches. Interventions attempting to influence power asymmetry towards WDM are judged to have little effect, while attempts to challenge it are judged to have only slightly more. It is argued that both approaches may be more effective if considered explicitly over the long-term, and take advantage of 'overlap groups'.

Problems with and obstacles to WDM in the Middle East and North Africa region

'Water demand management' is the catch-all phrase used to describe the alternative to 'supply-side' water management paradigm. WDM originated primarily as a response to environmental pressure in industrialised economies that have completed their 'hydraulic mission' (see Allan 2001). The idea has attracted significant practitioner and academic interest around the globe, with study of its application to the Middle East and North Africa region most actively supported by the International Development Research Centre (IDRC). The IDRC emphasises three principles in a broad and pragmatic definition of WDM: 'any practice or policy implemented which results in water being used in a more efficient, equitable and sustainable way' (Arafa *et al*. 2007b, 2).

WDM is formally incorporated into the national water plans in both Yemen and Jordan. The 2008–2022 *Water strategy* of Jordan, for instance, states clearly as one of its goals that 'water tariffs within and outside the water sector should support water demand management' (Hashemite Kingdom of Jordan 2009, 2). Yemen's 5-year *Water sector strategy* similarly lists reducing demand (through 'economic incentives') as one of its guiding social and economic principles (NWSSIP 2008, 16). The references to WDM into the text of the national plans does not reflect the frustration of groups who promote the practice of WDM throughout the Middle East and North Africa region, however. WDM measures are still much more observed on paper than in the ministries or on the farms.

Part of the discrepancy may be due to the incoherence of the concept itself. The three principles of WDM (efficiency, sustainability and equitability) are laudable and broad – but may be irreconcilable. WDM may be another example of what Molle (2008) refers to as a 'nirvana concept' – one with such vast appeal that different groups make of it what they would like, and in the process render it devoid of meaning. The evidence base for including 'efficiency' as a principle of WDM, for instance, is wanting: in many contexts greater water use efficiency leads to greater, not less, water consumption. Where land is the limiting factor, increased water efficiency may reduce overall water consumption (Cornish *et al*. 2004; Perry *et al*. 2009; Lankford 2011). But where land is not a limiting factor – as in semi-arid regions like Jordan and most of Yemen – no overall savings are likely. The very efficient drip irrigation of Jordanian and Israeli hothouses on either side of the Jordan River, for instance, may have increased the 'dollars per drop', but has not led to reduced overall water consumption rates. The attention devoted to improved efficiency (e.g. Water Resources Group 2010), furthermore, can come at the cost of the WDM principles of equitability and sustainability, as we will see.[2]

Confronting and challenging power

This paper's concern about equitability and sustainability also sheds some light on Hardin's (1968) idea of the 'tragedy of the commons'. The observation that unchecked use of a common resource ultimately affects all users is often evoked as the basis for more sustainable water use. Because the groundwater or surface water resources are replenished by rainfall, however, the tragedy can unfold unevenly. The farmers with shallower wells (in Yemen) or at the end of the main irrigation canal (in the Jordan River Valley) may suffer tragedy more harshly and often than those with deeper wells or upstreamers who may also have the ears of the policymakers. What is a tragedy for the weaker may be sustainable for the elites, in other words, when access to and use of the commons is skewed.

Understanding asymmetries in power thus becomes crucial to the task of interpreting resistance to changes in water policy (see e.g. Hamann 2005). Interests vested in either support of or opposition to the status quo will compete through and be mediated by various forms of power. As we will see, power – the ability to influence outcomes – derives as much or more from legitimacy and authority as it does from the barrel of a gun. For the purposes of this paper, the latter is characterised as 'hard' power, and the former as 'soft' power.[3] Stakeholders in the agricultural sectors of Yemen and Jordan employ multiple manifestations of both hard and soft power, often in combination. In claiming a stake in the sector, the international donor community also routinely employs 'soft' power, whether or not the nature of their intervention is acknowledged as such.

The interventions this community plans with like-minded 'partner' ministries and NGOs are classified into two categories. The first category groups interventions that influence power in the 'reform' spirit of 'speaking the truth to power' so that abuses of power will or can be rectified once they are recognised. The success of 'positive-sum outcome' schemes relies on meeting or enhancing the interests of the more powerful actors, for instance. The second category groups interventions that challenge power asymmetry in order to redress, or partially redress, influence over decisionmaking processes. The more conventional capacity-building projects aimed at increasing the ability of specific stakeholders to govern, negotiate or carry out science fall into this category[4] (Zeitoun and Jägerskog 2009). Efforts in both categories are found to have marginal effect in Yemen and in Jordan, though a very interesting picture nonetheless appears from the stakeholder analysis.

WDM interests and influence in the agricultural water sector of Yemen

The water resources management challenges facing the Republic of Yemen are formidable. With nearly 80% of the population of 21.2 million living on the plateaus several hundred metres above the aquifers that sustain them, water users face big topographical challenges. Traditional tribal structures, relatively young ministries following the 1960s civil war and unification in 1990, and lingering internal political tensions ensure that governance of the water sector is a significant challenge throughout the country (see Negenman 1996).

Roughly 90% of the fresh water consumed in Yemen is by the agricultural sector. A tenfold increase in irrigated areas – from 37 000 ha in the 1970s to 368 000 in 1996 (NWSSIP 2008, 10) – testifies to the momentum that can build when technology and the political economy combine. The expansion was facilitated by improved (and cheaper) deep well drilling and pumping technology, coupled with remittances from Yemeni expatriates (mainly in Saudi Arabia), and the high market value of *qat* and other irrigated cash crops. The practice was lubricated through ill-devised national social welfare programmes, such as heavy subsidies for diesel (the fuel of choice for the motors driving the deep well pumps) (Ward 2005, 7), and generally not hampered by the availability of irrigable land. Representing one third of the agricultural GDP, and 6% of the overall GDP (Lichtentaehler 2010), and double the 'dollars per drop' (approximately US$1.1 per m^3 of water) of other cash crops (Hellegers *et al*. 2009, Tables III and IV), cultivation of *qat* can be quite lucrative.

Deep water well drilling and pumping continues effectively unregulated and beyond the sustainable limits of the resource (Hellegers *et al*. 2009, Table I). The infamous 1996 Ta'iz water crisis has become symbolic of the effects of unchecked pumping, where the inhabitants of the city lived through a 42-day drought caused by agricultural abstractions in Upper Wadi Rasyan (Mohieldeen 1999). Access to the aquifers supporting agricultural production is skewed, however, and the effects of the practice affects the large landowners much later and to a lesser degree than it does the city-dwellers or smaller subsistence farmers. The centre of influence in the agricultural water sector stems from the intimate relations between traditional tribal leaders and the highest echelons of government. Stakeholders with an interest in WDM – the agencies of the Ministry of Water, and smaller farmers – find themselves in opposition to this alliance.

Stakeholders and interests in the agricultural water sector in Yemen

The agricultural sector in Yemen is composed of a number of different water users which may be grouped according to their varying interests. The position on and influence over implementation of WDM policy of these groups is shown in Figure 1. The striking top left–bottom right congregation of stakeholders

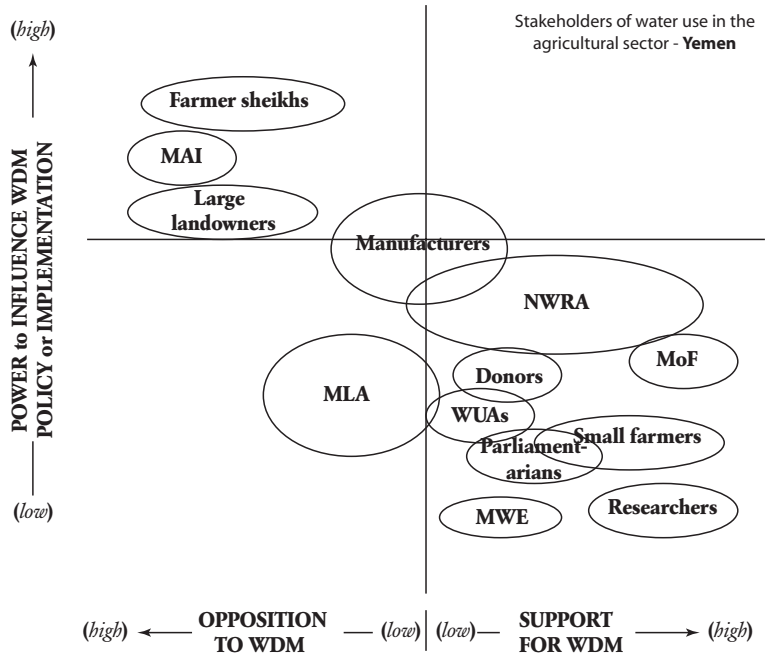

Figure 1 The relative influence of main water use stakeholder groups in the agricultural sector in Yemen, plotted against their support for development or implementation of WDM policy. The figure is indicative only. Stakeholder groups shown to span both support and opposition to WDM indicates the different positions supported by individuals wthin the groups (referred to as 'overlap groups')

MAI: Ministry of Agriculture and Irrigation; NWRA: National Water Resources Authority; MLA: Ministry of Local Administration; WUA: Water User Associations; MoF: Ministry of Finance; MWE: Ministry of Water and Environment

Source: Modelled after the method provided in Annex 3 of Ward *et al*. (2007)

indicates the tussle between power and interests quite clearly. Ward *et al*. discuss the dynamics, noting for instance that the resistance to reform comes from

> the potential losers from the changes . . . the politically powerful, the tribal leaders and a large number of farmers with access to capital gained from [unregulated groundwater development and *qat* production] . . . By contrast, poorer farmers and the rural landless did not benefit.
>
> Ward *et al*. (2007, 9)

In general, the less wealthy small farmers have less influence over water use than do the more wealthy and politically-connected farmer sheikhs, but there are substantial nuances worth exploring.

Tensions at the political level in the Yemen water sector derive from the contest between well-established traditional authorities on the one hand, and the rules and organs of the young Yemeni state on the other. The main water managing stakeholder in this latter group is the Ministry of Water and Environment. The ministry is considered to have generally low implementation capacity and bargaining power when faced with better-established ministries which enjoy more political clout. Efforts to implement the WDM strategy are led by the National Water Resources Authority, a Ministry of Water and Environment agency seen as financially dependent on donors – primarily the World Bank and the Dutch government. A primary policy instrument employed by the Ministry of Water and Environment to control water use has been the 2005–2009 National Water Sector Strategy and Investment Programme (NWSSIP), and its update in 2010. The strategy lists as one of its guiding social and economic principles that 'Water supply concerns are to be balanced by demand management measures, including the use of economic incentives to reduce the demand' (NWSSIP 2008, 16). The National Water Resources Authority is judged by some to be 'dogged by a top-heavy and rather inert headquarters and lack of management vision or capability' (Ward *et al*. 2007, 34).

The 'parliamentarians' group has been considered 'by and large a positive force' (through the Water and Environmental Committee) for reform of agricultural water (Ward *et al*. 2007, 33). This group is understood to derive its power from legitimacy granted by the people. Water User Associations established through

international donor support have had limited successes locally, but little or no effect at the national level. The otherwise limited influence shown in Figure 1 of the international donor community is attributed in part to the competition amongst themselves. The community as a whole is thus considered susceptible to 'divide and conquer' tactics by local leaders or authorities.

The primary state authority resisting attempts at WDM is the Ministry of Agriculture and Irrigation. At least until the updated 2010 Sector Strategy (NWSSIP), the Ministry of Agriculture and Innovation looked upon the Ministry of Water and Environment 'as a menace to its power', and officials have openly discredited the NWSSIP, for example (Anon f personal communication 2009). Resentment is also sensed through inequitable budgets, with Ward *et al*. noting, for example, that 'agriculture has 93% of the water – but only 8% of the NWSSIP budget' (2007, 37). The large landowners and 'farmer sheikhs' benefitting directly from current water use practice are considered to be both the most opposed to reform and the most influential over actual water use.

Power backing interests in Yemen

The difference in 'power to influence WDM policy or implementation' (Figure 1) between those opposed to and those supportive of WDM is clear (at least at this level of indicative portrayal). The burden of overcoming inertia to change is thus carried by 'weaker' stakeholders with an interest in the principles of WDM – namely the National Water Resources Authority, small farmers and the international donor community. Should it be taken on at all, part of the burden involves confronting a variety of forms of power used to maintain the status quo.

The use of firearms as deterrent power in the water sector may be nowhere more obvious than in Yemen (see Handley 2001; Lichtentaehler 2002). As just one example, several people were killed in 1997 at Jabel Sabr in fighting between villages over the effects of a water development project (Ward 2009, 252).

But the use of 'soft' power is also common. As Handley notes, the major sheikhs in 1993

> were invited up to Sana' to hear the president declare 'you will cooperate with the drilling . . . either by custom (that is, gentleman's agreement), or by violence.
>
> Handley (2001, 152)

According to Ward and al-Aulaqi, the opposition of sheikhs and landowners to reform is manifested in 'discreet ways – in non-compliance, or in cornering large shares of publicly subsidized programs' (2008, 13). The same authors discuss how power may also be influenced by payments to the police for the enforcement of National Water Resources Authority policy, even if some influential ministers, sheikhs and army and security officials continue to drill and operate illegal wells. As such, the wealthy farmers have the ability both to drill and equip wells, and to bribe officials to bypass the law.

Official attempts to implement WDM in Yemen did not, at first, seek to confront such exertions or imbalance of power. The general failure of the first NWSSIP is attributed to the fact that it avoided debate with the Ministry of Agriculture by ignoring it outright. The Ministry of Agriculture's lack of support for the new policy was thus as destructive as it was predictable; with nothing to gain in return, the ministry had little incentive to commit (Anon b personal communication 2009).

Nor is the influence of newly formed state institutions such as the National Water Resources Authority (and, especially, Water Users Associations) helped by their 'legitimacy problems' (Anon d personal communication 2009) or by the uneven field they are playing on. Any bargaining power the National Water Resources Authority or Water User Associations may yield will remain constrained until they 'prove' themselves to be technically and organisationally competent, and build legitimacy in the eyes of those they are attempting to regulate. Water User Associations can be empowered through community interest or self-interested ways; they can inform the National Water Resources Authority of illegal drilling, for example. But the National Water Resources Authority cannot enforce regulation, and is not supported by the Water Law: NWRA staff are obliged to 'interpret or misrepresent the law in order to stop drilling' (Ward *et al*. 2007, 19).

Of particular interest in Figure 1 are those stakeholder groups that straddle both opposition to and support for WDM – referred to as 'overlap groups'. The large industrial families (labelled 'manufacturers'), for example, are traditionally opposed to WDM as they perceive it will reduce their productive capacity (Anon a personal communication 2009). Also of note is the overlap of support for, and opposition to, WDM by the Ministry of Local Administration and some of the local National Water Resources Authority offices. The overlap indicates a difference of opinion of individuals within these groups, particularly across offices of the Ministry of Local Authorities nationally, reflecting also allegiances between the southern and northern parts of the country.

WDM interests and influence in the agricultural water sector of Jordan

With meagre rivers and little rainfall to replenish its aquifers, the Hashemite Kingdom of Jordan has amongst the lowest per capita freshwater availability in the world. Withdrawal rates are currently up to 20% above the estimated sustainable capacity. A 'super green revolution' in the 1970s led to a tenfold increase in agricultural revenue (Venot *et al*. 2007) and the sector consumes roughly 70% of total water

used (Abu-Sharar and Battikhi 2002). The population is projected to grow by 74% by 2030 (IFAD 2009, Table 3.1), and the country absorbs periodic surges of immigration caused by regional conflicts. Jordan's physical water scarcity is also compounded by second-order scarcity, and issues of inequitable distribution within the country and internationally.[5]

Despite the prominence given to 'effective water demand management' in the 2008–2022 *Water Strategy* (Hashemite Kingdom of Jordan 2009, preliminary matter), the bulk of government effort appears fixed on meeting water demand rather than on managing it. The project with the highest profile in this regard is the colossal Red Sea–Dead Sea Canal project (World Bank 2005). Other policy in the same vein includes consistently subsidised water for agriculture in the Jordan River Valley[6] (Venot *et al*. 2007).

The political economy of the agricultural sector in Jordan is similar to that of Yemen. Agricultural production in the Jordan River Valley is limited more by the availability of water than of land. Thousands of (relatively small) 2–4 hectare unit Jordan River Valley farms established by the government after the construction of the King Abdallah Canal in 1961 receive their water from the Yarmouk River, a main tributary to the Jordan River. Larger farms up to 1100 hectares were allocated in the wake of the 1967 war with Israel (Jridi 2002, 16). Subsidised irrigation water and pumping costs (Jabarin 2007, 4) have ensured that agricultural water demand in the Valley has far outstripped supply. Faced with limited water availability some farmers cultivate only half of their allocated units, or switch to more efficient use (e.g. multi-span hothouses) in order to maximise their exploitation (e.g. see Mazahreh *et al*. 2000). A form of 'land market' has been established as a result of the over-subscription for the water, as powerful farmers purchase the land allocated to smaller farmers – primarily for the water rights that come with it[7] (Anon d personal communication 2009).

Policy-setting and decisionmaking in the water sector in Jordan also resembles the Yemeni case. Major water policy decisions are taken by the 'shadow state', where policy is influenced by individuals or small group forces from outside the formal branches of government. Stakeholders in the agricultural water sector are classified by their influence and interest in WDM policy, as shown in Figure 2.

Stakeholders and interests in the Jordan River Valley

Amongst the most powerful bodies in water policy-setting in Jordan is the Royal Commission for Water. Headed by HRH Prince Faisal Ibn al Hussein, the relatively recently formed Commission is composed of a handful of technocrats and academics that may draw upon the strategies and research of the Ministry of Water and Irrigation, and research by the universities. The Commission drafted the formative 2008–2022 *Water Strategy* (Hashemite Kingdom of Jordan 2009), and the diversity of its make-up[8] is reflected in its span, in Figure 2, of positions both in support and opposed to WDM.

The Higher Agricultural Council is chaired by the Prime Minister, and includes the Minister of Water and Irrigation, the Minister of Agriculture, and several other ministries, syndicates and the private sector. As a strong parliamentary body, the Council is considered to wield greater influence than the Royal Commission (successfully imposing taxes on livestock, for example), and is expected to endure beyond the life of the Council (Anon d personal communication 2009). Responding primarily to the more powerful farmers, the Council is considered on the whole to be against the introduction of water demand measures (Anon e personal communication 2009).

The bulk of large farms in the Jordan River Valley are held by members of two tribes, with a few large farms run by Jordanian farmers not associated with a particular tribe. The interests of these groups in citrus plantations has manifested itself in tariffs protecting domestic production of bananas (Venot *et al*. 2007, 21) – in direct contradiction to Ministry of Water and Irrigation policy (see Jabarin 2007, 14). Market demand and subsidised water costs favour continued banana production, to the point that it is economically rational for the 'banana lobby' farms to irrigate their crops with (expensive) desalinated brackish groundwater (Anon e personal communication 2009).

Outside of the 'shadow state' structure, the Ministry of Water and Irrigation is the most influential institution in the water sector, with full responsibility for the management of the King Abdallah Canal which runs along the Jordan River Valley. The Ministry of Water and Irrigation established a unit to advance WDM in 2002, having inherited the responsibility for its implementation. Though weak in administrative and implementation capacity, the legitimacy of the Ministry of Water and Irrigation's sub-authority, the Jordan Valley Authority 'cannot be ignored' by farmers within its jurisdiction (Anon d personal communication 2009). The influence of the ministry appears to be increasing, possibly keeping pace with the growing awareness of the acute water challenges the country faces. The lack of uniform support for WDM within the ministry is attributed to reductions in technical support and donor funding (of the WDM Unit in particular, which was stopped in 2005).

The Ministry of Agriculture has the authority to drill wells required for livestock production, to build dams for animal feed production (Abed Rabboh and Jabarin 2008, 18), and to assist farmers with improved field-level water management practice. Traditionally representing or susceptible to the interests of Jordan River Valley (and highland) farmers, the Ministry of Agriculture on the whole traditionally rejects WDM measures. Yet, its relative lack of influence over the distribution of water (e.g. compared with the Ministry of Water and Irrigation) and direct experience with

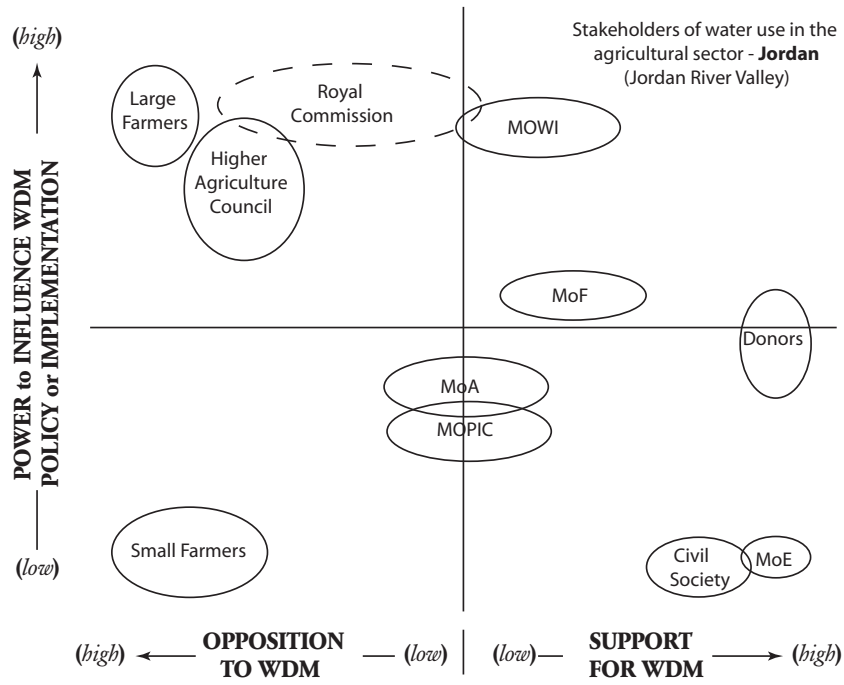

Figure 2 The relative influence of main water use stakeholder groups in the agricultural sector in Jordan (Jordan River Valley), plotted against their support for development or implementation of WDM policy. The figure is indicative only. Stakeholder groups shown to span both support for and opposition to WDM indicates the different positions supported by individuals wthin the groups (and are referred to as 'overlap groups'. Dashed line around Royal Commission indicates position is less certain, due to its recent establishment)
JRV: Jordan River Valley; MOWI: Ministry of Water and Irrigation; MoF: Ministry of Finance; MoA: Ministry of Agriculture; MOPIC: Ministry of Planning and International Cooperation; MOE: Minstry of Environment
Source: Modelled after the method provided in Annex 3 of Ward *et al.* (2007)

water shortages explains why the ministry no longer speaks with one voice in rejecting WDM measures.

The government arm most supportive of WDM measures is the Ministry of Environment, which plays a minor role in the development of water policy, limited to participation in committees or meetings chaired by the Ministry of Water and Irrigation. Also generally supportive of WDM measures (for economic reasons), the Ministry of Finance carries relatively more influence within government. The Ministry of Finance is judged particularly influential for 'determining the actual cost of devices and equipment used in rationing the demand for water by different users' (Abed Rabboh and Jabarin 2008, 17). The Ministry of Planning and International Cooperation plays an important role in donor coordination, in reviewing all plans submitted by the Ministry of Water and Irrigation, and in liaising with local and national institutions (Abed Rabboh and Jabarin 2008, 17).

The researchers, NGOs and marginalised groups that make up 'civil society' are characterised on the whole as generally quite supportive of WDM measures. Attention to WDM policy and water management is continuously increasing at the universities. But academic lobbying and advocacy efforts have little demonstrable effect against the vested interests in established water use practice.

Power backing interests in Jordan

The scattered positions of Figure 2 are in contrast to the distinctive top left–bottom right grouping of the Yemen plot. The general trend, however, is consistent: those most strongly promoting WDM in both Yemen and Jordan are the least influential over its implementation, and those opposing WDM are the most influential. The burden of reform water use to more sustainable levels is carried by the former group, and will have to confront a variety of forms of power.

It is not unheard of for disputes over water prices and enforced regulation to be settled through threats of the use of firearms, particularly in the central and northern parts of the Valley (Anon e personal communication 2009). The use of hard power in the most

extreme form of guns is limited, however, in comparison with Yemen.

The bargaining power of the less powerful groups is compromised by their lack of access to the decision-making organs of the shadow state. Though legitimate under the law and in the eyes of professionals for their scientific rigour, the individuals and sub-groups of civil society have had limited influence on policy-setting circles. The 'voice' of environmental groups – so loud in the media and international stage (e.g. FOEME 2010) – have little effect on the Royal Commission or the Agricultural Council. Even the influence of the powerful Ministry of Water and Irrigation with the Royal Commission is limited, though it is quite strong within the Agricultural Council.

The tariffs protecting the banana investments of the larger Jordan River Valley farmers (and which violates Ministry of Water and Irrigation policy) are in effect exclusive, and do not present great opportunities for the poorer and less well-connected farmers. The costs involved with production (through desalinated brackish groundwater) and marketing costs are feasible only to large farmers taking advantage of economies of scale. The influence of the larger farmers is also exerted through personal or tribal relationships with ministry officials, and they may bypass Jordan Valley Authority policy through a number of means, including bribes and favours (Anon d personal communication 2009). Smaller farmers in the Jordan River Valley also have a certain ability to bypass Jordan Valley Authority policy through established special relationships, though with much less protection and thus to a lesser degree than the large farmers. Internally divided, the smaller farmers on the whole are considered to remain without a strong policy-setting voice (Anon d personal communication 2009).

There is evidence of limited success of the two broad approaches to confronting power asymmetry in Jordan. Stakeholders with an interest in promoting WDM hope that the consultative approach taken by the 'Idara' project may garner the attention of the policy-setting circles. The deputy director of the Jordan water programme of the project's donor (USAID) suggests sustainable water use may come through greater efficiency, prescribing that 'the only way to make water allocation and use more efficient in Jordan is to manipulate the relative power of special interests to change the incentive structure' (Hagan 2008, 10). Reform of the water sector, he notes, is also hampered by the 'sanctioned discourse' (see Allan 2001), which prevents discussion amongst water professionals of restraint of agricultural water use, through fear of the impact on their careers.

Attempts to confront power asymmetry in Yemen and in Jordan

This section summarises how and the extent to which interests and power asymmetry related to water use in the agricultural sectors in Yemen and in Jordan are challenged. It first discusses under which conditions 'influencing' or 'challenging' approaches can work, in a situation where the effects of the tragedy of the commons are as skewed as is access to them. It then identifies two important features of reform in the water sector: the potential facilitating role of the 'overlap' groups, and the importance of long-term strategies that can both erode positions and capitalise on change-moments.

Stakeholder groups supporting WDM in Yemen and in Jordan have used or conceived of many different interventions in their attempts to change the status quo. These are classified in Table 1 according to the type of approach used.

Influencing power asymmetry

A purely realist or truly cynical view of power imbalance would hold that there is little point in negotiating with authorities, particularly when decisions are made by non-responsive governments in a 'shadow state'. It is rare that the power of authorities does not derive at least in part from legitimacy, however, and as Machiavelli has pointed out, 'even a ruthless ruler needs to ensure that the ruled believe his rule is justified' (Wester and Warner 2002, 66). Indeed, both the Jordanian and Yemeni cases demonstrate that the water policy-setting influence of specific individuals in the 'shadow state' can be over-estimated, if not understood within the political economic context in which it plays out.

In Jordan, the power invested in these decisionmakers derives primarily from the Prime Minister, and can shift with a change of Prime Minister. Ministers often seek to have advisors who are close to the Prime Minister in order to gain his or her favour. The Royal Commission is influenced by the Minister of Water and Irrigation, and directly influenced by the Prime Minister and each of these are in turn influenced to a degree by their constituents (Anon d personal communication 2009). Similarly, while powerful farmer sheikhs in Yemen may be untouchable at the higher level, they can in fact be quite susceptible to pressures at the community level (Anon c personal communication 2009). The power and influence of the sheikhs, after all, relies on their legitimacy in the eyes of tribe members, and this legitimacy to a large extent must be earned.

Consideration of actual reform in water use casts a cloud over the hopeful idea that powerful groups can be influenced to any extent, however. One frequently invoked 'influencing power' intervention of Table 1 is the 'positive-sum' idea of water transfers and water markets. These have been proposed in Yemen to assist with the tensions between the agricultural and industrial sectors around Ta'iz. In theory, the farmer benefits financially, while the urban dwellers benefit from a more reliable and cheaper water supply (Riaz 2002;

Table 1 Ideas or efforts undertaken by stakeholders with an interest in promoting WDM in Yemen and Jordan from year 2000. The efforts are grouped according to interventions that either influence or challenge power asymmetry, and sub-classified into four characteristic approaches

	Approach
Existing or proposed efforts understood to 'influence' power asymmetry	
Rural to urban water transfers/water markets	
Reflexive governance (e.g. the Social Fund for Development)	
Appropriate regulation and incentives – for political leaders, e.g. through NWSSIP	Create positive-sum outcomes
Decision-support models and systems	
Plasticulture and more efficient use of water	
Inducements for the national government, e.g. access to World Trade Organisation	
Improving inter-governmental relations, e.g. between MAI and MWE	
Reforming the economic incentive structure for poor or wealthy farmers	
Developing more effective communication, e.g. between villagers and Governorate Development Units	Encourage transformation
Shadow law enforcement	
Persuasion based on information	
Existing or proposed efforts understood to 'challenge' power asymmetry	
Capacity-building projects for WUAs	
Renewed effort on existing pro-poor programmes (e.g. the Social Fund)	
Maintaining local knowledge (e.g. about pre-deep well adaptation to seasonal variance)	
Building networks, e.g. through 'stakeholder involvement plans'	Level the players
Consensus-building	
Increasing education levels, particularly among rural poor	
Increasing negotiations capacity, at international but especially local levels	
Improved regulation	
Well drilling-rig tracking devices	
Increasing transparency, e.g. through wider dissemination of policy and data, and encouraging open-door policies	Level the playing field
Capacity-building in law-making and enforcement, e.g. through executive and legislative branches	
Improving equity impact, e.g. through NWSSIP	
Decision-support models and systems	

Source: Adapted from Zeitoun (2009). Based primarily on Abed Rabboh and Jabarin (2008), Ward and al-Aulaqi (2008), Ward *et al*. (2007) and Hellegers *et al*. (2009)

Anon c personal communication 2009), but the idea has not been tested or supported by the government. In Jordan, an increasing number of small Jordan River Valley farmers are selling their water rights to the government rather than continuing to farm with limited supplies. The practice occurs concurrently with the purchase by powerful farmers of smaller farmers' plots, for the water rights that come with them. Such trading effectively sets up a water transfer to the capital city of Amman. Here the benefits of the scheme fall mainly to the more powerful, while the weaker group is left to fend for their livelihoods by themselves, and unsustainable water use continues. Thus while satisfying one of the principles of WDM (efficiency), inequitability and unsustainability are perpetuated.

The approach of influencing power also works – in theory – where the rule of law applies. The violations of policy and law seen in both Yemen and Jordan indicate that the local governance context is not adequately regulated to ensure that the law is worth more than the paper it's printed on. The strength and reach of law and policy in both cases is generated by its concurrence with the interests of the powerful.

Tangible incentives have proven more effective at influencing policy (and behaviour) in both contexts. Stakeholders both opposed to and supportive of WDM regularly engage in 'influence-peddling' with government officials and community groups alike. Along with technical know-how, in fact, funds are the international donor community's most influential assets as the USAID water programme director has noted. Ward suggests that refinement of the incentive structure is 'the most powerful influence on use of water in agriculture' (2007, vii). The willingness to fund National Water Resources Authority, Water User Associations and other programmes, projects and

institutions can provide a counter-balance for economic disparity, but (along with issues of institutional sustainability and donor dependence (as with the case of the WDM Unit in Jordan)) not at a scale that can compete with the revenues generated by the production of bananas or *qat*.

Challenging power asymmetry

The 'challenging power' approach suggest a redress – or partial redress – of disparities in influence over decisionmaking processes. In a situation of an 'uncommon commons', such as with the groundwater in Yemen or surface water of Jordan, this is tantamount to an equitable sharing of the effects of the tragedy of the commons, or of the goods produced by them.

As seen in Table 1, attempts to confront power imbalance through this 'challenge' approach in Yemen and in Jordan are common. The 'empowering' of Water User Associations has been identified in both cases. Ward and al-Aulaqi suggest for instance that Water User Associations 'can help farmers, particularly smaller farmers, in several ways: 1. as a means of accessing public programs . . . ; 2. as a solidarity mechanism . . . ; 3. as embryonic "water management agencies" ' (2008, 16). In Yemen, Water User Associations have been shown to temper the influence of sheikhs, particularly when they are staffed by well-educated members (as the al Hayat Water User Association for women (Anon f personal communication 2009)), to a degree. The example of the Damiya Village Youth Club's successful efforts in lobbying the Jordan Valley Authority to provide it with water exemplifies the benefits of improving the negotiations capacity of community groups (Abu-Elseoud *et al*. 2007, 43).

Another type of intervention that challenges the asymmetric status quo are those projects that build consensus amongst stakeholder groups. The more powerful groups that are resisting implementation of WDM may be willing to discuss and debate in 'dialogue platforms' arranged by groups seen as relatively neutral. Figure 2 suggests that such a platform may be convened by an 'overlap group', for instance between members of the Royal Committee, the Ministry of Water and Irrigation and the Ministry of Planning and International Cooperation. Other 'harmonisation and coordination mechanisms' identified include: establishment of WDM Forums; establishment of Water User Associations; extension of technology campaigns; support to networking to share data; establishment of motivation and incentive systems; and the establishment of donor support groups (Abed Rabboh and Jabarin 2008, 34).

Efforts to level the players may be assisted by the ever-present challenge of 'levelling the playing field'. The strong top left–bottom right trend on Figures 1 and (to a lesser extent) 2 reflects uneven playing fields created by various forms of power employed to ensure that the 'law of the jungle' applies. The use of GPS well drilling-rig tracking devices has been suggested to get control over unlicensed well-drilling, for example. These have failed in part since not all the rigs are registered (Ward *et al*. 2007, 18), and the ease with which bribes may be paid to remove the devices.

Transparency in decisionmaking in shadow-states is another theoretical route to parity, and decision-support systems that are based on research and evidence have been identified as one way of reducing the inaccessibility of the decisionmaking circles. As with improvements in technology, the merits of these approaches are as yet unproven, and certainly subject to power asymmetries themselves.

Change in the long-term

A further lesson drawn from the Yemeni and Jordanian experience with attempts to reform the status quo is that change should be understood as a process, and engagement in the process is more likely to be effective when undertaken over the long term. Environmental or political 'windows of opportunity' may then be seized upon. There is a strong general feeling that a growing number of stakeholders are considered to be changing their position from opposition to support for WDM, for instance, because of 'reality kicking in'. That is, as the unsustainable limits of the groundwater are reached, the water table drops even beyond the reach of most deep wells. The 1996 Ta'iz incident and other water shortages 'accelerated the policy curve, in that case acting as a driver of the urban water reform program' (Ward *et al*. 2007, 9). Faced with the option to continue unsustainable pumping activities, even the powerful irrigators and authorities may become more receptive to the water conservation plans promoted by the National Water Resources Authority or Royal Commission. Political windows also exist, particularly with parliamentarians and representatives of the Royal Commission. These open and shut for stakeholder groups both opposed to and supportive of WDM, preceding and following election campaigns or other types of regime change.

The very low rainfall in Jordan of the 2008/2009 winter season was expected to spur some of the drastic changes towards WDM (Anon e personal communication 2009), but seems to have promoted the opposite. Official pursuit of the Red Sea–Dead Sea Canal continues unabated. The burden of change still rests fully on the shoulders of those promoting WDM, while the political economic order favours those promoting 'supply-side' management.

Conclusion

This paper has shown how established water use patterns in Yemen and Jordan are maintained by the interests of and power asymmetry between stakeholder groups. Measured in terms of influence over

and opposition to or support for attempts to implement WDM, stakeholder analysis has shown that the most powerful groups generally oppose changes to the status quo, while those seeking to change it are generally weaker.

The contrast is striking in Yemen, where the National Water Resources Authority is effectively alone in challenging established water use which benefits the farmer sheikhs, large landowners and the Ministry of Agriculture and Irrigation. The picture is more complex in Jordan, where the Ministry of Water and Irrigation is aligned with the Ministry of Finance, and parts of the Royal Commission, facing the Higher Agricultural Council, the Ministry of Agriculture, larger farmers, and rest of the Royal Commission.

Forms of power used to maintain the status quo vary in both countries from the use of force to much more subtle expressions of 'soft' power – bribes, exclusion and discrimination. The benefits from the lucrative production of *qat* (in Yemen) and bananas (in Jordan) are judged to far outweigh any arguments for sustainability and equitability, and the tragedy of the water commons is felt more by the weaker parties than by the stronger.

Government and donor interventions aimed at reform of water use are classed into categories either influencing or challenging power asymmetry. The success of the former approach is judged as negligible, and the relative success of the latter approach is limited. But these attempts are not explicitly carried out with the goal of challenging power asymmetry. The interpretation of evidence and opinion undertaken here suggests that such interventions may lead to more sustainable water use if overlap groups are identified, and a long-term strategy that capitalises on windows of opportunity created by 'change moments' is developed. Overlap groups identified include the 'manufacturers' in Yemen, and the Ministry of Agriculture and Royal Commission, in Jordan. Change moments that might occur include sustained droughts or radically altered political circumstances.

The analysis has highlighted some areas where further research would be most beneficial. First, the texture of relations and individuals within each stakeholder groups (which has only been superficially explored here) should be teased out through in-depth case studies. The relations between farmer sheikhs and their tribe members and neighbours they have influence over, for instance, is not uni-directional, and may hold clues to generate a more equitable commons. Likewise, the plurality of views within any government bureaucracy or donor agency must be understood, if a more equitable distribution of water is to be achieved.

Second, deeper exploration of the evolution of stakeholder groups and of change moments that have passed will lead to a greater understanding of the context that facilitates them. The knowledge would be of crucial relevance to any long-term strategy developed to implement WDM, or other water policy.

Finally, the political economy that generates current unsustainable water use practice must be understood in its entirety, before more sustainable water use can be achieved. This would necessitate investigation into the pricing signals, target markets and habits of *qat* and banana producers and consumers, as well as into the political motives of the relevant ministries and the international donor community. This stream of research would be most useful if directed in particular at the generation and perpetuation of ideas that suspend the firm grip on 'supply-side' management, even in the fact of overwhelming evidence of its destructive effects.

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Notes

1 The exploration of the role of power in the affairs of 'shadow states' relies on a particular research methodology, as discussion of such topics can put reputation and livelihoods at risk. 'Expert' opinion, review and triangulation were elicited from three anonymised practitioners and four academics, in January and February 2009. The practitioners are external consultants that may be classified in the stakeholder group 'international donor community'. The academics are both national and external, the former of which may be included in the stakeholder group 'civil society'. The data were later interpreted through the awareness and insight of the authors of this paper. Government officials and non-academic elements of 'civil society' have not been consulted at this stage of the research. It is understood that self-analysis by these groups would both serve to triangulate the findings of the 'expert' group as well as introduce biases beyond these that may already be introduced here.

2 Principles of WDM may furthermore be resisted for being viewed as an outsider concept with little legitimacy. The (relatively) limited efforts of government ministries and donor or research agencies (e.g. employees of GTZ, the World Bank, IDRC) to encourage WDM in Yemen and Jordan are in this way a clash with the world views of many of the stakeholders they are purporting to assist.

3 For greater discussion on the use of 'soft' power in transboundary water contexts, see Zeitoun *et al*. (2010) and Theesfeld (2011).

4 Thought on challenging power asymmetry may be gleaned from the work done on 'weapons of the weak' (Scott 1985), counter-hegemonic strategies (Cascão 2008 2009), strengthening of social capital (Inturias and Aragón 2005), and the 'power cube' work of John Gaventa (2010).

5 The Kingdom lives with the effects of unfavourable water sharing arrangements with Israel on the Jordan River, with Syria on the Yarmouk River, and with Saudi Arabia on the Disi Aquifer.
6 The focus of this analysis is on farming in the Jordan River Valley. Irrigated farming (from groundwater wells) in the highlands is discussed in Zeitoun (2009).
7 The efficiency and re-allocation towards more productive use has not, however, led to a drop in water use within sustainable limits (see e.g. Al-Omari *et al*. 2009), and reductions in use are attributed only to droughts (Suleiman 2003, 77).
8 Other water stakeholder groups (e.g. Bedouin, women's groups, farmers' groups, NGOs or environmentalists) are not included.

References

Abed Rabboh W and Jabarin A 2008 *Political economy for water demand management in Jordan* WaDI*mena* Research Study International Development Research Council – WaDI*mena* project, Amman

Abu-Elseoud M, Al-Zoubi R, Mizyed B, Abd-Al Hadi F T, Barghout M, de la Harpe J and Schouten T 2007 *Doing things differently: stories about local water governance in Egypt, Jordan and Palestine* Inter-Islamic Network on Water Resources Development and Management, Amman

Abu-Sharar T M and Battikhi A M 2002 Water resources management under competitive sectoral demand: a case study from Jordan *International Water Resources Association* 27 364–78

Al-Omari A, Al-Quraan S, Al-Salihi A and Abdulla F 2009 A water management support system for Amman Zarqa Basin in Jordan *Water Resources Management* 23 3165–89

Allan J A 2001 *The Middle East water question: hydropolitics and the global economy* IB Tauris, London

Allan J A T and Mirumachi N 2010 Why negotiate? Asymmetric endowments, asymmetric power and the invisible nexus of water, trade and power that brings apparent water security in **Earle A, Jägerskog A and Öjendal J** eds *Transboundary water management: policy and practice* Earthscan, London 13–26

Anon a 2009 In person UK personal communication 2 January

Anon b 2009 On telephone UK personal communication 5 January

Anon c 2009 On telephone Netherlands personal communication 6 January

Anon d 2009 On telephone Jordan personal communication 18 January

Anon e 2009 Through voice over internet protocol Jordan personal communication 18 January and 26 January

Anon f 2009 Through voice over internet protocol Yemen personal communication 21 January

Arafa D, El-Fattal L and Laamrani H 2007a *Gender & WDM in the Middle East & North Africa* Water Demand Management Research Series, International Development Research Council – WaDI*mena* project, Amman

Arafa D, Thompson L and El-Fattal L 2007b *Local-level water demand management: IDRC and partners research experience in MENA* International Development Research Council, Ottawa

Brooks D and Wolfe S 2007 *Institutional assessment for effective WDM implementation & capacity development* Water Demand Management Research Series, December International Development Research Council – WaDI*mena* project, Amman

Cascão A E 2008 Counter-hegemony in the Nile River Basin *Water Policy* 10 13–28

Cascão A E 2009 'Political economy of water resources management and allocation in the Eastern Nile River Basin' Unpublished doctoral thesis, Department of Geography King's College London, London

Cornish G, Bosworth B, Perry C and Burke J 2004 Water charging in irrigated agriculture: an analysis of international experience *FAO Water Report No. 28* FAO, Rome

Courcier R, Venot J P and Molle F 2005 Historical transformations of the Lower Jordan River Basin (in Jordan): changes in water use and projections *Comprehensive assessment of water management in agriculture, research report 9* International Water Management Institute, Colombo

Ferragina E and Greco F 2008 The Disi project: an internal/external analysis *Water International* 33 451–63

FOEME 2010 *Towards a living Jordan River: an environmental flows report on the rehabilitation of the Lower Jordan River* Friends of the Earth Middle East, Amman, Bethlehem, Tel Aviv

Gaventa J 2010 *Power pack: understanding power for social change* Institute of Development Studies, University of Sussex

George A 1979 'Making the desert bloom': a myth examined *Journal of Palestine Studies* 888–100

Hagan R E 2008 *Strategic reform and management of Jordan's water sector* United States Agency for International Development, Amman

Hamann R 2005 *The power of the status quo. Adaptive governance and water conflict: new institutions for collaborative planning* Resources for the Future Press, Washington DC

Handley C D 2001 *Water stress: some symptoms and causes: a case study of Ta'iz, Yemen* Ashgate, Aldershot

Hardin G 1968 The tragedy of the commons *Science* 162 1243–48

Hellegers P J G J, Perry C J and al-Aulaqi N 2009 Incentives to reduce groundwater consumption in Yemen *Irrigation and Drainage* 60 93–102

Hashemite Kingdom of Jordan 2009 *Water for life: Jordan's water strategy 2008–2022* Royal Commission for Water, Hashemite Kingdom of Jordan, Amman

IFAD 2009 *Improving food security in Arab countries* World Bank, Food and Agriculture Organisation, International Fund for Agricultural Development, Washington DC

Inturias M L and Aragón M 2005 Strengthening the social capital of weak social participants in environmental conflicts between oil companies and indigenous peoples in Bolivia in **Correa H D and Rodríguez I** eds *Environmental crossroads in Latin America: between managing and transforming natural resource conflicts* University for Peace, San José 235–50

Jabarin A 2007 Assessment of agricultural production and marketing issues in Jordan *Roundtable discussion: 'Rural community approaches to integrated water resource management'* Report prepared for USAID/Jordan, Amman 21–22 August

Jridi A 2002 *The Development of the Jordanian Jordan River Basin: The Main Historical Steps*. French Institute for Forestry

and Agriculture – Water and Environmental Engineering (Engref), Montpellier

Lankford B 2011 Responding to water scarcity – beyond the volumetric in **Mehta L** ed *The limits to scarcity: contesting the politics of allocation* Earthscan, London 195–214

Lichtentaehler G 2002 *Political ecology and the role of water: environment, society and economy in northern Yemen* Ashgate, Aldershot

Lichtentaehler G 2010 *Water conflict and cooperation in Yemen* Middle East Report Middle East Research & Information Project, Washington DC

Mazahreh N, Shatanawi M and Ghezawi S 2000 Jordan experiences in water saving and participatory irrigation management *OPTIONS méditerranéennes Series B* 48 171–84

Mohieldeen Y 1999 Responses to water scarcity: social adaptive capacity and the role of environmental information. A case study from Ta'iz, Yemen. *SOAS Water Issues Group Occasional Paper No. 23* September

Molle F 2008 Nirvana concepts, narratives and policy models: insights from the water sector *Water Alternatives* 1 131–56

Molle F, Floch P, Promphakping B and Blake D J H 2009 The 'greening of *Isaan*': politics, ideology and irrigation development in the northeast of Thailand in **Molle F, Foran T and Käkönen M** eds *Contested waterscapes in the Mekong region: hydropower, livelihoods and governance* Earthscan, London 253–82

Negenman T 1996 Evolution of water resources management in Yemen in **ILRI** ed *Groundwater management: sharing responsibility for an open access resource – lessons from developing countries* ILRI, Netherlands 65–80

NWSSIP 2008 *National water sector strategy and investment programme, 2005–2009* Republic of Yemen, Ministry of Water and Environment Final draft 17 December

Perry C, Steduto P, Allen R G and Burt C M 2009 Increasing productivity in irrigated agriculture: agronomic constraints and hydrological realities *Agricultural Water Management* 96 1517–24

Riaz K 2002 Tackling the issue of rural–urban water transfers in the Ta'iz region, Yemen *Natural Resources Forum* 26 89–100

Scott J C 1985 *Weapons of the weak: everyday forms of peasant resistance* Yale University Press, London

Suleiman R 2003 *The historical evolution of the water resources development in the Jordan River Basin in Jordan* International Water Management Institute, Stockholm

Theesfeld I 2011 Perceived power resources in situations of collective action *Water Alternatives* 4 86–103

Tyler S 2007 *Water demand management, poverty & equity* Water Demand Management Research Series, International Development Research Council – WADI*mena* project, Amman

Venot J P, Molle F and Hassan Y 2007 Irrigated agriculture, water pricing and water savings in the Lower Jordan Basin (in Jordan) *Comprehensive Assessment of Water Management in Agriculture Research Report 18* International Water Management Institute, Colombo

Ward C 2005 Coping with water scarcity in Yemen: conflict and adaptation *Coping with Scarcity* World Bank, Washington DC

Ward C 2009 Water conflict in Yemen: the case for strengthening local resolution mechanisms in **Jagannathan V N, Mohamed A S and Kremer A** eds *Water in the Arab world: management perspectives and innovations* The International Bank of Reconstruction and Development/The World Bank, Washington DC 233–67

Ward C and al-Aulaqi N 2008 *Yemen – issues in decentralized water management* WaDI*mena* Research Study, 5 August International Development Research Council – WaDI*mena* project, Amman

Ward C, Beddies S, Hariri K, Yaffiei S O, Sahooly A and Gerhager B 2007 *Yemen's water sector reform program – a poverty and social impact analysis* Republic of Yemen, GTZ, World Bank, Washington DC

Water Resources Group 2010 *Charting our water future: economic frameworks to inform decision-making* The Barilla Group, The Coca-Cola Company, The International Finance Corporation, McKinsey & Company, Nestlé S.A., New Holland Agriculture, SABMiller plc,Standard Chartered Bank, and Syngenta AG (a.k.a. 'the McKinsey Report')

Wester P and Warner J 2002 River basin management reconsidered in **Turton A and Henwood R** eds *Hydropolitics in the developing world: a Southern African perspective* African Water Issues Research Unit, Council for Scientific and Industrial Research, Pretoria 61–72

Wichelns D 2003 Moving water to move people – evaluating success of the Toshka Project in Egypt *Water International* 28 52–6

World Bank 2005 *Red Sea – Dead Sea water conveyance project: feasibility study – environmental, technical and economic and environmental and social assessment terms of reference* World Bank, Washington DC

Zeitoun M 2009 *Synthesis of WaDImena research on political economy of water demand management in Yemen and Jordan* International Development Research Council, Ottawa

Zeitoun M and Jägerskog A 2009 Confronting power in transboundary water interaction in **Jägerskog A, Zeitoun M and Berntell A** eds *Getting transboundary water right: theory and practice for effective cooperation* Stockholm International Water Institute, Stockholm

Zeitoun M, Mirumachi N and Warner J 2010 Transboundary water interaction II: soft power underlying conflict and cooperation *International Environmental Agreements* 11 159–78