Virtual Water: virtuous impact?

The unsteady state of virtual water

Dik Roth (Wageningen University and Research Centre, Law and Governance Group)

Jeroen Warner (Wageningen University and Research Centre, Disaster Studies Group)

Abstract:
'Virtual water', water needed for crop production, is now being mainstreamed in the water policy world. Relying on virtual water in the form of food imports is increasingly recommended as good policy for water-scarce areas. Virtual water globalizes discussions on water scarcity, ecological sustainability, food security and consumption. Presently the concept is creating much noise in the water and food policy world, which contributes to its politicization. We will argue that, as the virtual water debate is also a 'real water' and food and agricultural policy debate, it has political effects. Decisions about food strategies and resource allocation play out on the national political economy, benefiting some while harming others. Therefore, a policy choice for virtual water is not politically neutral. 'Real water' interventions are, likewise, inspired by economic as well as political considerations like control of the countryside, geopolitical strategy, and food sovereignty (independence from international political conditionality and market uncertainties). To illustrate these ideas, we look into case studies of Egypt and the State of Punjab in India. In India, a debate on the merits and demerits of a virtual water strategy is now emerging. In Egypt, which switched to food imports in the early 1970s, a long-standing taboo on debating virtual water is now being relaxed.

Key words: agricultural policy, food production, food trade, food security, hydro-politics, virtual water, water scarcity

Virtual water: a medicine against hydrochondria

'Virtual water' is rapidly becoming a key concept in scientific and policy debates about regional, national and global water scarcity (Kumar and Singh, 2005).[1] Virtual water, "the water required to produce water-intensive commodities such as grain" (Allan, 2002), links water scarcity to global, regional and other trade flows. The concept has started on a remarkable march through development agencies, agricultural research and planning institutions, and development policy institutions (Rosegrant et al., 2002; UNESCO, 2006; World Water Council (ed.), 2004). The basic idea is economic: the lions' share of available water resources - up to 90% - goes to food production, leaving a meagre 10% for drinking and other uses (Allan, 1998). Resulting water scarcity problems can be solved and economic efficiency of water use increased by adapting global and regional food trade to existing variations in water scarcity. In this view a net water-saving effect can be reached by concentrating production of water-intensive food crops and products with low water productivity in water-abundant countries while turning water-scarce countries into food importers and producers of less water-intensive crops. While agricultural production in the former tends to be based on rain-fed agriculture, in the latter it requires complex interventions in the 'real' water cycle (irrigation systems, dams) that often contribute to depletion of scarce water resources and ecological degradation (Chapagain et al., 2005; UNESCO, 2006; Wichelns, 2001).[2]

According to virtual water analysts, countries or regions with a water deficit can increase national food security by importing water-intensive food. The virtual water discussion focuses primarily on water-deficient countries in the Middle East and North Africa (MENA region), where some countries have experienced deficits since the 1950s and demand started exceeding supply in the early 1970s. Egypt usually serves as an example of a country that, according to Allan, who coined the concept (Allan, 1997; Allan, 1998; Allan, 2002), consciously if quietly avoids hydro-political crisis by its strategy of virtual water import. Stressing that "more water flows into the MENA region annually as virtual water than flows down the Nile into Egypt", Allan has called virtual water "the dream solution in water-stressed economies" (2002: 29). Virtual water is politically "silent" and "therefore not politically controversial" (1998: 545). Apart from being a politically suitable solution to an economic problem, virtual water is cheap thanks to subsidized foodgrains and trade below production costs. With this solution at hand, why should countries look for hydraulic solutions or risk 'water wars'? At least as an abstract concept, virtual water has proved an effective medicine against 'hydrochondria'.

Bringing together issues related to food production, consumption and trade[3], the virtual water metaphor has stimulated scientific efforts to estimate and map virtual water flows between (and within) nations and regions in the world. This has yielded the water accounts and "footprints" (Hoekstra, 2003) that are prominently present in the virtual water literature. But the debate is more than just an abstract academic exercise. It has entered the policy domain, where recipes ('solutions') for water scarcity are produced and environmental conservation and food strategies based on it are increasingly recommended as good policy for water-scarce areas (Warner and Johnson, forthcoming; Wichelns, 2004) . Hoekstra and Hung, for instance, stress that the next step is "to go beyond 'explanation' and to study how governments can deliberately interfere in the current national virtual water trade balances in order to achieve higher global water use efficiency" (Hoekstra and Hung, 2003: 46). In a nutshell, the concept's main practical ambitions are, first, to solve water scarcity problems at various scales and levels of governance by making optimal use of comparative advantage and differences in resource availability; second, to prevent water conflicts in a 'politically silent' manner (Hoekstra, 2003; see Allan, 1998).

As a virtual water strategy is generally expected to expand state control, Turton (1999) rates virtual water as adaptive management to water stress. In light of the concern over climate change-induced weather extremes, virtual water is set to rise on the international political agenda as smart solution to future challenges. In its transformation from analytical concept to policy prescription, we will argue here, the concept becomes more explicitly normative in its content and real-life consequences, and therewith more problematic.[4] Implementing virtual water policy entails conscious social and political choices based on problem perceptions and definitions, conceptualizations of solutions, and assumptions and ideological values pertaining to the new and 'better' conditions to which such solutions should lead.

We take a different approach here by relating the virtual water debate to 'real water' politics and food security. It does not suffice to limit analysis to the abstract data of water accounting. As the concept becomes 'policy' and data are mobilized for legitimizing certain courses of action pertaining to food production and natural resources governance, we enter the field of politics. We must, therefore, liberate the virtual water debate from its focus on water accounting and macroeconomics and explore possible contributions to the debate by political science and other disciplinary fields. Is virtual water as 'politically silent' as Allan suggests? Should its 'political silence' be regarded as a benefit, or are there real political effects? Where are the food-producing rural livelihoods that will feel the impact of food policies based on virtual water?

This article is structured as follows: we will, first, present a critical discussion of the concept. Second, we will question the assumed politically 'silent' character of virtual water by discussing the politics of virtual and real water. In the next section we focus on the water debate in Egypt, long characterized by a taboo on discussing the policy option of virtual water. The next section deals with the emerging virtual water debate in the State of Punjab in ndia, and its relationship to inter-state real water and territorial issues. Finally, we will draw a brief conclusion on the benefits and pitfalls of the virtual water concept.

Virtual water: An emerging debate

The production of any product requires smaller or larger volumes of water (its "water footprint"; Hoekstra, 2003). Globally, about 70% of available water resources are used for irrigation (Gleick et al., 2002; UNEP, 2002). However, water use for agriculture is under growing pressure of reallocation to non-agricultural sectors and uses.[5] Reallocation and the associated competing claims are socially and politically sensitive. Main competitors in this arena of water transfers are irrigators on the one hand, and urban, domestic and industrial users on the other. The latter tend to be winning out, as water use for irrigation is regarded as the least beneficial and productive in market terms (Boelens et al., 2005). According to the more pessimistic water professionals, transboundary water scarcity can even cause 'water wars' (Kumar and Singh, 2005; Warner, 2003).

The exact relationship between water and food production can be made visible through the concept of virtual water. One way of dealing with water scarcity is through the import of staple foods like wheat and rice. Putting into practice the virtual water concept, "countries are, in effect, using grain to balance their water books" (Brown, 2006: 55). Food imports to a water-scarce country can release scarce water for more productive (e.g. industrial) uses (de Fraiture et al., 2004). We will not go into figures here, but to give a basic indication: the amount of virtual water in international trade is estimated at 1,625Gm3 (1,6 trillion m3) annually (Chapagain et al., 2005; UNESCO, 2006)[6]: 16% of all water use is now for export (Hoekstra and Hung, 2003).

In the virtual water debate, water is considered an economic good (e.g. Hoekstra and Hung, 2003). Much virtual water literature reflects this economic bias, engaging mainly in the calculation of crop virtual water contents, food trade-related water flows, and estimated volumes of savings, which have a temporal and a spatial dimension: the food export from water-abundant to water-scarce countries and the 'virtual water' storage capacities of food in periods of water scarcity respectively (Chapagain et al., 2005). Some authors distinguish several levels at which intervention to increase water use efficiency can take place and these efficiencies can be reached: the local level, where pricing structures will stimulate water-saving technology and create awareness of scarcity; the catchment or river basin level, where available water will be re-allocated to uses with the highest marginal benefits; and the global level, where comparative (dis-)advantage will stimulate import or export of virtual water (Chapagain et al., 2005).

Virtual water: a fresh approach to water scarcity and food production

Use of the concept has both its merits and its pitfalls. Let us first look at its possible contributions. First, it makes explicit a dimension of food (and, of course, other goods) that tends to remain (largely) hidden: the role of water in its production and the scarcity and opportunity costs of this resource (Wichelns, 2004; 2005). It also provides us with an instrument to take into account the important factor of soil moisture (Allan, 1998). The relationship between water scarcity and food production makes it possible, in principle, to relate production, consumption, and trade policy to food self-sufficiency, food security and food sovereignty in a broader resource scarcity and sustainability perspective.

Second, it globalizes these discussions on water scarcity, ecological sustainability, food production and consumption. Virtual water is an important 'tele-connection' in the global water system, bringing together biophysical, institutional and governance dimensions of water scarcity problems (Craswell, 2005). Therefore, it is a promising entry point for analyzing the global, regional and local character of issues concerning food and natural resources, and the growing interdependencies of a global market.

Third, virtual water stimulates reflection on processes of socio-economic change in relation to changing food consumption patterns leading to growing and changing demands, production needs, pressures on current production systems and the environment (Hoekstra, 2003).[7] These changes have serious consequences for food production and trade, and natural resource use (water, land, forest). They also affect social relationships, networks and power relations. The rapid economic development of giants like India and China and the growth of large middle classes with buying power in these countries are a major 'challenge' for the future. Attention to virtual water contributes to the debate if it is embedded in a broader framework. Meat consumption is not only water-intensive, but may also boost the cutting of existing forests for soy cultivation for cattle fodder.

The concept may also increase public awareness of water scarcity among consumers, public officials and producers (Wichelns, 2004; 2005). This may stimulate the development of water-saving policies, 'more crop per drop' technologies, water pricing and allocation that reflects scarcity. Water allocation between sectors in ways that create high returns and employment levels are crucial for economic and political stability (Allan, 2001). According to Hoekstra (2003) it is indispensable for developing rational national policies and in promoting water savings "through enhancing food security by appropriate agreements and increasing reciprocity in agricultural food products trade" (Hoekstra, 2003: 21; see Hoekstra and Hung, 2003; Wichelns, 2004; 2005). It may also be helpful in valuating water-related processes and trends. In China, for instance, 'real' water is now increasingly transferred from the water-

abundant South to the water-scarce North, while North China exports large volumes of water-intensive food to the South (Ma et al., 2005). Intriguingly, while some authors see virtual water as a possible alternative to real water transfers, others see the latter as an alternative to virtual water (Kumar and Singh, 2005).

Finally, the concept is useful in understanding what water-related food policies would actually mean for demand and supply. Though starting from an environmental doom perspective, Brown (2006) gives an interesting picture of China turning virtual water theory into practice. China's grain production has been falling, in part due to water shortages, from 392 million tons in 1998 to 358 million tons in 2005, a drop that "exceeds the annual Canadian wheat harvest" (Brown, 2006: 45). According to Brown, the world grain markets will ultimately be the battlefield on which 'water wars' will be fought.

Another metaphor for the real world: need for caution

After this overview of merits, let us highlight some critical notes. Merrett (2003a, b) discards the concept as redundant: why not just speak of 'water requirements'? Why are food imports presented as water imports? Further, there is nothing 'virtual' in water needed for food production: 'virtual water is real water' (2003b). What he considers the false and misleading assumptions underlying the concept puts analysts on the wrong track: it focuses on the water contents while the most problematic dimensions of virtual water is its free-market bias, the issue of political control, the lack of attention to negative impacts of food imports on domestic agriculture and rural livelihoods, foreign exchange needs, and the dependence on import subsidies. Chapagain et al. (2005) mention similar factors but add the stimulating effect on urbanization and new environmental and other externalities in exporting countries.

The most cited examples in the virtual water literature are not always the most convincing ones. To what extent can Egypt's food policy be analyzed as based on a conscious policy decision to implement 'virtual water policy'? Arguably, ecological and demographic processes left little room for alternatives. Egypt does not 'save' any water (because it is not there) and, as we shall see, has no strategic interest in reducing its claim on water; starvation of its population is the only alternative to virtual water import (de Fraiture et al., 2004; Wichelns, 2005). Second, the issue cannot be seen in isolation from the political status of Egypt in the Middle East. As the main regional political ally of the United States, it controls resources not commanded by geo-politically less salient countries like Ethiopia (Warner, 2003) (see below).

Allan's approach leans heavily on an analysis in terms of comparative advantage (Allan, 2003). However, as Wichelns (2005: 430) remarks, comparative advantage is more than just resource endowments. Even the production of water-intensive goods may give a comparative advantage to a water-scarce country or region.[8] Therefore, virtual water does not suffice to determine optimal production and trade strategies for a country. Kumar and Singh (2005) show that there is no correlation between relative water availability in a country and its virtual water trade.[9] Much trade takes place between either water-abundant countries or for reasons unrelated to water scarcity. According to de Fraiture et al., in 2025 more than 60% of cereal trade will be unrelated to water. An important additional argument is that water need not be (and, actually, tends not to be) the decisive factor in countries' crop production and trading strategies (de Fraiture et al., 2004; Wichelns, 2005).[10]

The water focus tends to shift other production factors (land, labor, genetic resources) to the background. Moreover, it leaves largely unanswered the question what is going to happen with the 'saved' water and how it can be used more productively. De Fraiture et al. mention the Asian paddy areas as an example where 'saving' is hardly useful or even possible (see

Chapagain et al., 2005; de Fraiture et al., 2004; Wichelns, 2004).[11] Food crops might even be replaced by more water-intensive crops because of their higher market value. Wichelns (2004) stresses the role of comparative advantages (which is not just resource endowments but also includes a comparison of production techniques and opportunity costs). Kumar and Singh (2006), therefore, seem right in concluding that a discussion of food security and food policy should not be based on a water resources perspective only, but also take into account factors like the availability of arable land and size of landholding.

The concept is excessively optimistic about the role of the global food market in solving water scarcity problems. In virtual water trade, it seems that there are only winners and no losers. We think that much more caution is needed here. Though presented as an unproblematic solution designed on the basis of rational calculation of comparative advantages and efficiencies, there is much disagreement on globalization of trade, increasing interdependence, the market and the inequalities it creates or reproduces (see Hoekstra and Hung, 2003; Warner, 2003). Globalization, boosted by food dumping and aid, is blamed for homogenization of diets, while diversity is a key aspect of human quality of life and conservation of genetic diversity (Neubert, 2001). The contentious issue of health risks and pests spread by GM foods (the bulk of American food aid) remains unresolved.

Windfuhr and Jonsén (2005) provide a more comprehensive critique of the current international trade-biased system of rules governing food and agriculture. Their food sovereignty policy framework aims at "refocusing the control of food production and consumption within democratic processes rooted in localized food systems" (2005: preface). Virtual water hardly deals with crucial questions about food security, the right to food, food self-sufficiency and food sovereignty, though its impact on them may be considerable. Food security refers to "the capability of a nation to provide access to everyone in the country to adequate, nutritious and safe food now and in the future" (World Water Council (ed.), 2004); see Wichelns, 2001). This can be reached through strategies based on self-sufficiency, imports or mixes of these.[12] 'Food sovereignty' refers to people's right to define and control issues pertaining to agriculture, food production, trade and consumption in such as way as to support their rights to safe food produced in healthy and ecologically sustainable way (Windfuhr and Jonsén, 2005).

The aggregate concept of 'food self-sufficiency' stands apart from food sovereignty and food security, in the sense that a country may be self-sufficient in food production while part of its citizens suffer from chronic malnutrition or even acute hunger. Clearly there is a considerable gap in terms of starting points between the virtual water and food sovereignty approaches. While the former has solving a water scarcity problem as its main objective and sees global food markets as an instrument to reach it, the latter regards food security as its main objective for which food sovereignty is a precondition and the formulation of a basic human right to food as a major instrument (Windfuhr and Jonsén, 2005; World Water Council, 2004).

Further, attention to local (rural) livelihoods of food-producing people and rights to natural resources like water and land is conspicuously lacking.[13] Yet, both are crucially related to virtual water policy intentions. In the virtual water debate there is an almost myopic gaze at the larger structures. The 'national level' seems to be about the lowest conceivable in most contributions, no attention being paid to the ways in which virtual water policies might work out in specific local settings. If it is to become more than just the umpteenth policy concept with little analytical value, the virtual water debate needs a much stronger focus on 'the local', away from the dreams of water accountants and planners.

As to rural livelihoods, virtual water policy will probably have serious implications for food producing people (rights to resources, crop production, food (in-)security, dependence on the food market, migration). However, livelihoods are not the exclusive product of top-down

policies and regulations, but at least partly shaped by local actors and their perceptions of ecological, social, economic and political conditions and influences (de Haan, 2000; de Haan and Zoomers, 2005). As to the second issue, a major ambition of virtual water policy is redirection of water to other uses. The assumption is that populations can be unproblematically engineered into new agricultural techniques and practices, relations to the market, and property rights regimes. However, in practice, much depends on the complex and often plural character of social and legal institutions (law, property rights) that co-determine (legitimate) access to natural resources in interaction with human behaviour (Bruns and Meinzen-Dick, 2000; Donahue and Johnston, 1998; Roth et al., 2005).

A final point is the ambivalence of virtual water as both a theoretical and a policy concept in science-for-policy (Warner and Johnson, forthc.). We must be aware of the normative and ideological assumptions (e.g. about scarcity, the market) behind the impressive figures and formulas of water budgeting that form the scientific legitimation of virtual water, as these can have a notable impact on water policy-making circles. As the 'neutral' concept is gaining ground in the water and food policy world, its descriptive and analytical character will give way to the normative and prescriptive approaches of the policy world. Virtual water policy crucially entails political decision-making about the (re-)allocation of resources, with important consequences for the livelihoods of rural and urban people. As an area of political contestation, virtual water and its consequences in agricultural policy and natural resources governance unavoidably concern issues of legitimacy. When confronted with the 'real' world, what is currently hailed as a 'politically silent' solution will in fact be shouted down by the deafening noise of political processes.

Water as a political good

The infrastructural 'hydraulic mission' to mobilise real water for national development can have crippling social, economic and environmental opportunity costs. The question is whether, as Turton (1999) maintains, a switch to virtual water is a softer option. Rather than simply pass judgment on whether risk or opportunity prevails, we shall here highlight the under-adressed 'political risk' side: why do states keep investing in water infrastructure and protecting their farmers rather than let the market do its work? This section zooms in on the political role of water and 'real' water transport in state-society relations (what Turton has called the *Realpolitik* of water), and their influence on such choices. It argues that water development and sovereignty in (semi-)arid zones are core legitimising state strategies that will not be easily given up. Political manipulation of water scarcity is as important as economic choices are. Dependence on the world market may not only bring moral problems for the North (Merrett, 2003a) but also political trouble for the states of the South (Hakimian, 2003).[14]

Most literature on virtual water tends to conflate states with the people living in their territories, as if there is perfect harmony between state and society and adaptivity between economic sectors. This gives a reductionist perspective of how the international political economy functions to even out local surpluses or deficiencies. A critical view of the domestic political economy highlights rather different issues with respect to choices for or against a 'real' or a virtual water strategy. States may have overriding political reasons for ignoring the Malthusian-Smithian compromise that Merrett (2003) calls the "Kyoto Consensus" - to open up their markets for the sake of water conservation. It is therefore important not only to concentrate on states that have silently or publicly embraced a virtual water import strategy like Egypt, but also on those who seek to avoid it, such as India. Both country cases are discussed in this contribution.

In economic terms, the key rationale for state intervention is to reduce citizens' transaction costs in filling their needs. The ultimate Hobbesian rationale (legitimizing myth) for state supremacy is that it keeps people from fighting each other for survival; order reduces transaction costs for citizens. In the course of time, states have, of course, expanded their 'security contract', taking on many more roles that cushion shocks and mishaps in acquiring shelter, food and other needs. Political science literature shows that states do not do this out of the goodness of their institutional hearts. Once we recognise that the state is not a disinterested political actor but a political agent that uses its resources to (seek to) wrest control over the population and economy in its territory, we can see how the state's uncertainty- and conflict-reduction strategy is, at least in part, self-serving.[15]

A state can never be sure of the continued loyalty of its citizens. Therefore, it develops control tactics ranging from patronage and co-optation to extortion and force vìs-a-vìs society. Weber (1964) recognised that the state may use force (its monopoly of the means of violence), if necessary, to have its way. However, Arendt (1969) showed that power based on force only is not really power. Nonviolent, subtle forms of power have more impact and provide the state with its prime political capital: legitimacy and control. This encourages treating water as a political good that procures organisational influence and control rather than an economic or cultural one. Water supports biological and cultural reproduction, but also reproduces state power (Donahue and Johnston, 1998: 4). This explains why long-dead water projects can repeatedly be brought to life by 'hydraulic mission' states.

State control through development and the 'hydraulic mission'

For a developing state, becoming a 'development(al) state' has proved a strategically powerful avenue that promises increased control and a growing tax base. To find the money, states look where the surplus is: an emerging urban middle class and a reliable water supply for irrigated farming in the countryside. Assured water, often accompanied by assured inputs and minimum prices, ties a rural clientele to the state. But a state cannot afford to ignore the urban masses either, which may revolt if they feel that their security interests are badly served. Rural development promises to make cheap food available.

'Development' therefore is a powerful, depoliticised, 'hegemonic strategy' sold on the premise that it will benefit everyone, even if it means local sacrifice in the form of mass displacement or environmental destruction (Crush, 1995). This strategy is not only beholden to the so-called developing world. Spain is still in the middle of bringing water from its wet north to its dry south (Naredo, 1999). A key aspect here is the 'manipulability' of water and food scarcity. An adequate understanding of scarcity should include how scarcity and resource crises are defined, created, reproduced, and reduced (Donahue and Johnson, 2001: 5). Power lies not only in politically inducing scarcity but also in reducing it for political purposes: reducing uncertainty for economic groups means reducing uncertainty for the state. In this view, water is a good that can be 'colonized', controlled and deployed to gain and maintain control over people.

The design of water infrastructure determines where the water goes, who gets water and who not (Mollinga and van Straaten, 1996; Turton, 1999). This is perceived at the level of irrigation systems, but also at the urban-rural nexus: "dams are one 'node of control' [...] in the interrelated processes of the changing territoriality of the state, the commodification of water, and the increasing penetration of a largely urban elite into rural areas" (Bakker, 1999). This points at the centre-periphery nature of infrastructure. Big and small infrastructural projects, preferably externally funded, are effective ways to expand state control.

Thus, providing a reliable source of water helped the Saudi government settle nomadic tribes in the 1920s. Turkey is now in the last stages of building a 22-dam project in the poor region of Southeast Anatolia. These will irrigate the fertile Harran plains and hydro-power new industries.[16] Among other rationales, this 'Greater Anatolia' Project can be seen as a way of luring the Kurds from their mountain hideouts by offering jobs in irrigation, construction and industry (MacQuarrie, 2004; Warner, 2005).

Who pays for virtual water?

While Wichelns (2004: 429) stresses that its policy relevance pertains primarily to the supply side "because the embedded water concept is pertinent only to producers", there are considerable distributive effects on the demand side - the importers of virtual water, such as the recipients of food aid. Water may be virtual, but food is real: it can be captured, hoarded and sold or withheld at an economic or political premium in the form of conditionality on loans and aid. Governments likewise intervene in the creation or alleviation of food scarcity. Amartya Sen has shown (if not without contention) that famine doesn't stem from rainfall variability but from failure of people to access food (Sen, 1980; Sen, 1981). In times of increasing food scarcity, wheat traders tend to hoard grain until the price goes up. The only alternative for states to secure food for the population is to buy or obtain food on the world market. For this, one needs foreign currency or must curry favour with providers of food aid; both entail a political risk.

The world market is not a level playing field. Exposure to virtual water means exposure to sudden price shocks in the world market, including manipulation of trade politics. Five countries account for 80% of all cereal exports. While the Middle East, due to its geo-strategic position and oil wealth, may have benefited, the same policy prescription is unlikely to work well for, say, Sub-Sahara Africa, whose bargaining position in the global political economy is weaker. Low agricultural world prices hurt agrarian exporters who do not have the option to subsidize their agricultural sector (Neubert, 2001). For poor countries, trade means participation in a system dominated by powerful interests. Further, food scarcity can also be actively induced by food multinationals to manipulate prices (Ritchie, 1992).

Richards (2003) notes that neo-conservative American governments are again giving American client states cash in hand to pay for food imports. Given the "sclerotic economic bureaucracies" and "lumbering public-sector industries", the "Washington Consensus strategy to provide cash-strapped states with foreign exchange to buy food and thus import 'virtual water' constitues a *faute de mieux* strategy". But the case of Egypt shows the consequences of this dependency, and helps explain the political capital, in the form of a popular legitimacy base, created by a self-sustained hydraulic development strategy. The embarrassing silence over virtual water allowed Egypt and other Middle East states to avoid having to admit the painful truth that water supplies are limited - which might lead to a legitimacy crisis - while at the same time adjusting their economies to that truth. However, this quiet adjustment has not been without its social price.

So a crucial question is: who or what will pay the bill for virtual water imports? Prescriptive virtual water analysis claims that countries should bank on the adaptive forces in the international political economy to diversify their economy. If they do not have to produce all food themselves, they can concentrate their energies on the development of other sectors (as India did, for instance). A 'weak' political economy is an unadaptive one, while a 'strong' one diversifies. Diversified national political economies fare better than weak ones when faced with drought and scarcity. However, a state that opts for a food import strategy will have to pay its virtual water bill. As almost any non-agricultural use of water is more remunerative

than agriculture, diversification out of agricultural self-sufficiency ('more jobs per drop') is expected to generate funds and employment opportunities to more than make up for the loss of food self-sufficiency. Singapore counts as an economy that generates enormous wealth that more than compensates for its limited natural resource endowments.

But this trajectory is not so easily turned into reality. First, imposed structural adjustment and liberalisation do not wait for economies to be strong. 'What would Yemen export that was not agriculturally based, other than its own people?' (Richards, 2003: 65). Second, a non-agricultural export state is not necessarily a diversifying economy. Non-agricultural primary sector exports dominate OPEC's oil and gas producing countries, but are owned by foreign multinational companies. Such 'rentier states' (Beblawi and Luciani, 1987) have felt - or may soon feel - compelled to sign away large parts of their sovereignty over resources developed on their territory to be able to pay for their import bills (Kuwait, Algeria, Bolivia). A virtual water strategy may intensify resource sell-out and increase external dependencies for cash-strapped states. Third, what about states that successfully switch to manufacturing by neglecting their agricultural sector? Given that food imports and aid are usually heavily subsidised in the country of provenance, they easily outcompete domestically produced food, pushing small producers out of the market. Marginal producers have nowhere to go but the city. As Merrett (2003: 542) puts it: "food imports by the South weaken the domestic sector that produces food by driving down the market price of grain output. The decline of agriculture drives down rural incomes and stimulates rural-urban migration."

At the domestic level, then, a naked switch to virtual water imports in (semi-)arid regions is a choice for the city, may intensify non-water primary resource sell-out and increase external dependency for cash-strapped states. While we do not advocate economic conservationism, it is important to consider the social costs of transition. Given these social 'adjustment' costs, it is all the more important that momentous economic choices like a virtual-water strategy do not remain politically silent.

The political uptake of virtual water

It is still tempting to see virtual water as 'so much hot air'. There is, however, a danger in not taking it seriously since it is not just an analytical concept. It is rapidly becoming a policy prescription for water-scarce areas. The politically efficient but economically inefficient clientelism of the state-led 'hydraulic mission' is under attack from greens and market reformists. 'Virtual water' seems to become increasingly adopted by the green liberals in the developmental world who rely on a more open market as the key ordering mechanism to solve problems of Malthusian 'resource closure'.

Thus, there appears to be an emergent discursive alliance of free-marketers and (post-) Malthusian environmentalists, both focusing on scarcity. At some point, the pie cannot be expanded; 'closure' makes adaptation unavoidable (Turton and Ohlsson, 1999). Dams are found to bring environmental destruction as basins close and a painful transition needs to be made to a post-'hydraulic mission' economy through diversification and reallocation. According to Turton and Ohlsson, this closure impels a switch to a new hydro-social contract, underpinned by 'reflexive modernisation' which recognises water as an economic good, and incorporates participatory and environmental values.

How great is the probability of the virtual water prescription being turned into practice? Molden and de Fraiture (2004) question if it is realistic to assume that countries will change their trade policies because of emerging global water scarcity issues. However, it could become part of an existing 'green conditionality' whereby donor agencies use environmental goals as a form of leverage over national governments (Leach and Mearns, 1996). Further, not

so much to save the planet as their own economies, governments have clearly taken notice of the virtual water debate.

Especially in arid areas, the water world and the policy world are not a million miles removed from each other. Israeli water managers, faced with acute water crisis in the 1980s, were the first to cotton on to the idea that every exported orange meant a loss of scarce water (Allan, 2003; Fishelson, 1994). Once a crisis had been called, Israel's government centralised water management and changed to a strategy in which no new water resources are allowed to be exploited (Lees, 2001). In the 1990s, Jordan's former Water Minister Haddadin became a fan, and was in several virtual water conferences (e.g. Delft 2002, WWF 2003). Jordan now imports 60-90% of its food. Policy makers in South Africa also 'got it' at a conference in Oman in 2005 (Allan, 2003): a virtual water strategy would obviate the need to build more expensive infrastructure for intra- and inter-basin transfers. Other SADC countries found it more opportune to dismiss the concept.

Indians also paid close attention to virtual water (Reddy, 2005; Sharma, 2003b; Sivakumar, 2004) when it came onto the global water agenda at the 2003 World Water Forum. Here, the debate is highly unlikely to be 'politically silent'.[17] Sharma, for example, aware of the danger of dependence on food imports, states that "countries of the South rightfully wonder if this will be yet another imposition on them! Otherwise why should 550 litres of water to produce flour for one loaf of bread be of greater concern that 7000 litres for producing 100 grams of beef?" (Sharma, 2004). In the case of countries like India and China, given the size of their economies, we should perhaps be grateful that they are not pursuing a virtual water import strategy. It would wreak havoc on world prices and resources distribution: "countries like India and China [...] feel that because they have such large populations, the world market would not be able to supply their food demands in any crisis and so, as much as possible, they want to take care of their own food needs" (Daniel Zimmer, World Water Council, quoted in *The Hindu*; (Sivakumar, 2004); (Cai and Rosegrant, 2005).[18]

Instead, both countries are pursuing a food self-sufficiency strategy (World Water Council 2004). India even seems to be intensifying its virtual water export strategy. Shiva quotes India's Planning Commission Deputy Chairman, Montek Singh Ahluwalia, proposing the cultivation of more water-intensive products like fruits and vegetables for export: "[…] while India is gripped by a severe water crisis, and even more severe water conflicts, our Deputy Chairman of the Planning Commission is recommending that we export water as a "virtual water" subsidy to the rich consumers of the North" (Shiva, 2005). However, as we will show below, a reverse trend of buying farmers out of water-intensive cultivation into cultivation of other crops is also (and at the same time) visible in states with severe groundwater problems like Punjab.

The case of Egypt is an intriguing one. Applauded by virtual water analysts for shifting from virtual water export to imports in the 1970s, it has long resisted the virtual water discourse itself. The next section will take a closer look at the issue of food security, real and virtual water in Egypt.

Egypt: a not so silent virtual water revolution

It has been noted that Egyptian water professionals, well represented in the international water community[19], did not want to hear about virtual water for many years and - it seems - kept it off the agenda where they could.[20] For the Egyptian state, the myth that water will always be available has been an important legitimising dogma, both for the domestic (voters) and the international audience (upstream states and donors). A Ministry of Public Works and Water Resources expert said that the idea of there being a water shortage is absurd. Like many of its

neighbours, Egypt has not really begun to contemplate the kind of 'demand management' all water-poor states will eventually have to accept, however painful the transition to a water-extensive economy will be. In Egypt, the dream of 'water self(?)-sufficiency' is alive and well.

In such a context, a prescription that Egypt should turn more to the world market is anathema. When Beyene and Wadley (2004: 35) discuss this as an option, they voice concern that the market mechanism does "not account for the different social meanings attributed to water across state boundaries [….] It is hard to predict […] how far the Egyptian farmers are ready to buy the idea of detaching themselves from producing agricultural products, should the Egyptian government agree to implement the 'virtual water' scheme." But what seems to have escaped the authors is that Egytian food producers - whether they 'buy the idea' or not - have already been adjusting to a virtual water strategy for more than thirty years.

When Gamal Abdel Nasser came to power, he sought political support in the countryside by pushing through land reform (Bush, 2005). Egypt's 1959 'Full Utilisation of the Nile' treaty with Sudan seemed to leave enough slack for expanding water use for food and cotton production. Indeed, up to the 1970s it was possible for countries in the Middle East to augment water supply by finding or mobilising new resources to ensure food self-sufficiency. Since around 1972, Egypt switched to importing food. Nowadays, imports meet half of Egypt's food requirements. Food constitutes 10.8 per cent of Egypt's imports bill. Importing food saves Egypt billions cubic metres of premium water. Thanks to American food aid and the availability of cheap grain on the world market, Egypt is less and less dependent on its own water. In this way, a 'silent revolution' has realised an economic adaptation process which spares the government an embarrassing political debate on the question whether the state is accountable for a looming water shortage and dependency on the rest of the world; a debate Egyptian officials prefer to keep silent about.

Allan has repeatedly described virtual water as economically invisible and politically silent. However, non- or depoliticization is also a political act. It can be argued that virtual water perpetuates existing economic inefficiencies, and hampers adaptation to scarcity through technological change as well as the remedying of negative externalities from exploitation of natural resources and labour. The emphasis on political silence in the virtual water debate is revealing. It portrays politicisation as needlessly problematic and political contest and popular protest as undesirable and meddlesome. However, another view of politics is possible: democratic politics as a social correction mechanism. Political contest about the road ahead can contribute productively to debates about how to adjust to scarcities and its allocative implications. Silencing virtual water means avoiding tough decisions on rights and allocation between social groups and countries, as well as on the relations (hydro-social contract) between state and society.

For a control-obsessed Egyptian government, food imports have proved an ideal control mechanism. It is easier to control the distribution of imported food than of food produced by millions of *fellahin* (small farmers) in the countryside. In 1977 'bread riots' broke out after draconian price rises following IMF-imposed structural adjustments. The government cut subsidies, which doubled food prices in the cities. As Richards and Waterbury (1990) have noted, Egypt's geography allows all food imports to come in at a central location and be distributed for food coupons to the urban poor. Like Aswan High Dam, this creates an 'obligatory passage point'. A virtual water (import) strategy has thus strengthened political control while widening a socioeconomic gap between mega-city and countryside (and between North and South Egypt). After the riots, the Egyptian state responded by a policy of subsidies and social welfare programs, combining welfare and developmental roles and focusing on the urban electorate in such a way that the infrastructural links with and investments in the countryside were neglected. Imported food brings wealth to harbours, not

to farmers. Their bargaining power is eroded, which may lead to further marginalisation. All such factors intensified the rich-poor divide.

Nowadays the revolution is not so silent anymore. In a second IMF-impelled wave of reforms, Egypt liberalised its agrarian policies, abandoning fixed supply and price support in wheat and maize from 1987. After Land Law No. 96 of 1992, previous subsidies on farming inputs were cut. This is especially meaningful in Egypt, where the fertile sediment from the Nile, 99% of which is trapped in lake Nasser, has to be replaced by chemical fertiliser. Even worse, land tenure was reformed: over a five-year period, tenants had to return their land to the landowners. They had rented this land for forty years at fixed rates; now the rents were allowed to skyrocket. As a result, widespread violence occurred in the countryside, due to police-assisted evictions of tenants. The inevitable outcome was for tenants to swell the shantytowns of Cairo (Bush, 2004; Bush, 2005).

In its Nile negotiations, Egypt wants to uphold the claim that the country needs the 55.5 billion cubic metres of Nile water it is entitled to under the 'Full Utilization of the Nile' treaty signed with Sudan in 1959. Waterbury and Whittington (1999) have shown how Egypt's new land reclamation schemes are a strategy to create facts on the ground. In the context of the Nile Basin Initiative, Egypt may be able to stop any upstream water resource development on the basis of the agreement signed with Sudan but not with Ethiopia. Some suggest that equitable distribution means that Ethiopia should get as least as much Nile water as Sudan (e.g. Tafesse, 2000). If virtual water were formally incorporated in Egypt's water balance, different figures might come out and weaken Egypt's claim on the Nile. Instead, Egypt is planning in New Valley to house 7 million inhabitants in the desert. Each year, some 20,000 hectares are to urbanisation. A major legitimizing argument of the New Valley project therefore is the supposed overpopulation on a narrow strip of land.[21] In a vision remarkably similar to that of the colonisers of the American West - develop the land and the rain will come (Worster, 1992) - the Valley will need 5-10 billion cubic metres per year in a country where it barely ever rains.

Remarkably, Egypt is now pushing an aggressive water-saving policy in the countryside. This promotes water-saving technology, improved drainage, drip irrigation, stepped-up recycling efforts and levelling of arable land. But it is also moving agriculture out of water-guzzling crops, notably through cuts in rice and sugar cane. This seems to finally evidence an acute if tacit awareness of virtual water export. During the Fourth Water Forum in 2006, the Egyptian water bureaucracy came round to recognising the virtual water concept (pers. comm. T. Allan, 2006), but it is still a taboo in the Nile negotiations. Egypt will economise, recycle, and modernise its way out. But admitting water shortage? Never!

We have seen that governments that, at least discursively, feel bound to hang on to a 'security contract' to secure food do not want to be seen to leave their citizens' food security to the Invisible Hand of the world market. Dependency on food imports may easily provoke social and political tensions in countries or regions that have a history of shortage or famines (India, Bangladesh). They set great store by food self-sufficiency, claiming the right to food sovereignty to prevent them from ever being dependent on others (and their conditionalities) again. The same debate has dominated the European Common Agricultural Policy until the end of the Cold War. It is, therefore, no surprise that countries balk at donor or academic prescriptions that urge them to produce less and import more.

Depleted groundwater and redundant food stocks: the case of Punjab, India

The Egyptian case shows that the rural peasantry has been more or less 'given up' by the state that opts for virtual water imports in favour of the urban poor. The following case from India, a country following a strategy of food self-sufficiency, illustrates another dimension of the politics of virtual water and food production. The case focuses on plans to shift agricultural policies in the Indian state of Punjab away from water-intensive crops, for which no ready market exists, towards less water-intensive crops with a, it is hoped, more promising market potential. The combined pressures of a perverse foodgrain production system and ecological degradation have made Punjab's status as exporter of virtual water to other states increasingly problematic. The plans were presented in the report of the Johl Committee (Chief Minister's Advisory Committee on Agriculture Policy and Restructuring, 2002).[22]

Historically, the role of India's government has been overwhelming. The development challenge was daunting at independence in 1947, when India had to import huge quantities of foodgrains to feed its rapidly growing population. After the instatement of U.S. Public Law 480 India became the biggest recipient of American food aid in the early 1950s. This can be said to have enabled India to concentrate on industrialisation and, some claim, neglect its agricultural base. But dependence on aid had serious political implications. American President Lyndon Johnson did not hesitate to tie food aid to political and economic concessions (a more open market) in the famine of 1965-1966. In 1974, India switched to the Soviet Union for food aid.

Given that memory, it is not surprising that, ideologically, agriculture is the backbone of development. Gopalakrishnan, Secretary General of the International Commission on Irrigation and Drainage (ICID): "a country must be food secure (self-sufficient) before any trade can begin. Can empty bellies attempt to trade, especially if the needs are sizeable and 'purchase power' is lacking?" (Sivakumar, 2004). The enormous US$200 million river inter-linkage plan again seeks to bring physical ('real') water to people in dry areas. This can be explained from a political determination never to be dependent on food aid and imports again.

In the mid-1960s India still imported more than 13 million tonnes of foodgrains.[23] However, the Green Revolution was boosting foodgrain production in, for instance, Punjab. India has a foodgrain procurement system through the Food Corporation of India (FCI) that guarantees a minimum support price (MSP) to producers. As a consequence of this policy, in 2002 India had built up a food stock of about 70 million tonnes (while only 22 million tonnes are needed for its buffer stocks for national food security). These stocks exist side by side with widespread poverty and malnutrition among those without access to resources needed for food production or to the market.

However, wheat and rice production has reached such high levels that stocks are growing while no ready markets exist.[24] Often wheat and rice crops replaced other crops for which a strong demand existed like oilseeds, pulses and coarse grains. This remarkable growth was made possible by a combination of incentive structures, input policies and infrastructural works. After a period in which national production was growing while imports continued, in the 1980s India became a net exporter of foodgrains. In the meantime, the fact that supply exceeded (effective) demand had turned the subsidy system from a benefit into a major financial burden to the central government. Social tensions created by the prevailing market conditions (with production costs increasing more rapidly than minimum support prices) arose.

Two earlier reports - one on reorganization of the electricity tariffs, the other on diversification - had warned against the growing problems in the foodgrain sector in the 1980s.[25] But to no avail; the government even stimulated groundwater extraction through electric pumping by keeping (flat) electricity rates low. This has always been a major

instrument for politicians to maintain and increase political support from rural voters. In the 1980s, with a 20 million tonnes increase of Indian paddy and wheat production in just a few years, demand for foodgrains was soon getting satiated. As procurement policies were now rapidly becoming a burden to the central government, it started imposing excessive quality standards. This led to further stagnation in procurement and increased farmer protests.

These developments and a growing awareness of the ecological impact of intensive wheat-paddy cultivation - primarily groundwater depletion - made it clear to the 1980s committee on diversification that a shift towards technically feasible and economically viable alternatives like pulses and oilseeds was badly needed. In advising along these lines, the committee had to maintain a shaky balance between farmer interests and state interests, state interest and national interests, and between the mechanisms of a market economy and the food needs of the poor without effective demand. The report states that "[…] the production of food grains could not be considered in excess of the real needs of the nation […]. Yet, due to the lack of demand, primarily because of the low purchasing power of the poor in the country, supplies of foodgrains appeared to be in excess" (Chief Minister's Advisory Committee, 2002: 6).

Paddy and wheat farmers were and still are not enthusiastic, because returns from alternative crops would be lower, market prices and demand less predictable, risks higher, and storage possibilities smaller. Nor were there any new incentives in agricultural policy to make farmers shift to alternative crops. Thus, while market prices for alternative crops were higher than the minimum support prices (MSPs) guaranteed by the government, for wheat and paddy the MSP was higher and even continued rising.[26] In this situation "the farmers have to per force continue producing wheat and rice crops in the state" (Chief Minister's Advisory Committee, 2002: 10).

The politics of virtual water and real water

In Punjab, stagnation of foodgrain marketing due to an agricultural policy based on perverse incentives to farmers and over-extraction of groundwater were the key issues. While 'virtual water' is not explicitly mentioned anywhere in the report, the virtual water debate plays an important role. The report pays much attention to excessive groundwater exploitation associated with intensive irrigated rice and wheat cropping in Punjab.[27] In the 'dark zones' of Punjab (Sharma, 2003b), the situation is critical and rapidly deteriorating.[28] The groundwater table is declining by 30 cm. per year, and the critical depth of below 10 meters has been reached in 28% of the state. In Central Punjab, which produces 65% of Punjab's rice and 64% of which is under rice crops, the situation is worse than average (46% below critical depth in 1994). Tube well irrigation provided by tens of thousands of wells covers 79% and canal irrigation 21% of total irrigation water needs (Chief Minister's Advisory Committee, 2002: 11). Punjab is paying a high economic, ecological, social and political price for being the granary of India. The current practices may "soon prove to be economically disastrous, socially untenable and politically unsustainable" (Chief Minister's Advisory Committee, 2002: Annexure 1).

The Committee, therefore, formulated radical measures to restructure agriculture. It stresses the need to "rationalize the utilization of scarce water resources of the state by the farmers, because it is a national resource belonging to the society as a whole and can not be allowed to be irrationally exploited". It also warns that the existing conditions "might lead to a situation where the possibilities of serious social unrest develop due to the lack of market clearance for the produce of the farmers" (Chief Minister's Advisory Committee, 2002: 17).

The Johl committee advices to replace at least one million hectares of paddy and wheat land by crops that guzzle less water and find a stronger demand in the market. Currently the central

government incurs a huge financial burden of procurement, handling, storage, damage and loss, and transport of a product that has no market demand. These expenses can be used to subsidize paddy-wheat farmers into alternative crops. To this purpose, the central government should provide the state government with funding: the 'Crop Adjustment Programme'. Note that, again, the debate is about supply and effective (market) demand, not about the societal need for food: "although these high stocks are in a sense illusory when viewed from the perspective of nutritional needs of the Indian population, because more than one-third of the people in the country cannot meet their minimum nutritional requirements for healthy living, yet this supply-demand mismatch is of serious concern, because it puts heavy financial burden on the state exchequer" (Chief Minister's Advisory Committee, 2002: annexure 1).

Are there any (partial) alternatives to these radical measures? The report mentions a number of changes in agricultural practices to make cultivation less water-intensive. Further, the development of more water-efficient paddy strains provides new solutions to the water scarcity problem. However, Sharma (2003a) wonders whether the current political-institutional environment is conducive to the introduction of alternatives to subsidized measures. His doubts concern the use of subsidies to undo the current conditions that are the product of earlier subsidy politics, and the political character of agricultural policy and the important role ascribed to the private sector in a readjusted agriculture.[29] The adjustment plan fully depends on central government subsidies as an incentive for shifting to alternative crops. These subsidies serve various purposes, both agricultural-economical and political. Sharma: "the state government not only stands to firm up its electoral base amongst farmers but gain patronage of the private companies in the process too. […] the future of this innovation, that neither attracts any large capital transfer to the state […] nor benefits the private companies by way of better market for their seeds […], remains obscure". (Sharma, 2003a).

In the meantime, contract farming is being propagated by the state government as the new future of a diversified agriculture in Punjab and other Indian states (Andhra Pradesh, Gujarat, Karnataka, Tamilnadu). Sharma concludes for Punjab that the "Government's obsession with diversification of crops has exposed farmers to the vagaries of corporate interests in the state" (Sharma, 2006).[30] Contract farming does not work, according to Sharma, because corporate interest in Punjab primarily goes to water-guzzling *basmati* rice. In addition, the quality argument is often used to reduce prices to farmers.

Where virtual water is the topic of debate, 'real water' politics are never far away. In 2004, Punjab enacted the Termination of Agreements Act. This act repealed existing agreements on inter-state water sharing. Punjab Chief Minister Singh legitimized this step, which threatens access to water for neighbouring states like Haryana and Rajastan, with reference to water scarcity and the need for agricultural diversification. The Chief Minister was cited saying: "the question […] before all of us should be about the future of Punjab [….] What Punjab is going through should be of concern to the nation because it is we, who helped the country build up a huge foodgrain bufferstock and protect its food security and help it run its food distribution system" (Gill, 2004).

The issue focuses, among others, on the 306 kilometre long Satluj-Yamuna Link (SYL) Canal linking Rivers Satluj and Yamuna. Since several years Punjab refuses to build the last section of the canal. This brought the state into conflict with the neighbouring state of Haryana. The Punjab government argues that water transfers would seriously affect its own farmers and make groundwater recharge impossible. There even was political pressure in favour of scrapping a section (section 5) of the Punjab Termination of Agreements Act that still guaranteed continued use of water from two rivers (Ravi and Beas) by the non-riparian state of Haryana (Tribune News Service, 2005; Venkatesan, 2004).[31]

Significantly, the conflict is not only about water but also about geopolitics: Punjab has a number of long-standing territorial claims on Haryana - to hand over the town of Chandigarh

and swap Hindi- for Punjabi-speaking areas in the border area between these states. These issues were formally dealt with in a 1985 treaty that also foresaw in the building of the Satluj-Yamuna Link by Punjab but was never implemented.[32] Both territorial and water issues can be traced back to the division of Punjab into the three smaller states of Punjab, Haryana and Himachal Pradesh in 1966.

In this context, the Punjab debate on crop diversification spawned by the crop adjustment programme plays an important political role in two ways. First, it has created a lot of unrest among wheat and paddy farmers. Many farmers fear they will suffer the negative consequences of crop diversification: reduced incomes, greater uncertainty and insecurity. Hence, they refuse to leave the wheat-paddy cropping pattern with its minimum support price and guaranteed marketing opportunities (Pandher, 2006; Shergill, 2005). In the perception of many farmers, crop diversification would not even be necessary if the state's river water would not be shared with other states. In view of this, it is not surprising that there is strong rural pressure on the state government to take a harsh stance in its real water negotiations. Farmers' organizations, for instance, demanded cancellation of all water treaties in which Punjab is involved.

Second, state politicians can use the affair for their own political purposes and power games. According to Swami (2004) "emotive mass mobilization on river water issues has been a way for politicians to deflect attention away from the very real agrarian crisis they face and the need for serious, constructive reform". Thus, the current focus on inter-state litigation, blaming and claiming hides the real issues of inefficient state irrigation policies, the cultivation of water-guzzling crops, and the need for water conservation and spread of water-saving technologies: "neither state government [...] seems willing to even discuss the possibility that the right kind of public investment and usage policies could be more important to their long-term water security than the loss or gain of water through the SYL canal" (Swami, 2004).

Conclusion: virtual water, real politics

On its journey from analytical concept to policy tool, 'virtual water' is now increasingly in vogue to make states more adaptive to resource scarcity pressures and related environmental shocks. In this article we have, first, introduced the concept of virtual water and pinpointed some of its advantages and pitfalls in analyzing issues of water scarcity and food security. A major contribution is that it highlights an otherwise hidden externality of global trade and its consequences; for food importers (focus of attention in virtual water analyses) as well as exporters (the focus of attention of water footprint analysis).

For states facing water shortage, virtual water is part of a wider palette of policy choices: moving water to people (infrastructure), moving people to the water (zoning, resettlement), importing food (virtual water), and demand management (saving water). A choice between a 'real water' and 'virtual water' policy, however, is a political as much as an economic choice. Constructing infrastructure means control of people and production, prestige, self-esteem and sovereignty. Virtual water import means central control of urban food supplies, freeing states from obligations to rural development and reducing resource base mining.

Without passing judgement on whether liberalization is a better idea than subsidized agriculture, our contribution sheds light on a number of political and practical reasons why states and social actors may resist a shift towards a market-dependent virtual water strategy in countries that have so far aimed for food self-sufficiency. It has allocative and (possibly destabilizing) social effects. It also impacts on established relations between countries (e.g. Ethiopia and Egypt), between states (e.g. Punjab and neighbouring states), and between states

and urban and rural interest groups in society (policy shifts away from rural producers' interests in both Egypt and Punjab).

A political economy approach to water scarcity recognizes that scarcity can be induced and conditional. Economically weak states that do not have matching funds to pay for food imports to make up for dry spells will have to accept loans and food aid with political strings attached. Losing food sovereignty may expose a state to embarrassing political blackmail on the international scene, as especially India has experienced. As water and food are political capital, and sovereignty is furiously guarded, states will think twice before opening up their economies.

What happens if a water-stressed state decides it is time to shift from food production to food imports but manages to keep quiet about it? Egypt has decided to cut its 'special relation' with the countryside and pacify its urban client base with food coupons. This has inevitably led to increased urbanization (accompanied by social and political tension). It was a mirage to expect that farmers can easily adapt to international price shocks. Egyptian farmers have, indeed, proved unable to compete with heavily subsidized imports and food aid from temperate zones, and moved to the city. In this sense, a virtual water policy is almost a virtual resettlement policy.

Virtual water also impacts on political relationships. States struggling to remain in control dread an image of scarcity and dependency, whether in the water domain or in the food domain. In Egypt, the change from export to import has long been too embarrassing to discuss. While the 'political' silence surrounding virtual water may have been comfortable for Egypt's water authorities in the short term, it has negated and perhaps postponed a more fundamental social debate on water and food. The question whether this silence is a good thing from an ethical perspective is legitimate, but actually beside the point: our contribution suggests that such issues will find their political expression anyway. In Egypt, the switch to imports and land liberalization has had livelihood effects which now find political expression, whether in social instability or parliamentary demands.

A public debate on the need for, and the price of, adaptivity may lead to demands for accompanying measures like compensation, or even to a decision against relying on virtual water imports. This case study suggests an interesting difference between virtual water imports and exports. In Egypt, the need to conserve water has opened up the arena for a debate on rationalising water *exports*. This can be framed as a relatively safe debate on demand management, efficiency and resource conservation. Virtual water *imports*, however, remain touchy due to the political taboo of dependency and vulnerability in a 'strong state'.

The Punjab case illustrates similar dimensions of the virtual water debate. First, like the Egyptian case, it illustrates the political character of decisions concerning water allocation and staple food production. However, in India there is no taboo on the political debate. The burgeoning debate shows that the proposed turn away from staple food production shakes up the whole system of established interests and relationships. Finding 'the' solution to scarcity in an arena where any policy move is heavily politicized and contested by one of the parties involved is not possible without inflicting pain on one or more parties; one party's solution is another party's nightmare.

The Indian situation is complicated by the differential or even contradictory interests of state and central government. The state's need for agricultural reform may be seen in the long term as a threat to national food self-sufficiency. It also goes against the short-term interests of food producers who enjoy the advantages of a subsidized and relatively secure market. However, doing nothing would ultimately chase farmers away from foodgrain production. Whatever direction the food policies of the state of Punjab and India will take, it is bound to be heavily politicized and have this complex component of multiple levels and scales of governance.

Where the Egyptian case underscores the importance of linkages between the virtual water debate and international transboundary 'real' water issues, the Punjab case shows similar linkages between virtual water policy and real water issues with political consequences for relationships between states as well as between Punjab and the national government. The pressures exerted by farmer organizations on the Punjab government to revoke water-sharing agreements with neighbouring states shows that rural populations are indeed a political force to be reckoned with. However, their current role is primarily the outcome of a long history of strategizing by political elites bent on extending their power into rural areas and winning the hearts of rural populations.

Therefore, we have to add virtual water strategies to those based on hydraulic mission, resettlement and demand management as strategies that have redistributive outcomes and political effects. It is crucial to be reminded that, when states show enthusiasm in exploring sustainable social and environmental water use, political sustainability is never far from their minds.

Notes

[1] Also called 'embedded', 'encapsulated', 'shadow' or 'supposed water'.
[2] The concept can also be applied to other (non-food; non-agricultural) goods and services (Hoekstra and Hung, 2003) and resources (e.g. land, labour).
[3] In relation to issues like urbanisation, globalisation, food aid, cheap food imports, and food habits.
[4] Some critics reject its claims to scientific value, seeing it as a badly chosen metaphor that does not add anything to existing concepts like 'food trade'; see below.
[5] In 2000, an estimated 67% of the world's total freshwater withdrawal went to agriculture. By 2025, water requirements in agriculture will have increased by 1.2 times, in industry by 1.5 times, and for domestic consumption by 1.8 times (UNEP, 2002).
[6] About one fifth of total world trade; 80% of virtual water flows is embedded in agricultural -, 20% in industrial products. Produced with an actual 1,2 trillion m3 per year, a 352 billion m3 saving is claimed, especially in crop production. The 'water footprint', which can be determined internally or externally, for individuals or nationally, expresses water use in relation to consumption (Chapagain et al., 2005; UNESCO, 2006: 392).
[7] Thus, every individual turning to meat consumption enlarges his water footprint by 4,000 liters a day!
[8] Wichelns (2005) discusses wheat production in Saudi Arabia, and Sudan grass and ethanol in the USA.
[9] Countries with high water availability like Japan, Portugal and Indonesia have high virtual water imports, while Afghanistan, Malawi, India, Thailand and Denmark are water-stressed but export much virtual water. Many water-rich countries have little arable land resources available for using their water resources in crop production. Virtual water flows often go from water-poor but land-rich countries to water-rich but land-poor countries (Kumar and Singh, 2005: 765; 785).
[10] Political and economic considerations like production increase for food self-sufficiency, poverty reduction and food security may be more important and constrain policy options for virtual water trade, especially for poor countries sensitive to price fluctuations on the food market (de Fraiture, 2004; Kumar and Singh, 2005; World Water Council, 2004). A contrary trend pushes countries away from food self-suffiency, to meet the growing water demand from other sectors (Kumar and Singh 2005).
[11] How much water is 'saved' also depends on the definition used: the volume used by the exporter or the volume the importer would have used in the absence of export? (De Fraiture, 2004 ; Hoekstra, 2003).
[12] Food grants are another option (Wichelns, 2004).
[13] A notable exception is the synthesis of an E-conference on virtual water, in which such topics are mentioned as important (see World Water Council, 2004).
[14] Hakimian tests virtual water for the Heckscher-Olin theory of trade which assumes that trade in commodities in fact means a trade in factors of production.
[15] We recognise that 'the state' cannot be reified, but is an ensemble of institutions which, in turn, consist of 'real people'.
[16] Water not only produces food but also low-cost energy and as such constitutes an engine for industrial development. See Bakker (1999) for the Mekong.
[17] Water and food sovereignty also have a powerful political identity value.
[18] Reddy argues that a virtual water import strategy will, for socioeconomic reasons, not be relevant for India. He sees, however, three important policy-related contributions of the concept: first, for critical consideration of exports (India being the fifth largest virtual water

exporter in the world); second, for making agricultural policy choices between states to optimize water use; third, to increase public awareness of the resource consequences of consumption (Reddy, 2005).

[19] Boutros Ghali: UN Secretary General; Serageldin: World Bank vice-chairman; Mohammed Abu-Zeid: president World Water Council. Not incidentally, these same people have often been quoted sounding alarm over impending water wars. Egyptians often chair or organise themes of international water meetings like Stockholm Water Symposium and World Water Forum (personal comm. T. Allan, 2006).

[20] quoted in 'Le second Nile', *Jeune Afrique* 27 Julyi-2 August 1999, pp 56-59.

[21] Just 5% of Egypt (an area the size of Switzerland) is inhabited by some 63 million Egyptians. Egyptian 'decentralisation policy' has resettled several hundreds of thousands of Egyptians and seeks to resettle 6 million more. We should not be taken in by the word 'overpopulated': Egypt is still less densely populated than Belgium and produces three times as much crop per hectare as Bangladesh. Mitchell's (1995) analysis of World Bank documents shows that the portrayal of Egypt as a space-constrained country in need of development is unfounded.

[22] We are very grateful to Dr. Sudhirendar Sharma, water management policy analyst and director of the Ecological Foundation, Delhi, India, for discussing with us the Punjab case and sending us a copy of the report of the Johl Committee.

[23] Unless stated otherwise, this section is based on information in the Johl Committee's report.

[24] The state produced 3 million tonnes of foodgrains in 1961, and 25.3 tonnes in 2000-2001. Thus, its share in total national grain production amounts to 12.9% (22.6% of wheat and 10.8% of rice) (Chief Minister's Advisory Committee, 2002).

[25] The committees responsible for these earlier reports had also been chaired by Johl.

[26] Thus, in the 1990/1991-2001/2002 period the MSP of paddy increased by 159%, that of wheat by 184% (Chief Minister's Advisory Committee, 2002: 8)

[27] Other environmental problems like soil degradation are also mentioned.

[28] In India, 'dark zone' refers to those areas with a severe problem of groundwater overexploitation. For Gujarat, see Prakash, 2005.

[29] Readjustment towards proposed crops will make farmers dependent on unstable and uncertain markets and buyback arrangements with the private sector.

[30] In 2005 some 80.000 hectares had been brought under contract farming in Punjab (Bhatt, 2005). Punjab has targeted one million acres or 10% of its total acreage by 2008. Main player in this reshuffle of agriculture is the Punjab Agro Industries Corporation (see Sarkar, 2004).

[31] Punjab claims that non-riparian states like Haryana are not entitled to water from the rivers concerned (see Swami, 2004).

[32] The Rajiv Gandhi - H.S. Longowal accord (Swami, 2003).

References

Allan, J.A. (1997). ""Virtual water", a long term solution for water short Middle Eastern economies? " SOAS occasional paper no. 3.

—. (1998). "Virtual water: a strategic resource. Global solutions to regional deficits". *Ground water* 36: 545-546.

—. (2002). "Water resources in semi-arid regions: real deficits and economically invisible and politically silent solutions". in A. Turton & R. Henwood(eds). *Hydropolitics in the developing world. A southern African perspective* (pp. 23-33). Pretoria, South Africa: African Water Issues Research Unit, Centre for International Political Studies (CIPS), University of Pretoria.

—. (2003). "Virtual water - the water, food, and trade nexus. Useful concept or misleading metaphor?" *Water International* 28: 4-11.

Arendt, H. (1969). *On violence*: Harvest, Harcourt Brace and Company.

Bakker, K. (1999). "The politics of hydropower: developing the Mekong". *Political Geography* 18: 209-232.

Beblawi, H., and G. Luciani. (1987). *The Rentier State*. Rome: Croom Helm for Instituto Affari Internazionali.

Beyene, Z., and I.L. Wadley. (2004). "Common Goods and the Common good: Transboundary Natural Resources, Principled Cooperation, and the Nile Basin Initiative". in *Breslauer Symposium on Natural Resource Issues in Africa*. Berkeley: Berkeley University of California, Center for African Studies.

Bhatt, R. (2005). "Focus: Punjab. Interview with Chief Minister Amarinder Singh". in *Frontline*.

Boelens, R., M. Zwarteveen, and D. Roth. (2005). "Legal Complexity in the Analysis of Water Rights and Water Resources Management". in D. Roth, R. Boelens & M. Zwarteveen(eds). *Liquid Relations. Contested Water rights and Legal Complexity*. Piscataway, NJ: Rutgers University Press.

Brown, L.R. (2006). *Rescuing a planet under stress and a civilization in trouble*. New York: W.W. norton & Co.

Bruns, B.R., and Meinzen-Dick (eds) 2000. *Negotiating Water Rights*. London: Intermediate Technology Publications / International Food Policy Research Institute (IFPRI).

Bush, R. (2004). "Civil society and the un-civil politics of the Egyptian state: land tenure reform and the crisis of rural livelihoods, civil society and social movement. UNRISD Paper No. 9".

—. (2005). "Mubarak's legacy for the poor: returning land to landowners". The Hague: Institute of Social Studies.

Cai, X., and M. Rosegrant. (2005). "Water management and food production in China and India". *Water Policy* 7: 643-663.

Chapagain, A.K., A.Y. Hoekstra, and H.H.G. Savenije. (2005). *Saving water through global trade*. Unesco-IHE Institute for Water Education.

Chief Minister's Advisory Committee on Agriculture Policy and Restructuring. (2002). *Agricultural production pattern adjustment programme in Punjab for productivity and growth. A report submitted to the Government of Punjab*.

Craswell, E.T. (2005). "Water and poverty in Southeast Asia. The research agenda from a global perspective". in *SEARCA regional conference on water governance and poverty*. Manila.

Crush, J. (1995). *Power of Development*. London: Routledge.

de Fraiture, C., X. Cai, U. Amarasinghe, M. Rosegrant, and D. Molden. (2004). *Does international cereal trade save water? the impact of virtual water trade on global water use*. International Water Management Institute 4.

de Haan, L. (2000). "Globalization, localization and sustainable livelihood". *Sociologia Ruralis* 40: 339-365.

de Haan, L., and A. Zoomers. (2005). "Exploring the frontier of livelihood research". *Development and Change* 36: 27-47.

Donahue, J.M., and B.R. Johnston (eds) 1998. *Water, culture, and power. Local struggles in a global context*. Washington, D.C.: Island Press.

Fishelson, G. (1994). "The allocation of marginal value product of water in Israeli agriculture". in J. Isaac & H. Shuval(eds). *Water and peace in the Middle East* (pp. 427-440). Amsterdam: Elsevier Science

Gill, P.P.S.a.P.B. (2004). "SYL: farmers endorse all steps taken by Amarinder". in *The Tribune online edition*.

Gleick, P.H., G. Wolff, E.L. Chalecki, and R. Reves. (2002). *The new economy of water. The risks and benefits og globalization and privatization of fresh water*. Pacific Institute for Studies in Development, Environment, and Security.

Hakimian, H. (2003). "Water Scarcity and Food Imports: An Empirical Investigation of the 'Virtual Water' hypothesis in the MENA region". in *Occasional Paper No. 46*. School of Oriental and Asian Studies, Water Issues Study Group (SOAS), University of London.

Hoekstra, A.Y. (2003). "Virtual water: an introduction". in A.Y. Hoekstra(ed.). *Virtual water trade. Proceedings of the international expert meeting on virtual water trade* (pp. 13-23). Value of water research report series No. 12. Delft: IHE.

Hoekstra, A.Y., and P.Q. Hung. (2003). "Virtual water trade: a quantification of virtual water flows between nations in relation to international crop trade". in A.Y. Hoekstra(ed.). *Virtual water trade. Proceedings of the international expert meeting on virtual water trade* (pp. 25-47). Value of water research report series No. 12. Delft: IHE.

Kumar, M.D., and O.P. Singh. (2005). "Virtual water in global food and water policy making: is there a need for rethinking?" *Water Resources Management* 19: 759-789.

Leach, M., and R. Mearns. (1996). "Environmental change and policy: challenging received wisdom in Africa". in M. Leach & R. Mearns(eds). *The lie of the land: challenging received wisdom on the African continent* (pp. London: Villiers Publications.

Lees, S.H. (2001). "Kinging off the *Kaiko*. Instability, opportunism and crisis in ecological anthropology". in E. Messer & M. Lambek(eds). *Ecology and the Sacred. Engaging the Anthropology of Roy A. Rappaport* (pp. 49-64). Ann Arbor: University of Michigan Press.

Ma, J., A.Y. Hoekstra, H. Wang, A.K. Chapagain, and D. Wang. (2005). "Virtual versus real water transfers within China". *Philosophical transactions of the Royal Society of London - B* 361: 835-842.

MacQuarrie, P. (2004). "Water Security in the Middle East: Growing Conflict over Development in the Euphrates-Tigris Basin ": Trinity College.

Merrett, S. (2003a). "Virtual water and the Kyoto consensus. A water forum contribution". *Water International* 28: 540-542.

—. (2003b). ""Virtual water" and Occam's razor".(pp.: Occasional Paper No 62, SOAS Water Issues Study Group, School of Oriental and African Studies / King's Collega London, University of London.

Mitchell, T. (1995). "The Object of Development: America's Egypt . Power of Development." in J. Crush(ed.). *Power of Development* (pp. London: Routledge.

Molden, D., and C. de Fraiture. (2004). "Investing in water for food, ecosystems and livelihoods".(pp.: Colombo, Sri Lanka: International Water Management Institute.
Mollinga, P.P., and C.J.M. van Straaten. (1996). "The politics of water distribution". Paper presented to the Proceedings of the International Conference on Water Policy, Cranfield University, 1996. (pp. 243-250).
Naredo, J. (1999). "El Agua y la Solidaridad. Ciudades para un Futuro mas Sostenible. El Boletin de la Biblioteca 11". in *El Boletin de la Biblioteca 11*.
Neubert, S. (2001). "Wasser- und Ernährungssicherheit. Problemlagen und Reformoptionen. " *Politik und Zeitgeschichte* 48-49: 13-22.
Pandher, S. (2006). "Crop diversification no solution to farm crisis ". in *The Hindu (www.thehindu.com)*.
Prakash, A. (2005). *The dark zone. Groundwater irrigation, politics and social power in North Gujarat* (Wageningen University Water Resources Series. New Delhi, India: Orient Longman.
Reddy, Y.R.K. (2005). "Time to promote virtual water measures". in *The Financial Express*.
Richards, A. (2003). "Modernity and economic development. The 'new' American messianism". *Middle East Policy* 10: 56-.
Richards, A., and J. Waterbury. (1990). *A Political Economy of the Middle East*. Bolder and London: Croom Helm.
Ritchie, M. (1992). "Free trade versus sustainable agriculture: the implications of NAFTA". *The Ecologist* 22.
Rosegrant, M.W., X. Cai, and S.A. Cline. (2002). *Global water outlook to 2025. Averting an impending crisis*. International Food Policy Research Institute (IFPRI) and International Water Management Institute (IWMI).
Roth, D., R. Boelens, and M. Zwarteveen (eds) 2005. *Liquid Relations. Contested Water Rights and Legal Complexity* Piscataway, NJ: Rutgers University Press.
Sarkar, R. (2004). "The return of the native. With a unique contract farming experiment, Punjab is trying to develop a diversified portfolio of crops that can compete with wheat and paddy. " in *Businessworld*.
Sen, A. (1980). "Famines". *World Development* 8: 913-621.
—. (1981). *Poverty and famines. An essay on entitlement and deprivation.* Oxford: Clarendon Press.
Sharma, S. (2002). "Water markets exclude the poor". in *The Hindu Business Line internet edition*.
—. (2003a). "Rooted in paddy". *India Together (www.indiatogether.org)*.
—. (2003b). "Stopping virtual water trade". in *India Together (www.indiatogether.org)*.
—. (2004). "Throwing away the problem with water". *Deccan Herald*.
—. (2006). "Signing the wrong contract".(Infochange (www.infochangeindia.org).
Shergill, H.S. (2005). "Punjab should stick to wheat, paddy. Farm incomes will fall with new crops". in *The Tribune online edition*.
Shiva, V. (2005). "Water Privatization and Water Wars".(http://www.zmag.org/Sustainers/Content/2005-07/12shiva.cfm
Sivakumar, S. (2004). "It's called 'virtual water' ..." in *The Hindu*.
Swami, P. (2004). "A canal crisis". in *Frontline*.
Tafesse, T. (2000). "The Hydro-Political Perspective of the Nile Question". in *Proceedings of the VIII Nile Conference.* Addis Ababa, Ethiopia.
Tribune News Service. (2005). "Scrap Sec 5 of termination of agreements Act: SAD". in *The Tribune online edition*.

Turton, A.R. (1999). "Precipitation, people, pipelines and power: towards a "virtual water" based political ecology discourse". MEWREW Occasional Paper No. 11.

Turton, A.R., and L. Ohlsson. (1999). "Water Scarcity and Social Stability. Towards a Depeer Understanding of the Key Concepts Needed to Manage Water Scarcity in Developing Countries". London: SOAS, University of London.

UNEP. (2002). *Vital water graphics. An overview of the state of the world's fresh and marine waters*. United Nations Environment Programme (UNEP).

UNESCO. (2006). *Water: a shared responsibility. The United Nations World Water Development Report*. Paris / New York: United Nations Educational Scientific and Cultural Organization (UNESCO) and Berghahn Books.

Venkatesan, J. (2004). "SYL canal row: Haryana seeks rejection of Presidential reference". in *The Hindu*.

Warner, J. (2003). "Virtual water, virtual benefits? Scarcity, distribution, security and conflict reconsidered". in A.Y. Hoekstra(ed.). *Virtual water trade. Proceedings of the international expert meeting on virtual water trade* (pp. 125-135). Value of water research report series No. 12. Delft: IHE.

—. (2005). "Mending the GAP: Hydro-Hegemonic. Stability in the Euphrates-Tigris Basin. In Wirkus, Lars (ed.) Water, Development and Cooperation. Comparative Perspective: Euphrates-Tigris and Southern Africa. BICC Paper 46, Bonn, pp. 184-215", Zentrum für Entwicklungs-Fragen (ZEFF-Bonn) and the Bonn International Centre for Conversion (BICC), 2005. (pp. 184-215).

Warner, J., and C. Johnson. (forthcoming). "Virtual water, real people. Useful concept or prescriptive tool?" *Water International (accepted)*.

Waterbury, J., and D. Whittington. (1999). "Playing Chicken on the Nile? The Implications of Microdam Development in the Ethiopian Highlands and Egypt's New Valley Project". *Yale, F & ES Bulletin* 103: 150-167.

Weber, M. (1964). *The Theory of Social and Economic Organisation*. New York: Free Press.

Wichelns, D. (2001). "The role of 'virtual water' in efforts to achieve food security and other national goals, with an example from Egypt ". *Agricultural Water Management* 49: 131-151.

—. (2004). "The policy relevance of virtual water can be enhanced by considering comparative advantages". *Agricultural Water Management* 66: 49-63.

—. (2005). "The virtual water metaphor enhances policy discussions regarding scarce resources". *Water International* 30: 428-437.

Windfuhr, M., and J. Jonsén. (2005). "Food sovereignty. Towards democracy in localized food systems." Warwickshire (UK): ITDG Publishing.

World Water Council (ed.). (2004). *E-conference synthesis: virtual water trade - conscious choices*. World Water Council. 4th World Water Forum.

Worster, D. (1992). *Rivers of Empire*. New York: Oxford University Press.