The Turning of a Screw

Social Resource Scarcity as a Bottle-Neck in Adaptation to Water Scarcity

Societal attempts of adaptation to water scarcity in fact run the risk of giving rise to mechanisms whereby the overall adaptive capacity of societies are undermined. This problem, arising from the need to apply an increased amount of social resources in order to adapt to water scarcity, constitutes a vicious circle that is often neglected in research on water resources management, and urgently needs to be investigated in order to identify unforeseen bottlenecks.

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The three stages of adaptation to water scarcity thus could be envisaged as "the turning of a screw," whereby a first-order scarcity of the natural resource water gives rise to a second-order scarcity of social resources required for successful adaptation to live with and develop under conditions of water scarcity. To visualize it, imagine a spiral movement, oscillating between a perceived scarcity of the natural resource water, and a perceived scarcity of the social means required to adapt to the original scarcity; all the while progressing towards ever increased amounts of social resources applied to adapt to the natural resource scarcity.

One must understand the stages of adaptation, the social resources employed at the stage and the possible challenges.

Three stages of adaptation to water scarcity

At the first level, societies attempt supply-side management ("get more water") involving dam building, pipelines, inter-regional water transfer schemes and the drilling of boreholes to abstract groundwater. Social resources employed at this stage mainly are large-scale engineering efforts. Current examples in the Southern Africa Development Community (SADC) region are the Kafue Gorge and Cunene Dam projects, the Lesotho Highlands Water Project (the largest water transfer scheme in the world bringing water to South Africa's industrial heartland from the Katse Dam in Lesotho), a pipeline from the Zambezi-Chobwe to Botswana and a pipeline from the Zambezi bringing water to Bulawayo. A low-tech example of supply-side management is rainwater harvesting, practiced insome parts of the Sahel, Eastern Africa and the SADC region.

At the second level of (increased) adaptation, when further supply-side management no longer can deliver the amounts of water required by continuing population increases and desirable welfare increases, societies are forced to employ demand-side regulation, first by end-use efficiency measures ("get more use out of every drop"). Social resources employed at this stage are institutional change, new regulatory frameworks and economic incentives for water saving (plus the scrapping of previous economic disincentives, such as subsidies). A current example from the SADC region is increased water pricing in Namibia.

"At different turnings of the screw, distinctive challenges are encountered."

At the third level of (further increased) adaptation, societies are forced to abandon the traditional goal of food self-sufficiency, and replace it by food security. This is the ability to produce sufficient economic value in industries and cities, or by non-renewable resource abstractions, to be able to import the required amount of food. This is the second stage of demand management, namely so called allocative efficiency ("get more value out of every drop"), entailing imports of "virtual water" – the amount needed, but not available, in order to grow the food now imported instead. The need for social resources at this stage are particularly acute, since allocative efficiency entails enforced and large-scale social restructuring. For example, people now have to find jobs and livelihoods in cities and industries instead of in agriculture. A current example from the region is Botswana, which explicitly has abandoned food self-sufficiency in favor of food security.

At different turnings of the screw, distinctive challenges are encountered.

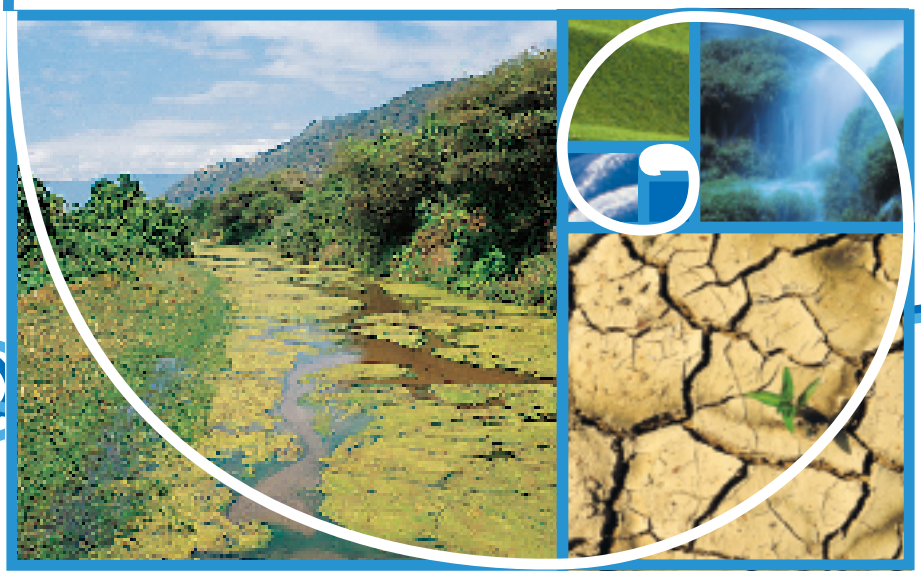
Challenges encountered in the first "turning of the screw"

At the first turning of the screw, the phase of large-scale engineering projects, the problem is perceived as water scarcity, pure and simple. It is a first-order scarcity, and the solution is to mobilize more water – supply-side management. Challenges encountered are how to deal with conflicting interests between countries, and between groups of users and sectors within countries.

Internationally, the mechanism of conflict is the perceived zero-sum, upstream-downstream game, which gives rise to fears of "water wars" as a result of one country (most often upstream) holding other countries ransom to its own capture of water resources. Note, however, that this risk of conflict is relevant only as long as water policies of countries are focused on the first turning of the screw, attempting adaptation to water scarcity solely by supply-side management. At all later stages, the pressure to "get more water" diminishes as societies adapt to living with water scarcity. [Note also that all empirical evidence points at the risk of international conflicts in fact giving rise to cooperation between countries, albeit with possible tensions continuing, rather than conflict. A number of treaties and cooperative administrative bodies on shared rivers exist in the region.]

Locally and regionally within countries, the conflict mechanisms are those described by the concept of "environmental scarcity." This involves demand-induced scarcity, which ensues from the water needs of increasing populations with justified demands for increased welfare; supply-induced scarcity, with rivers running dry, lowered water-tables, and polluted groundwater and surface water courses; and structural scarcity, as more powerful segments of water users confiscate a larger part of the scarce resource, resulting in the ecological and economic marginalization of the less powerful.

Conflicts may also arise between, for example, the often large number of people displaced by dam-building projects and the state (an example in the region is the Epupa Falls project in Namibia); and between frustrated and water-starved farmers in areas transversed by large-scale water transfer projects (an example is farmers in Zimbabwe along the projected Zambezi-Bulawayo pipeline), on the one hand, and the state on the other.



Challenges encountered in the second "turning of the screw"

Societies attempt to adapt to water scarcity in the second turning of the screw, the phase of institutional change, The solution then is to save water by doing more with every drop – end-use efficiency. To do this, the institutional framework of rules and regulations, administrative bodies and economic incentives are changed in order to bring more water-efficient modes of usage into practice. Water scarcity now becomes relative, since the available amount of water depends on the social willingness and economic rationality of employing more labor and technology-intensive, but less water-consumptive modes of production. On a high-tech level, examples are drip-irrigation, re-circulation of wastewater and water-efficient appliances.

"The social resources during the third "turning of the screw" are taxed to the outmost, while the supply of social ingenuity may be severely hampered by social conflict."

The means whereby this more water-efficient mode of usage is brought into practice are, however, not without social costs. Institutional frameworks (rules and regulations, administrative bodies and economic incentives) are always designed to facilitate a certain mode of water use, and to pave the way for a particular group of water users, be they cooperative farmers, large-scale irrigators or parastatal hydroelectric companies.

To change such an institutional framework is not only cumbersome and tedious; it will also infringe on the vested interests of societal segments that may have become very powerful and entrenched over time. The potential conflicts at this stage will thus occur within countries, and most likely exhibit a fault-line with the state (trying to impose new regulations and economic incentives) on one side, and so-called narrow coalitions of previously subsidized large water users on the other side.

Challenges encountered in the third "turning of the screw"

At the third turning of the screw, the phase of large-scale social restructuring, the second stage of demand-management, allocative efficiency, comes into play. The problem at this phase is perceived as achieving a quantum leap in water efficiency by maximizing the economic return of every drop of water mobilized in society. It is a logic that, once realized, follows almost inevitably from the institutional change and new economic incentives introduced during the previous stage. The solution, then, becomes a conscious effort to redirect water to cities and industries, yielding some 20-70 times higher economic returns to water compared to agriculture. Concurrently, a shift in food procurement strategy takes place, from food self-sufficiency, based on what a country can grow internally, to food-security, based on the degree to which a country can afford to import the food it no longer can find the resources for growing, water prime among them. It is thus a strategy of relying on virtual water.

Conflicts at this stage do not arise as much over competition for the amount of water diverted to cities and industries, since a comparatively small proportion of the water used for agriculture will suffice for those needs. The social challenge is much more basic and has to do with agricultural expansion as such no longer being an option. Thereby the issue of livelihoods, as distinguished from just food procurements, becomes pivotal.

This challenge is enormous, since it involves creating new jobs in cities and industries to compensate not only for the stagnating or even shrinking number of jobs in agriculture, but also to do this at a time when populations in many cases still are growing rapidly, and people have justified demands for not only livelihoods, but better lives. The conflicts likely to occur are extremely difficult to predict. In all probability they will not be directly coupled to changing water allocations, but to widespread ruptures in the social fabric, stemming from the inability to incorporate such a large and growing proportion of people into the modern sector, at the pace required by both continuing population increases and the structural change from agriculture to cities and industry. The social resources during this phase are taxed to the outmost, while the supply of social ingenuity may be severely hampered by social conflict.

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Editor's Note: The authors are currently involved in a SADC project to identify, discern and describe societal attempts of adaptation and their relation to adaptive capacities.