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Water and the potential for social instability: Livelihoods, migration and the building of society

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Abstract

In much of the Third World, access to secure water for irrigation, particularly groundwater, reduces vulnerability, stabilizes livelihoods, alleviates poverty and 'entitles' populations to education and other forms of capital accumulation. Water resource development can, as a result, be used as a key tool for addressing the social roots of instability. The reverse is also true — problems such as groundwater overdraft contribute to poverty and are often at the root of forced migration and the creation of underemployed and unstable displaced populations. Water is fundamental to regional as well as local security.

The benefits of water resource development and the risks associated with unsustainable use patterns are particularly critical in arid regions. Patterns of water use that are unsustainable can play a positive role in the transition of populations from nomadic or migratory to stable communities, where people have access to education and asset accumulation. The exit is, however, as important as the entry. In many regions, the majority of the population now need to make the transition from agriculture to non-agricultural livelihoods. Many people, particularly the wealthy, may already be doing this. Understanding and enabling transition represents one of the most important policy challenges for coming decades.

Using examples from India, Yemen, Saudi Arabia and other countries, this article documents some of the connections between water and security and clarifies the importance of effective solutions to water problems and to social transition in arid regions.

Keywords: Groundwater; Security; Sustainability; Poverty; Entitlements; Transition; Adaptation; Migration.

1. Introduction

Water and the potential for social instability are inextricably linked in much of the Third World. This linkage has little to do with the potential for conflict between nations over shared water sources. Instead it has to do with the impact water problems have on poverty, rural livelihoods and the relationship between governance and conflict at local levels. Water problems create an environment in which social tensions coalesce and internal conflicts often emerge. Where society has been able to provide reliable access to water and, in doing so, enabled populations to move out of poverty, conflicts appear less likely to emerge. Where water resources are limited or already overdeveloped, social stability over the long run depends as much on the transition out of agriculture as it depends on the initial water-led process of agricultural intensification.

Despite an increasingly global economic system, agriculture, 'the least-cost workplace', remains the foundation for most rural livelihoods (International Fund for Agricultural Development, 2001). Reliable water supplies, particularly groundwater, are the lead input to intensive agricultural production and a major catalyst for poverty alleviation and the development of stable farming communities. Water is, as a result, a powerful tool for the creation of peaceful economies (Abderrahman, 2001; Moench, 2001).

This article makes the argument that, when competition increases and problems such as groundwater overexploitation reduce water availability and reliability, agricultural populations become increasingly vulnerable. In conjunction with 'normal' droughts, this can result in large-scale migration. Most migrants are poorly equipped to develop non-agricultural livelihoods. Even in non-crisis periods, the gradual erosion of agricultural livelihoods due to increasing water scarcity leaves many people poor and creates incentives for those who can to migrate in search of better lives. Such populations, whether composed of migrants in urban slums or the rural poor, represent pools of potential social discontent. Migrant populations are often unstable — bombarded with images of wealth through access to the global media, but lacking opportunity to improve their own

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conditions. They are also often riven by religious, tribal, ethnic or other divisions that provide a ripe breeding ground for community tensions. Poor migrant populations often channel their discontent into identity politics or other forms of focused activism. They represent raw material for others to direct. Once catalyzed, discontented populations represent a major source of instability. While lack of water is thus intimately linked to questions of social instability, the dominant link relates more to the limitations and poor social climate associated with water scarcity than to questions of conflict between states.

2. Conventional analysis of the water-security link

Conventional debates over water and security have tended to focus on threats of war over limited supplies in major river basins such as those of the Jordan, Euphrates, Nile and Indus rivers. Statements by regional leaders and high-level executives in organizations such as the World Bank have often pointed to the threat of war over limited water.[1] The undeniable existence of such situations has led to a descent into sensationalism such as the oft-heard statement that: "the wars of the next century will be over water."

Threats of direct conflict between nations are, however, the exception rather than the rule. As Homer-Dixon (1994) points out, "Historical and contemporary evidence shows that conflict and turmoil related to river water are more often internal than international" (p. 19). Internal instability emerges due to conflict over access and to associated effects on governance at local and national levels. A weak resource base contributes to weak states and weak local governments divided by internal competition. Even when water is directly involved in conflicts, it is often more as a tool rather than an object of conflict itself. Gleick,[2] for example, documents numerous instances where water supplies and infrastructure are disrupted or water is used as a weapon in conflicts which are otherwise unrelated to water.

The role of water in conflict is, however, not only as a weapon or resource to be fought over. As Lonergan and Brooks (1994) have documented, dialogue over water has continued throughout much of the Israeli–Palestinian conflict and has served as a point for collaborative research and the building of trust (Lonergan and Brooks, 1994; Brooks, 2001). In both war and dialogue, the role water plays in conflict is not unlike that played by any other resource or piece of strategic infrastructure. Bombing of power supplies is, for example, a common tool for disrupting opponents during conflicts — and dialogue over the resumption of power is a point for trust building.

[1] See the listing maintained by the Pacific Institute for Studies in Environment, Development and Security at: http://www.worldwater.org/conflict.htm. Accessed 12/2001.

[2] http://www.worldwater.org/conflict.htm. Accessed 12/2001.

3. Alternative perspectives on the role of water development in security

The role of water in security is both more fundamental and more subtle than conventional analyses of water and conflict tend to portray. Take as a starting point the perspective, difficult to document though it is, that poverty and lack of hope lie at the root of much social discontent and create a breeding ground for conflict at both local and global levels. If this perspective is accepted, as substantive work by Homer-Dixon (1994) suggests that, in conjunction with many other political and economic factors, it should be — then the role of water in relationship to conflict becomes clearer. Water and conflict are linked through questions of poverty, migration, settlements and food security.

3.1. Water, poverty, migration and social instability

Systematic data to quantify the direct impact of access to water on the full chain of connections from production to poverty, migration and ultimately to social stability or instability are unavailable. Data from field research on groundwater access combined with correlations between groundwater use and poverty declines in India do, however, clearly document the links between access to secure water supplies, particularly groundwater, and poverty (Moench, 2001). There is also widespread evidence linking migration with drought periods and more location-specific (but growing) evidence indicating out-migration from areas where water and other natural resources are becoming degraded (Chopra and Gulati, 2001). Links between these emerging trends and social stability are poorly documented but suggestive. Let us start with the first link in the hypothesized chain: water and poverty.

3.1.1. From water to poverty

The conceptual relationship between groundwater access and poverty is based on the fact that most of the world's population is made up of rural farmers (Moench et al., 1999). Access to reliable water supplies, particularly groundwater, is the lead input for the 'green revolution' package of intensive agricultural technology. This package is the most common route to increased agricultural productivity and, through that, to higher incomes and better livelihoods. Groundwater is particularly important for irrigation because of its reliability, the ease with which application can be controlled, and the insurance it provides against fluctuations in precipitation or surface supplies (Tsur, 1990, 1993). In consequence, the productivity and income generated from groundwater-irrigated areas are generally much higher than those found in areas irrigated from other sources (Dhawan, 1990; Shah, 1993; Meinzen-Dick, 1997; Shah et al., 2000; Hernandez-Mora et al., 2001). The risk of loss is also reduced.[3] These factors

[3] See, for example, Gleick and Nash (1991).

enable farmers to generate surpluses far more consistently than when they depend on rainfall or surface irrigation. Once generated, surpluses are available for saving or investment in health care, education, land or business. Farmers become 'entitled' (Drez et al., 1995; Sen, 1999) to a much wider pool of assets than they would have been without access to groundwater. Furthermore, because losses are reduced, the capital stock held by groundwater users tends to accumulate over time, and people who were once marginal farmers move out of poverty. In sum, a secure water supply represents the foundation for a pyramid of entitlements (physical, economic and social assets) and helps break the cycle of poverty common in agricultural regions (Moench, 2001).

Empirical evidence from India provides relatively strong support for this. State level data on the incidence, depth and severity of poverty among states over the period 1957–58 to 1991–92 are highly correlated with 1991 figures for the level of groundwater extraction — a good proxy for groundwater development over the full 1957–1991 period (Moench, 2001). Location-specific data from studies in locations such as Gujarat also strongly support the hypothesis that increases in access to groundwater reduce poverty.[4] Many studies have, for example, clearly documented higher yields from groundwater-irrigated areas and better incomes — including the ability of farmers using groundwater to achieve effective wage rates that are well above market levels (Shah, 1993; Meinzen-Dick, 1997; Shah et al., 2000; International Fund for Agricultural Development, 2001). According to the International Fund for Agricultural Development (IFAD), the Green Revolution, which reduced urban and rural poverty, had much more impact in irrigated areas than elsewhere (IFAD, 2001). IFAD (2001) even suggests that East and South Asia's poverty reduction and farm growth owe much to the 30–35% of irrigated cropland — and the persistence of rural poverty and agricultural stagnation in most of sub-Saharan Africa to its mere 1–5%.

Clearly, increasing access to secure water supplies is central to poverty reduction. The reverse is also often true. Rural agricultural populations lacking access to secure water supplies are far more vulnerable than those with access. Vulnerability is particularly evident in intensive agricultural economies when long-term water problems, such as groundwater over-extraction, are compounded by drought (Moench, 1992). The intense drought in California during the late 1980s had minimal economic impact because farmers were able to shift to groundwater when surface supplies failed (Gleick and Nash, 1991). While systematic datasets documenting the impact of increasing water scarcity on poverty in the Third World seem to be unavailable, the dynamics and their link with migration are clear in location-specific situations in India (Moench, 2001; Janakarajan and Moench, 2002). Poverty and migration are, therefore, discussed together below.

[4] Personal communication, VIKSAT.

3.1.2. From poverty to migration

The case of Satlasna *taluka* in northern Gujarat, India illustrates the impact of water problems on poverty and migration. Groundwater overdraft and water quality declines in North Gujarat have been a major concern since the 1970s (United Nations Development Programme, 1976; Moench, 1992, 1993). Data from state and central government organizations indicate that declines in regional water level now exceed one metre annually over large areas (World Bank and Ministry of Water Resources, 1998). In sites such as Meshana District, pumping depths have increased from a few metres in the 1950s to, in many locations, greater than 150 m.[5] As a result of increasing water scarcity, many farmers are investing in other livelihoods — for example by having their children trained as teachers or other professionals. This gradual transition becomes abrupt in drought periods. During the 1998–2000 drought, water levels in Satlasna declined rapidly, and the relatively shallow upper alluvial portion of the aquifer that overlies the bedrock was dewatered. While close to 100% of the land was still irrigated in 1999, only 10% remained irrigated in the fall of 2001, despite a good monsoon.[6]

Wealthy farmers in Satlasna are now drilling deep wells in an attempt to restore lost supplies. These attempts are generally unsuccessful because the underlying bedrock contains few fractures. Savings accumulated by farmers over decades are rapidly disappearing in a futile search for water. Out-migration has increased greatly. According to villagers, many farmers are now searching for wage labour in adjacent agricultural areas and in cities. The situation has been further compounded by the global economic slowdown — few alternative jobs exist. In this local case, poverty is clearly increasing and, with it, perhaps the beginning of long-term movements of local populations out of what were previously highly productive and stable agricultural areas.

The problem is not, however, just a local one. During the 1998–2000 drought, the lack of water was identified by the media as a major cause of poverty and migration across large sections of Afghanistan, Pakistan and northern India. The case of northern India is probably the least severe — but it illustrates clearly some of the issues involved. In the spring of 2000, surveys conducted by the *Times of India* in northern Gujarat found that over 59% of farmers had lost all work, approximately 50% had migrated and 70% had seen their levels of debt increase (*Times of India*, 2000). Many had to sell agricultural lands in order to survive, and manual labourers were particularly affected. News reports and regional experts directly attributed the large impact of the drought to groundwater overdraft in preceding years.[7] Farmers in rural areas could not afford to replace dry wells

[5] Field work and personal communication, Gujarat Water Resources Development Corporation.

[6] Personal communication, field visit, November, 2001.

[7] Personal communication, Srinivas Mudrakartha and Shashikant Chopde, VIKSAT, Ahmedabad.

and, as a result, had to either migrate, depend on food-for-work programmes or subsist on resources accumulated during previous years (*Times of India*, 2000). Articles on droughts in Gujarat often link poverty and other drought impacts directly to groundwater over-extraction (Bavadam, 2001). Overall, there is widespread, but not systematically documented, evidence that groundwater overdraft in North Gujarat is substantially increasing drought vulnerability, poverty and migration.

How significant are the impacts of groundwater overdraft on migration in India? Short-term migration is a common adaptive response to drought. Long-term shifts resulting from depletion or degradation of the groundwater resource base may be of more importance from a security perspective, because they represent a fundamental decline in regional economic prospects.

Unfortunately, it is not possible to document quantitatively the extent of migration occurring in India as a result of groundwater overdraft. At least initially, the impacts of groundwater overdraft are unlikely to be reflected in regional statistics, because they depend on hydrogeological factors that do not coincide with the administrative boundaries on which statistics are collected. In Gujarat the affected areas probably follow a relatively narrow band along the borders of the deeper aquifer system. Although the impact may be large, it is dispersed over many villages and districts.

3.1.3. From migration to social instability

The consequences of water-induced migration for social stability depend on many factors. As the Indian case illustrates, drought often depletes the assets of small farmers. Impoverished migrants, whether in refugee camps or dispersed as wage labourers at the bottom of the economic ladder, can become a prime source of political instability. The issue is, however, much wider than this. Homer-Dixon (1994) documents the manner in which environmental problems encourage destructive forms of competition — from the entrenchment of local elites to the encouragement of corruption and decline of civil institutions. Similar observations are also clear from the results of collaborative research in India and Nepal (Moench et al., 1999). In Gujarat, for example, groundwater overdraft has led to political demands on scientific organizations to falsify data and has contributed to political manipulation of funding flows to rural communities (Moench, 1994). Similarly in Tamil Nadu, competition over increasingly depleted groundwater resources has led to social tensions within families, between communities and between water sectors (Janakarajan, 1994, 1999). In some cases these tensions have been violent and in all cases they have contributed to wider social concerns, such as distrust between government and local populations, communal politics and the decline of community institutions.

Despite the lack of specific evidence of the aggregate impact of groundwater depletion on social instability, it is clearly generating significant tensions at local levels. In Tamil Nadu, groundwater problems are a common source of conflict within and between communities (Janakarajan, 1999). Disputes over water, including riots, are also common in urban and rural areas of India, particularly during droughts. Perhaps the most telling indication of the importance of emerging groundwater problems, however, is their political sensitivity. The Rajasthan State Groundwater Department, for example, recently refused to give the Institute of Development Studies, an organization funded in part by the state, access to basic groundwater data because of their 'sensitivity'.[8] Access to groundwater data is a perennial problem for any organization outside the government (Moench, 1995). Government officials and local politicians often indicate that groundwater problems are a central point of concern for them. This, unfortunately, increases rather than decreases the sensitivity of data. In addition, it may decrease the ability of government to implement management measures. Proposals for groundwater regulation — which have been circulating since the mid-1970s — have not, for example, been implemented in most instances (World Bank and Ministry of Water Resources, 1998). This suggests recognition by the state that groundwater issues are closely related to the sets of basic livelihood questions around which populations mobilize, whether peacefully (through the political process) or otherwise.

Although groundwater issues are clearly sensitive in India, the links between water problems and social instability are, perhaps, best illustrated if one contrasts the situation in India with that in other countries. The situation in Yemen is illustrative. The primary form of livelihood in much of rural Yemen has traditionally been herding and spate agriculture. In the late 1960s and early 1970s, introduction of drilling technologies enabled the development of irrigated agriculture in many areas, and irrigated areas expanded rapidly. Some of the crops were of relatively low value, such as wheat. In many areas, particularly in the highlands, however, grapes or *qat* were grown, both of which are of high value and extremely water intensive. Yemen's population growth rate exceeds 4% per year, and the expansion of irrigated agriculture coincided with a rapid expansion in the main cities of Yemen, such as Sana'a and Ta'iz. Now there is intense competition between urban and rural areas over water and extraction in some areas, such as the highland plains aquifers, exceeds recharge by a factor of five (WRAY-35, 1995). As a result, water levels are dropping and the lower portions of many *wadi*-bed aquifers have gone dry. In some cases this has led to direct conflict. In Al Hima and Habeer, agricultural areas that are the primary sources of water for Ta'iz municipality, tension has been high for years, and people have been shot in water-related protests. When visited in 1997, wells being drilled for municipal supply were guarded by heavy machine guns. The most important impact, however, has been on the livelihoods of farmers in lower parts of the *wadi*. There,

[8] Personal Communication, IDS-Jaipur.

agriculture has been virtually abandoned, and many residents have migrated. Most of the remaining families subsist on occasional daily labour in Ta'iz (Moench, 1997). This situation is aggravated by the collapse of Yemen's economy following the Gulf War, when migrants were expelled from other Gulf countries, and remittances declined (Lyon, 1999). The 'safety valve' of alternative livelihoods and remittance income has evaporated, poverty has skyrocketed and many depend on charity through mosques for survival and education of their children.

The situation in Yemen is not dissimilar from that in parts of northern Pakistan and Afghanistan. In these regions, many families and individuals facing drought and social unrest take great risks in their attempts to migrate out of the region. Even greater displacement probably occurred internally. According to the Internal Displaced Persons Project: "Prior to the U.S. attacks most of the displacement took the form of a rural exodus, with families or entire villages fleeing drought-stricken areas in search of assistance in the main cities or in IDP camps set up around these cities."[9] Other people have ended up in refugee camps in northern Pakistan or have been given shelter by relatives, their communities and Islamic (and other) charities working in the region.

The drought in Afghanistan was compounded by a long-term process of groundwater overdraft. According to statistics compiled by FAO, roughly 15.4% of the irrigated area in Afghanistan is supplied from groundwater sources.[10] The relatively small percentage of area irrigated from groundwater is probably misleading in terms of its importance. The situation in Spain is illustrative. According to Barraqué (1997), "Irrigation uses 80% of all water in Spain and 20% of that water comes from underground . . . The 20%, however, produces more than 40% of the cumulated economic value of Spanish crops." Recent findings from Andalucia indicate that irrigated agriculture from groundwater is economically over five times more productive (in terms of pesetas/m^3) and generates more than three times the employment in comparison to surface-irrigated agriculture (Hernandez-Mora et al., 2001). Surface-irrigated areas in locations such as Afghanistan are generally dependent on highly variable spate or flood flows. Although detailed data are not available, highly reliable groundwater sources almost certainly play an even more important role in Afghan agricultural production than they do in the Spanish case cited above. Furthermore, although monitoring has been affected by decades of war, it is known that water tables have been dropping. According to the *Assistance Afghanistan* website maintained by FAO: "Afghanistan's grain production has fallen by more than 50% in the last two years and now meets less than half of total national grain requirements. Water tables are declining alarmingly in many parts of the country due to the drought and excessive, uncontrolled harvesting of groundwater."[11] Water tables have also been falling in urban areas, such as Kandahar, and threaten the shallow wells that provide most drinking water.[12]

Significant instances of internal conflict are emerging as a result. The situation reported by the Cooperation Centre for Afghanistan is illustrative of the local conflicts that emerged in many areas. According to the Centre, drought has led to ". . . disintegration of community ties through 'water disputes', in some villages even 'water war'." The report goes on to document numerous specific instances of fighting over water supplies in drought-affected villages and the presence of more than 500 court cases over water in Waras District.[13] The Centre also reports that the drought has caused increasing tensions among ethnic groups and disputes over access to resources.

Although not as extreme, the intertwined issues of long-term water resource depletion, drought, displacement, and social tension are also common in Palestine, parts of Egypt and much of the rest of the Middle East. In many cases, populations are forced to depend on others for assistance. Often this help is accompanied by an ideological message; one that is grounded in real and perceived injustices and that resonates with the issues many migrants face in their own lives and situations. The issues are often unrelated to drought or water scarcity *per se*. Instead, the conditions generated by water scarcity provide an unsettled environment in which many other factors are compounded and come to a head. These include corruption, unrepresentative governance systems, tensions over differences between local and global value systems and wealth differentials. As Homer-Dixon (1991, 1994) has documented, the links are not 'tight or deterministic'. It is the confluence of factors that leads to social tensions and the emergence of instability. The conditions have been created for identity politics and conflict.

3.2. Water and security

The dynamic described above has two implications. First, conditions that reduce access to reliable water supplies contribute to poverty and insecurity. Impoverished populations at the bottom of the economic ladder have little to lose and little ownership of the social stability on which peace is founded. Second, increasing access to secure water supplies, particularly groundwater, can reduce poverty and help avoid

[9] Internal Displaced Persons Project. http://www.db.idpproject.org/Sites/IdpProjectDb/idpSurvey.nsf/wViewSingleEnv AfghanistanProfile+Summary. Prepared 1 November 2001.

[10] AQUASTAT, Afghanistan, Table 3.

[11] http://www.pcpafg.org/Programme/ASG/Recent_Afghanistan_support_group_meetings/ FOOD_SECURITY_IN_AFGHANISTAN.shtml. Accessed 12/2001.

[12] Assistance Afghanistan, a site maintained by FAO. http://www.pcpafg.org/programme/drought/documents/Information_Note_The_Drought_in_Afghanistan.shtml and http://www.db.idpproject.org/Sites/IdpProjectDb/idpSurvey.nsf/1c963eb504904cde412567820074 93b8/61590b265351a084c1256841006e4a92?OpenDocument. Accessed 12/2001.

[13] http://www.ccamata.com/impact.html. Accessed 12/2001.

development of the of social conditions that breed insecurity. Water is more a weapon of peace than a weapon of war. While water problems can generate conflict, most water developments may have contributed to peace. Emerging water problems, such as groundwater overdraft, threaten that peace — but the opportunity to create the conditions of peace remains strong. Where water problems have grown and threaten livelihoods in a major way, internal conflicts have often emerged. Where society has been able to provide reliable access to water and, in so doing, enabled populations to improve their situation and move out of poverty, conflicts appear to have been less likely to emerge.

By helping populations to create assets, access to water may encourage social stability. Although (in theory) other forms of economic activity could be used to generate assets and social ownership, irrigated agriculture appears particularly powerful. It settles populations and ties them to specific locations. It also integrates populations into wider sets of non-transient social and economic relations. Farming is not a job that can be interchanged for another job. Farmers are dependent on networks of relationships that tie them to locations and communities. Furthermore, the value of the products is often less dependent on economic conditions than those produced by other activities. Food is relatively recession-proof — people do not stop consuming it during economic downturns. As a result, farming has a different risk profile from jobs within the modern economy.

Although speculative, it could be argued that increasing access to groundwater in India may have been a factor helping to contain existing social tensions. In the decades following Indian independence, many predicted the country's dissolution. The spread of groundwater irrigation may have, by improving rural livelihoods and 'grounding people' in productive agriculture, played a major role in mitigating the social tensions that would otherwise have spun out of control. This is, of course, speculative — but the logic is potentially strong. Improvements in irrigated agriculture may have given many parts of rural India 'hope' and focused communities on improving their own conditions, rather than on social mobilization and protest. Admittedly some of India's most violent separatist movements have taken place in areas where irrigated agriculture has been most successful, such as in the Punjab, the breadbasket of India, during the 1980s and early 1990s. The situation could have been much worse, however, if the population had not been 'grounded' by the specific location and highly profitable nature of the agricultural economy. People had something to lose and many individuals may, as a result, have been less willing to risk everything by supporting the militant elements within communities. Rural opportunities may have also limited the 'push' to migrate and kept urban immigration rates in India below the levels many analysts anticipated in the 1960s and 1970s. Research has shown, for example, that the creation of common pool water and other resources can be a significant factor in reducing distressed out-migration (Chopra and Gulati, 2001).

The relationship between water and security is not unrecognized. Many countries have a policy on domestic food production ('food security') — not because they cannot purchase food at a lower cost on international markets, but because they do not trust the reliability of such markets, particularly in times of conflict. The siege mentality remains relevant, and countries want to ensure that food cannot be used as a weapon. As James Scott (1998) comments: "Food supply was the Achilles heel of the early modern state; short of religious war, nothing so menaced the state as food shortages and the resulting social upheavals" (p. 29). While global debates exist over the implications of water problems for aggregate food security (Postel, 1999; Moench et al., 2001), the most immediate issue probably has to do with the ability of populations to purchase food during times of drought or other crisis (Sen, 1999). Scott's comment remains relevant. At a local level, the stability of agriculture is central to the security of states because most rural residents depend on agriculture for survival. Questions of security, however, extend beyond food supply and the political stability issues associated with it.

Countries such as Saudi Arabia have used water policies as an explicit tool for settling populations and creating a sense of ownership and place within modern society (Abderrahman, 2001). The relationship between water and security goes beyond this, however. In many countries, economic opportunities are increasingly concentrated in urban areas. Rapid growth of these areas combined with depopulation of rural areas is a dual source of instability. The problems with mega-urban areas and the combination of anonymity and slum conditions they generate are well recognized. As Mishra (1998) comments on migrants to Indian cities: "Half of [the city's] people live in slums . . . Back in the village [the migrant] was the concern of many . . . now in the large city, he faces a dehumanized society which cares least for those who are intruders and outsiders with skills no more valued in modern society" (p. 4). Depopulated rural areas are equally threatening, particularly along poorly-defined or disputed national boundaries. In the absence of a settled observant population that accepts and supports established political and governance frameworks, such areas may harbour those who reject the constraints of a civil society — be they smugglers, 'terrorists' or simply those who do not accept the status quo. Nations such as Afghanistan, Yemen and Somalia are cases in point; they provide a base for such people to thrive and organize. The populations in such areas tend to be mobile with little ownership for established social orders. This rural–urban/migrant–settled dynamic has been a source of instability throughout human history. Recognizing this, planners in Saudi Arabia made an explicit decision to develop settled agricultural populations in many rural areas by using a significant percentage of the non-renewable groundwater stored in the upper 300 m for agricultural production, mainly wheat (Abderrahman, 2001). Although food production was one of the objectives of the programme, the real goal was

to settle nomadic groups, to build stable populations in areas that would otherwise be relatively unpopulated desert, and to limit rural–urban migration.

Saudi Arabia shares borders with eight other countries. Many of these border regions are located in unpopulated desert areas where traditional populations have always been nomadic and difficult for a central authority to monitor or control. As a result, the development of settled agricultural populations in sensitive border regions was seen as a key tool for stabilization of such areas. It would reduce the number of nomads and by implication 'put people on the ground' in locations where disputes might arise with neighbouring countries. In addition, Saudi Arabia faced major social challenges as it transformed itself from a rural to an urban society. Before 1974, more than 50% of the population of Saudi Arabia was rural, of which roughly 30% was nomadic. As oil revenues grew, large numbers of jobs and other opportunities were created. The urban opportunities caused intensive migration of rural inhabitants to urban areas (the urban population increased to approximately 70% of the total by the mid-1990s) which "disrupted the social system and created a vacuum in remote areas" (Abderrahman, 2001, p. 5).

To limit urban migration and stabilize rural populations, Saudi Arabia drilled more than 100,000 water wells, provided a 40% subsidy for farm equipment and put in place a price support policy for wheat between 1980 and 2000 that ranged from $0.57 to $0.97/kg. From Abderrahman's perspective:

> "This agricultural development was an essential tool for social balance between urban and rural areas. The intensive agricultural developments resulted in the creation of stable farming communities in rural areas. . . . These prosperous communities helped in supplying the country with educated healthy generations of young men. . . . They also helped in filling the deserted areas and in giving the support to security and defense authorities in remote areas. . . . Other benefits were gained also such as minimization of movement of inhabitants from rural to urban areas." (Abderrahman, 2001, p. 8).

The use of water as a tool for stabilizing populations and increasing the security of border or other low population areas is not unique to Saudi Arabia. In India, the Rajasthan Canal has for a long time somewhat jokingly been referred to as the 'world's longest anti-tank ditch.' The physical impediment to tanks was, however, probably less important as a strategic objective than the development of a densely settled strip of agricultural communities. Far more than the canal itself, the settled strip of land reduces the potential for infiltration and smuggling in sensitive border areas.

Overall, the provision of water and creation of stable agricultural zones can be used as a key tool to increase social stability in sensitive regions. Furthermore, as the Saudi case illustrates, it can serve as an avenue for social transformation — enabling education and fostering communities that have a stake in civil society. That said, the history of building sedentary communities is, at best, mixed. Many programmes have been implemented more to achieve political control rather than for helping ordinary people. Nevertheless, it is important to recognize the role secure water supplies can play in enabling orderly social transition.

Secure water supplies encourage the development of settled communities with relatively stable agricultural economic systems. These systems enable education and asset accumulation. Subsequent generations generally enjoy far wider opportunities than their predecessors. This represents a key opportunity for countries seeking a stable avenue for helping their populations adapt to the transition from relatively low-level subsistence livelihoods to a much more diversified set of economic livelihood options. Recognition of these benefits should not, however, be interpreted as uncritical advocacy of attempts to settle populations in agriculture. Many nomadic populations have developed livelihoods that are well adapted to regional environmental conditions. Under such circumstances, settlement can itself be a prime cause of resource degradation, poverty and the decline of livelihoods. Furthermore, settlement can lead to a process of 'de-culturation' that is in itself a source of social tension. As with any approach to social transition, trade-offs exist, and a balance must be struck based on local conditions and the aspirations of the involved communities.

4. Toward better understanding

The links between water and questions of social stability or instability are indirect but strong. In areas of endemic poverty, where most of the population depends on agriculture, increasing access to secure sources of water, particularly groundwater, is a powerful tool for poverty alleviation. By increasing yields and reducing losses, access to water can enable farmers to accumulate both physical and social capital. Secure water supplies encourage the development of settled communities and reduce 'push' factors encouraging migration, particularly forced migration during droughts. Over the long term, the gradual accumulation of social and physical capital can enable populations to diversify out of agriculture and, thus, encourage the development of stable diversified economies that provide a wide variety of livelihood options for the local population. People with diverse livelihood options who are 'invested' in civil society and established economic systems may be less likely to seek social change through violent protest.

The reverse is also true. Insecure water supplies in agricultural populations represent a potentially powerful factor contributing to social instability. Problems are likely to be particularly intense when at least three sets of conditions coincide:

1. The region has faced a long-term process of decline in water resource conditions (overdraft or declining water levels);
2. Sudden climatic fluctuations, particularly drought, occur over a sufficiently sustained period to deplete families of their crop and cash reserves, thereby forcing them to seek alternative sources for survival; and
3. The regional economy is not sufficiently diversified or economic conditions do not allow those displaced from agriculture access to alternative livelihoods.

When the above conditions coincide, numerous problems are likely to emerge, including intense competition over resources within communities, declines in family-level food security and forced migration. These can, in turn, contribute to wider problems of social insecurity including the erosion of civil society processes and the rise of violent forms of identity conflict.

4.1. Issues of transition

Questions of transition are probably the most important factors determining whether or not water problems, such as groundwater overdraft, contribute to security or insecurity. As argued above and in an associated paper on groundwater and poverty (Moench, 2001), increasing access to groundwater is a powerful tool for poverty alleviation. In many arid regions, however, groundwater resources are finite. They can be used to increase the stability of water supplies and build a strong regional agricultural economy — but the sustainability of that economy depends on whether or not extraction can be maintained at a sustainable level. In most arid or semi-arid regions where groundwater development has occurred on a large scale, extraction is unregulated. The agricultural economy booms as groundwater is developed — but it will inevitably decline over time as groundwater resources become increasingly scarce or difficult to access. How this decline occurs is critical.

The transition in India is outlined in a box and diagram developed by Tushaar Shah in *Groundwater and Society* (Burke and Moench, 2000). In this book, he argues that early phases of groundwater development see a rapid (but not necessarily equitable) growth in agrarian income and employment. The agrarian economy then diversifies but, as groundwater overdraft begins to occur, the contradiction between demand and sustainable use and between different classes of users begins to emerge. When groundwater availability declines significantly, the agricultural 'bubble' bursts, out-migration and poverty increase. The well-off (and 'smart') proactively move into alternative livelihoods, while the poor are the last to leave and the hardest hit (Burke and Moench, 2000).

The above pattern is consistent with our own observations in the Satlasna case. It is important to recognize, however, that the wealthy and proactive are able to make the transition into alternative livelihoods because the Indian economy is relatively deep and diversified. While the poor are left behind, a wide variety of economic and livelihood options are available for the relatively well-off or proactive portions of the population. Tushaar Shah, for example, reports that North Gujarat has now become a major source of teachers for other regions. Although this is not well documented, families appear to be educating their children and encouraging them into non-agricultural livelihoods because of the increasingly clear decline in agricultural livelihood options due to groundwater overdraft.[14] As a result of this (and extensive government drought relief programmes), while drought and groundwater problems have led to migration, they have not led to the development of large unemployed populations. Although the transition in Gujarat is unplanned, Saudi Arabia had the explicit objective of initiating a similar transition (settlement → agriculture → education → diversification out of agriculture) in its decision to mine groundwater over the last three decades (Abderrahman, 2001). In this case, the transition was probably assisted by the relative wealth of the Saudi State — which enabled it to subsidize agricultural products and provide key supporting inputs (such as education).

Transition is far more challenging in regions such as Afghanistan or Yemen that lack resources or access to a diversified economy. In Afghanistan, in 2001 the World Food Programme (WFP) reported that that: "Lack of employment opportunities inside and outside the agricultural sector is also severely limiting access to food through the markets. Fewer and fewer Afghans are able to buy their way out of the hunger crisis."[15] The lack of livelihood alternatives within the local and national economy was probably a major factor forcing international migration even before the war intensified in late 2001. Prior to the Gulf War in 1991, Yemen exported large amounts of educated and manual labour to other countries. In effect, the country solved its problem of water scarcity in the predominantly rural agricultural economy through population exports. This ability to export labour to surrounding countries, particularly Saudi Arabia, collapsed following the Gulf War (Lyon, 1999). Now many people, such as those discussed above in the Habeer and Al Hima areas, are caught in a cleft stick where groundwater overdraft is undermining the rural agricultural economy, and few other livelihood options exist within the national economy. This is a major factor increasing tension over allocation of water between rural and urban areas. When water is reallocated to meet 'high value' urban uses, agricultural users lose their livelihoods and have few alternatives to turn to (Moench, 1997).

Water, poverty, migration, economic development and social transition issues are, thus, closely intertwined. Increasing the security of water supplies through, for example,

[14] Tushaar Shah, personal communication.

[15] http://www.wfp.org/newsroom/in_depth/afghanistan.html. Accessed 12/2001.

groundwater development can be a powerful catalyst for stabilizing populations and helping them make the transition out of poverty. Particularly in arid areas where water resources are limited or already overdeveloped, however, social stability depends as much on the transition out of agriculture as it depends on the initial water-led process of agricultural intensification. As Ian Goldin[16] (2001, p. 40) points out, ". . . even the best national and international policies may not be enough for millions living in regions with chronically weak resources or adverse geography. For this significant minority, there may be only one option to living on aid or remittances: migration".

4.2. Policy and security: the role of water

Water resource development, particularly groundwater development, can be a powerful tool for increasing the stability of populations and alleviating poverty. Particularly in arid regions where water resources are limited, however, policies need to focus on the way populations can use water in a transitional manner rather than as the primary basis for a sustained agricultural economy. As populations grow and water resources become increasingly limited, the factors enabling populations to make a successful transition to other rewarding forms of livelihood are likely to be critical from the perspective of social stability and security.

In regions, such as Afghanistan, where populations are dominantly rural and the economy is heavily disrupted, intensive and unsustainable forms of groundwater development may be justified on a short-term basis. Agriculture is, as IFAD (2001) points out, the 'least-cost workplace'. Furthermore, if water supplies are assured, agriculture can be a relatively low vulnerability form of livelihood. Even if economic conditions are disrupted, populations can eat the products of agriculture even when they cannot sell them. Furthermore, most irrigated agriculture is labour-intensive and can provide employment to many people beyond land and well owners. Because of this combination of factors, water development, particularly groundwater development, can enable populations to accumulate a pyramid of essential assets to move out of poverty and build stable forms of civil society that enhance security. This dynamic is important to recognize in relation to water development policies. Most international organizations, such as the World Bank, focus primarily on the economics of irrigation in relation to agricultural products. The economic value of social stability and transition is rarely reflected in such analyses.

Beyond the immediate role of water development from a livelihoods and poverty perspective, questions of transition are critical. From a policy perspective, simply encouraging extensive groundwater development in arid regions is unlikely to provide a sufficient basis for long-term poverty alleviation or social stability. Where water resources are limited, groundwater is vulnerable to overdraft, and/or droughts are common, strategies for ensuring that populations make a successful transition beyond agriculture are essential. Because the process of transition is long-term, such strategies need to be in place as early as possible. It is likely to be too late if society waits until water problems are already intense. Key issues that appear fundamental to any successful transition are likely to include:

- *Education*: agriculture can absorb large amounts of workers with little formal education. Most other forms of livelihood require education. Encouraging farmers to educate their children is critical if they are to make a successful transition.
- *Economic diversification*: populations cannot make a transition out of agriculture if there is nothing for them to move into. Policies that encourage economic diversification are essential.
- *Migration and urbanization*: issues related to migration and rapid urbanization need to be understood in much greater depth, and appropriate policy frameworks need to be developed. In many areas, there is little groundwater recharge, and therefore irrigated agriculture based on groundwater is inherently unsustainable. While agriculture may allow populations to accumulate assets and move out of poverty, over the longer term the sustainability of their livelihoods will probably depend on the ability to migrate, generally to urban areas. Both national and international policies related to migration and urbanization need to reflect this reality.
- *Adaptive civil society institutions*: irrigated agriculture may provide a mechanism for poverty alleviation over the short to intermediate term — but the window of opportunity will close. During this window of time, society needs to develop civil society institutions capable of maintaining social continuity during the process of transition. Most social institutions (such as village water management organizations or national legal structures) are designed for relatively static situations. When conditions change, existing institutions often constrain rather than enable appropriate transitions. The challenge is to develop institutions capable of adapting to change, while still maintaining the cultural and social continuity that grounds populations.

Overall, provision of access to secure water supplies, particularly groundwater, for agriculture represents a powerful tool society can, in many cases, use to jumpstart social transition. By providing relatively secure agriculture-based livelihoods and reducing the risk of loss, groundwater can enable individuals, families and communities to accumulate assets. These can, in turn, provide the resources families need to educate their children and enter the wider economy on an equal footing. This process represents a major opportunity for society to attack and reduce the underlying causes

[16] Director of Development Policy at the World Bank.

of social instability. The reverse is also true. Depletion of groundwater or degradation of water resources in general threatens this process and can, as a result, contribute to social instability. The exit is as important as the entry. Where water use is unsustainable, populations need to move into other livelihoods. What those will be and how the transition might occur represent fundamental challenges for peace and security.

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