WATER AND CONFLICT

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Contents

UNESCO – EOLSS SAMPLE CHAPTERS

Summary

The task of managing the process of adaptation to water scarcity essentially entails learning how to deal with: (a) the conflicts encountered as a result of the natural resource scarcity itself (both international and internal conflicts about the distribution of the resource); and (b) the conflicts encountered as a result of the social resources applied to overcome the natural resource scarcity (internal conflicts, often directed at the state, and therefore a dangerous impetus for external conflict). Countering the widely held opinion that water scarcity entails prime risks of international conflicts over shared water resources, it is argued that the risk of conflicts within countries in fact is larger, and that the risk of international conflict is derived from the necessity to avoid conflicts within countries, caused not by water scarcity itself, but by the institutional change required to adapt to water scarcity. The potential risks of conflict thus are better analyzed as caused by a social resource scarcity, rather than by a natural resource scarcity of water.

1. Introduction

The issue of water conflict belongs strongly to the post-cold-war era with its changing perceptions of security. The emergence of “Water Wars” as a major threat of international conflict may be dated to a 1991 *Foreign Policy* article with precisely this title by Joyce Starr. Since then a number of official views have been expressed along the lines of “the next war in the Middle East will be over water, not politics.” The issue to be addressed here is simple: Does this represent the most informed view of the future consequences of water scarcity? For a simple analytic framework, let us start with a few notes on the concept of scarcity.

Scarcity by definition entails increased competition for a resource with increased economic value. Attempts to overcome scarcities are sought through two distinct mechanisms: supply side regulation and demand side regulation. Competition, however, also entails a potential for conflict. Two levels of conflict are easily identified: international and within countries (national). Combined with the two mechanisms for adapting to change we get the convenient four-field diagram below.
Table 1. Causes and types of water conflicts:
(numbers refer to the arguments in the text)

Water conflicts bycauses (right) and types (down):	Attempts to increase supply	Attempts to manage demand
Conflicts between countries	(1)	(2)
Conflicts within countries	(3)	(4)

Table 1. Causes and types of water conflicts (numbers refer to the arguments in the text)

Following this simple analytic framework, it is the argument of this article that:

1. Attempts to increase supply are the driving force for water conflicts between countries;
2. attempts to manage demand will by definition alleviate this pressure;
3. the driving force for conflicts within countries at present are attempts to increase supply, resulting in competition between different sectors of society and different groups of population; but that
4. attempts to increase supply by necessity will be superceded by demand regulation.

Consequently, from a policy point of view, the most important potential cause for conflicts over water will be mechanisms for conflicts within countries caused by the new demand management practices that are necessitated by water scarcity. To summarize the argument, in water affairs we will increasingly experience a shift of focus from square (1) above to square (4).

In order to develop the appropriate policy responses, there is a need for an understanding of how water scarcity will develop over the medium period ahead (up to around 2025). There is also a need for an overview of theories and societal tools for

UNESCO – EOLSS SAMPLE CHAPTERS

dealing with international water conflicts, and a similar overview of societal tools for demand regulation, including theories of links between water scarcity and conflict within countries.

2. Water Scarcity

Scarcity by definition implies diminishing resources and/or pressure on the supply of available resources from an increasing demand. Analyses of water scarcity conventionally uses geophysical inventories of available water resources as a point of departure. This is combined with a socio-economic analysis of the driving forces behind increasing demands and their evolution over time, resulting in projections for water scarcity, according to some predefined level of water availability per capita. At best, these projections are adjusted for the adaptive economic and technological measures societies inevitably will undertake in the face of growing water scarcity.

UNESCO – EOLSS SAMPLE CHAPTERS

2.1 Availability of Water Resources

There is general awareness that water is a scarce resource. At the same time there is also a common perception that an abundance of water could be mobilized if socio-economic and technological constraints could be overcome. Both scientific and policy interests would gain from a greater clarity of perception on how much of the annual flow of water over the continents really is appropriated and how much is left for future increases of demand. Such a calculation has been made by Postel, Daily, and Ehrlich (1996). They start by calculating how much of the total evapotranspiration humans have appropriated, and arrive at the conclusion that rainfed agriculture uses up a quarter of all the water that evaporates from the leaves of all the green plants on the planet, which means that the three remaining quarters must suffice for all of the rest of the terrestrial eco-systems.

A number of items should be noted here: Evapotranspiration is the larger part of the water cycle over continents, roughly three times the amount of water that flows over and through the ground. It also represents the final “consumption” of water; until water is evaporated from the ground or through the transpiration of plants, it remains accessible for potential use—and reuse—by societies and ecosystems. This means that agriculture by principle remains the “end-use” of societal water-use. It is also the largest societal water-user by far.

Evaporation (from the ground) is also called “the thirst of the atmosphere,” and plays an extremely important role in water scarcity in arid countries. Here, the water availability is radically diminished by evaporation, and rains that may fill water reservoirs in temperate countries may not even suffice to give any usable infiltration into the ground or runoff to rivers at all.

From a conflict-analysis point of view, however, evapotranspiration as such (through rainfed agriculture) is not a cause of conflict. Conflicts are about getting more water for societal use, particularly for irrigated agriculture. Of more immediate policy interest therefore is the calculation of available runoff, that is, the renewable flow replenishing all rivers, lakes, and groundwater reservoirs, from which all water for irrigated agriculture, societies and industries is taken. A figure of around 12 000 to 14 000 cubic kilometers (km^3) per year is commonly cited in the literature. It is very important to understand the process by which this figure is arrived at, and what it implies for the potential increase of supply. Postel et al. use a figure of 40 700 km^3 for total global annual runoff. The *accessible* runoff, that is, the flow in rivers and through groundwater reservoirs that is geographically accessible and available at the time it is needed (e.g. the growing season), is much smaller for three reasons:

(a) The distribution of runoff over the continents is uneven and does not match population concentrations. Asia has 60 percent of the world's population but only 36 percent of the runoff. South America with five percent of the world's population has 25 percent of the runoff.
(b) A large part of the runoff, both in the tropics and in the northern areas, is inaccessible both today and in the foreseeable future.
(c) Water must be available at the time it is needed, both for irrigated agriculture, industry and domestic uses. This means that the highest reliability comes from that part of global runoff that is constituted by renewable groundwater or the minimum river flow. This part only constitutes 27 percent of the geographically available flow.

By adding minimum flow in rivers and that part of surface runoff that ends up in dams, and deducting that part of the flow that is geographically inaccessible, one gets an estimate of the permanently accessible flow. The result is a mere 9000 km^3 per year. To this should be added the approximately 3500 km^3 runoff that is regulated by large dams. The result is the widely circulated figure of 12 500 km^3 per year of accessible runoff, roughly a third of the total annual global runoff of 40 000 km^3. In order to determine whether this available supply represents a resource constraint, and thus a potential source of conflict, we must get an understanding of present societal water use.

UNESCO – EOLSS SAMPLE CHAPTERS

2.2 Water Use by Category and Sector

Three categories of water use can be identified:

1. Withdrawals, or abstractions, that is, water taken from rivers, lakes, and aquifers for human activities (also known as water demand or water use).
2. Consumption, i.e. water that is withdrawn in such a way that it cannot later be reused (mainly by agriculture but also as a result of, for example, pollution).
3. Human needs for what is known as "in-stream purposes" (mainly to maintain wetlands and aquatic eco-systems, water-courses as transportation routes, or for aesthetic and recreational purposes).

Postel et al calculate that human appropriation of the accessible runoff now amounts to fully 54 percent. The amount actually withdrawn is roughly twice as much as the amount left for in-stream purposes. The amount actually consumed is calculated to be roughly a third of the total human appropriation. To understand how this figure is arrived at a more detailed analysis of water by sector is illuminative.

A commonly cited figure of 65 to 70 percent of global societal water withdrawals makes agriculture by far the largest water user. It should be noted that this figure refers to the withdrawal by irrigated agriculture from the accessible runoff (rainfed agriculture, the largest part of agricultural production, is by definition not included here). The amount actually consumed in agriculture varies according to climate, types of harvests, and water use efficiency by irrigated agriculture. Postel et al calculate with a figure of 65 percent consumptive use.

A benchmark figure for industrial withdrawals is 20 to 25 percent. Industrial water use has leveled off or declined in many industrial countries, but is still increasing in large parts of the developing world. In contrast to agriculture, only a small fraction, roughly 9 percent is consumptive use.

The benchmark figure for household water withdrawals is 5 to 10 percent of the total societal withdrawal, of which the consumptive use is 17 percent. Other consumptive uses noted by Postel et al and not captured by the rough classification above are evaporation losses from large dams, where as much as five percent of the amount stored may be lost every year. Importantly, the amount set aside for in-stream purposes depends on the need to dilute pollution to an acceptable level.

From a policy point of view the purpose of such a detailed analysis as the one above is to gain a realistic understanding of the potential for increasing supply, to which the discussion now turns.

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UNESCO – EOLSS
SAMPLE CHAPTERS

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Biographical Sketch

Leif Ohlsson, PhD, is a researcher and analyst of conflicts related to environmental and social resource scarcities at the Department of Peace & Development Research, University of Göteborg, Sweden. He has edited *Hydropolitics: Conflicts over water as a development constraint*. London: Zed Books, 1995.

UNESCO – EOLSS
SAMPLE CHAPTERS