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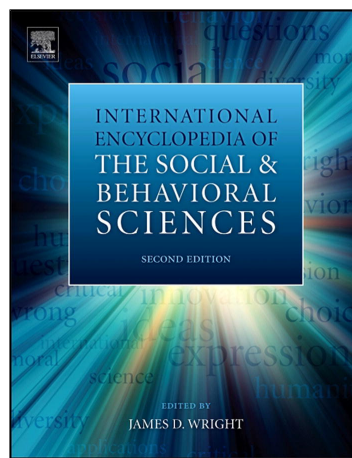
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Water Wars

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Abstract

It is often said that future wars will be fought over water. These water wars, defined as armed conflicts between two or more states over the scarce water resources, are predicted to take place over the sharing of international rivers. Sharing water is expected not only to increase competition and conflict, but also to contribute to build engagement and cooperation. In recent years, many water treaties have been negotiated and signed. However, these treaties face danger to their survival as allotted water in the existing sharing agreements in most of the cases is unable to meet the increasing demand. Possible impacts of global climate change have also brought further uncertainties to the peaceful sharing of scarce water resources.

Growing Water Scarcity

Water is critical for human survival, economic development, and the environment. Certainly, few other resources affect so many areas of the economy or human and environmental health. Seventy-five percent of the earth's surface is covered by water; however, most of it is saltwater, and much of the remaining quantity is stored in ice caps, glaciers, underground, within soil, in the atmosphere, and in living beings. Excluding lakes, only about 2000 cubic km of fresh water, found principally in rivers, is available for human consumption (Falkenmark, 1990).

More than 80% of this total global run-off is concentrated in the northern temperate zone, which hosts a small portion of the world's population (Postel, 2000). In the tropical and arid areas, where most of the population lives, the remaining water run-off resources are also distributed unevenly. Almost all of the developing countries are in the arid, semiarid, and tropical regions; many of them are facing severe water shortages. The world's population is now increasing by about 78 million people every year, and 95% of this growth is taking place in developing countries of Africa, Asia, and Latin America. This high population growth in the developing countries has multiplied pressure on fresh water resources (Swain, 2001). This problem is further exacerbated in these regions by their efforts toward rapid industrialization, massive urbanization, and agricultural intensification.

Developing countries are increasingly meeting growing water demand by building large dams for water storage, using a canal to divert water from one area to another or extracting ground water. The requirement for hydroenergy and commercial fishing has also contributed toward human intervention in water. Dam building, which has almost become obsolete in North America and Western Europe, is still considered the panacea for water shortage problems in many developing countries. However, dam projects submerge vast areas of land and forest and displace their inhabitants. There are millions of people who have lost their homes and livelihoods due to these large water projects (Swain, 2010).

The developing countries are primarily agricultural economies. To provide food to their growing population and also to achieve food security, these countries use proportionately more water on the agricultural sector than the industrial sector. Many

developing countries already face serious problems in meeting rapidly increasing water demands of their population. In many developing countries, urban centers are rapidly increasing. Moreover, some developing countries are also industrializing faster. The expansion of urban areas and industrial sector has further added to the increasing water demand. With greater pressure being placed on the scarce water resources, over-exploitation has resulted in acute shortages. Faced with such scarcity, water has increasingly become a source of social tension, bringing further competition and creating conflict within and between countries. However, these water conflicts not yet transformed to water wars, defined as armed conflicts between two or more states over the scarce water resources (Wolf, 1998). For a detailed analysis on conflict structure, please see the article Conflict: Organizational.

Water Scarcity and Conflict

The link between water resources and conflicts can be investigated in at least two different dimensions. First, in a conflict, the deliberate targeting of water storage facilities may be directly responsible for inducing water scarcity or reducing the water quality of the opponent. Thus, water scarcity becomes part of a military strategy and military behavior. Water supply is affected by conflicts, and fresh water resources also have the potential to cause or contribute to the emergence and/or escalation of conflicts among states or human groups.

Dispute over river water sharing usually comes up among the riparian states on three grounds: quantity, quality, and control. The incompatibilities of the last two issues (quality and control) are relatively easier to address with some financial and technical support (Swain, 2001). The quality issue, which had been the cause of disagreement among the riparian states in Europe's Rhine and Danube and North America's Colorado River in the past, has resulted in peaceful and cooperative arrangements. The disagreement over control of the Columbia River and Parana River in the relatively water abundant Americas has been settled for some time.

Water is not easily replaced; so, the problem of its reduced quantity is more difficult to address. The quantity factor in many cases threatens to destroy existing cooperative arrangements and forces the parties to take conflicting positions.

Global water consumption is rising steeply, and the lack of adequate supplies of water is a problem in many parts of the world. Water tables are falling increasingly in every continent. Several countries, most of them in the South, already face serious problems in meeting rapidly increasing water demand. Rivers are one of the most important sources of fresh water for human consumption. In scarcity situation, river water has increasingly become a source of tension as users are worried about the present or future availability of water supplies. Conflicts over water can be observed at different levels of society. Water issues can create new conflicting groups within a state, and in other cases, infuse incompatibility among the states. Even though water disputes are omnipresent they tend to become more complex and difficult when they concern international rivers.

Managing Shared Water Systems

According to the Trans-boundary Freshwater Dispute Database of Oregon State University, approximately half of the global fresh water is available through international basins in the world (UNEP, 2002). Overall, 145 countries have territories that include at least one shared river basin. Water has been frequently called the oil of the twenty-first century. Many believe that the dependence of these poor countries on an external water supply may force them to reorientate their national security concerns in order to protect or to preserve such availability. Such potential for conflict has brought global water issues into the arena of 'high politics.' United Nations (UN) officials and World Bank analysts regularly proclaim that "the previous war was about oil, the next war will be about water" (Morrisette and Borer, 2004).

Several countries are currently in dispute over the sharing of their common rivers. Some on-going international rivers inducing conflict are the Jordan, Nile, Euphrates-Tigris, Danube, Indus, and Ganges. With the exception of the Jordan basin (Cooley, 1984: 3-4), most international water conflicts have not led to physical violence, although the threat of the use of arms in these cases is not uncommon. As early as the mid-1980s, US intelligence services estimated there were at least 10 places in the world where war could break out over the shortage of fresh water supplies, with the majority located in the Middle East (Starr, 1991: 17).

Most developing countries require financial and technical aid and assistance to undertake large water projects. Very few countries can undertake expensive water projects on their own, coming at a heavy economic and political price (e.g., GAP project in Turkey, Three Gorges Project in China, and Narmada Project in India). In the post-Cold War period, it has become increasingly difficult to receive external support for a disputed project in an international basin. The end of the Cold War also stopped the alternative source of borrowing from the Eastern Bloc.

Water scarcity has caused a few minor skirmishes but no war has yet been fought between states. However, wars are very rarely fought over one issue. So, establishing water as the sole reason to cause violent armed conflict between two nation-states is not that easy. Water might have played a contributing role in a war through its contribution to food scarcity,

population displacement, and ethnic alignment, which can lead to internal disturbances and political instability resulting in war. So, the real contribution of water scarcity to a war may not be properly examined through a conflict mapping data set, which only captures immediate causes. In-depth studies of individual wars might reveal the real contribution water scarcity has on instigating wars in different parts of the world.

Shared water is expected not only to increase competition and conflict, but also to contribute to building engagement and cooperation among riparian states. Due to mutual dependence, the withdrawal or pollution of river water of one riparian state can potentially not only lead to disputes, but also bring cooperation in the basin. Particularly in the last two decades, several competing riparian countries have moved toward establishing regimes and institutions for cooperation. Shira B. Yoffe and Aaron T. Wolf (1999) count the signing of 145 water-related treaties in the last century. There have been a number of very successful cases of cooperation among riparian countries that address pollution and management issues of their shared waters. The agreements among the riparian countries of the River Rhine, Colorado, and Parana are some of these examples.

Agreements on international rivers have not been limited to addressing water quality or management issues. In the last two decades, several international river basins have also witnessed a trend toward reaching agreements on quantity allocation as well. Competing riparian countries of the Mekong, Jordan, Ganges, Nile, and Zambezi Rivers have signed sharing arrangements in the 1990s. The signing of the agreements on these important rivers in conflict-prone regions has been regularly referred to downplay the possibilities of 'water war' scenarios.

River Water Sharing Agreements

An agreement can be more likely among the contending riparian states over the quantity allocation of a river resource, when there is enough unused water left in the river. Agreement on the Indus River system became a possibility in 1960 between two traditional rivals, India and Pakistan, because nearly 80% of the river water was running into the Arabian Sea, unused by both basin countries. One year before the Indus Agreement, another agreement on the sharing of the Nile River was reached between Egypt and Sudan. The 1959 Agreement became a possibility since a large amount of the run-off remained unallocated from the 1929 Agreement. However, with increasing water demand upstream and less availability of unused water, these rivers have already become a source of serious tension among the major riparian countries. The increasing riparian demand has also raised doubts about the continuation of the existing water sharing arrangements on the Euphrates-Tigris river system. The hope for further exploitation has not only enabled agreements for the Indus, Nile, or Euphrates-Tigris Rivers in the past but also facilitated agreements in recent years. Bangladesh signed the 1996 treaty with India with the hope to build a barrage on the Ganges at Pangsha, downstream of Farakka in Bangladesh. The 1995 Agreement signed among the lower Mekong basin countries became a possibility as the slow-flowing Mekong River

provides a lot of potential for further exploitation. The Zambezi river basin is another example of riparian cooperation based on the hope for the further exploitation.

Water-scarce riparian states have been able to find cooperative solutions in the last two decades rather than enter into violent conflict. Signing of agreements on water sharing may be easy, but the real problem is how to keep the agreement viable. The compliance part poses real challenges. The agreement needs to stand the test of time. Many agreements in recent years have been reached about how the water should be shared. In spite of reaching agreement, riparian discontent has not dissipated as many upstream countries believe they should have complete control over the flow of the rivers and withdraw water according to their demands. In some cases, where the downstream states are often more powerful in economic and military terms, they challenge upstream rights over the river flow, like Egypt, India, and Israel.

Global Climate Change and Uncertainties

Global climate change brings further uncertainties to the smooth functioning, even survival, of these recent international water agreements. With increasing temperatures and rapidly melting glaciers, lesser water supplies will be available to farms and cities during summer months when irrigation demand is high. Some parts of the globe may experience sizable reductions in precipitation, or significant changes in the timing of summer and rainy seasons. Climate change will increase supply side pressure for river water management, and global warming may also contribute to the demand side pressure due to increased demands in domestic, irrigation, industrial, and ecological use (Arnell, 1999).

As climate change can potentially affect water supply and demand patterns, sharing of scarce water resources in the arid and semiarid regions will become the most likely security challenges in the near future. Climate science has been able to provide a basic understanding of how the hydrological cycle will change at the global level, but the predictions of water demand and supplies at the regional and basin level is still far from reaching any consensus. The projected impacts of global climate change over fresh water may be huge and dramatic, but they will not take shape on the same scale in every geographical region. Even within an international river basin, the effects will vary depending on the location. This further enhances the uncertainties and anxieties over the water availability in the shared river systems. In this context, both domestic and international water laws and policies are not well equipped to meet the challenges posed by the global climate change (Eckstein, 2010).

Existing water sharing arrangements between the riparian countries of international rivers in most cases provide some mechanisms to adjust to the run-off variability while agreeing on allocation of fixed quota of water. Of 145 river agreements signed in the last century, approximately 37% dealt with quantity allocations (Wolf and Hamner, 2000). Variability of river water flows can very well reduce the longevity of these river agreements (Drieschova et al., 2009). Usually, the regular water sharing agreements tend to be based upon the assumption that any resulting shortages will be for a short duration

only and that they can address the issue with temporary reallocation methods (Tarlock, 1999–2000). However, climate change can not only bring long-term increases or decreases to the average run-off of the river system, but also influence the variability of those flows that require flexibility to be the part of the water sharing framework to cope with emerging situation.

As global climate change brings long-term changes to the volume and pattern of run-off in shared river systems, it becomes crucial to examine the suitability of existing agreements to address this challenge. Climate-related changes might require comprehensive adjustments in the on-going water management structure of international rivers. This comprehensive effort might ask for the water sharing arrangements to be flexible and competent in allocating reduced and surplus water flow, maintaining certain water quality level, sustaining ecosystems, controlling flood, and protecting existing water development infrastructures. Thus, the river sharing arrangements need to have the provisions for information sharing, conflict management mechanisms, flexibility to adjust to the uncertainties, and endeavor for basin-based development strategy.

Basin countries must be under obligation to regularly exchange data and information among each other to monitor and manage changing conditions affecting shared water. In case of any dispute or disagreement over shared water management, there must be provisions available to basin countries to manage them as soon as possible. International river water management regimes and institutions require a flexible mandate to plan, operate, and implement, in order to cope with changing climatic conditions. The emerging unprecedented situation due to changes in climatic patterns requires basin countries to cooperate and act collectively (Swain, 2012).

There is no doubt that climate change poses extreme challenges to water resource management in international river basins in the South. Maarten De Wit and Jacek Stankiewicz (2006) demonstrate the dramatic potential effects of relatively small changes in rainfall due to climate change over the perennial drainage of the river. Moreover, climate change might cause extreme weather events, water shortages, changing sea levels, or melting glaciers that can generate serious threats to critical river water management infrastructure. While the importance of adjustment of flow variability in water sharing is crucial, many of the existing provisions within agreements are not adequate enough to meet the scenarios that global climate change models project. They lack enforcement and generally depend upon 'ideal' riparian behavior in case of eventuality. However, this approach may overcome run-off deficits in the short term, but climate change poses the risk of long-term flow reduction that would severely test existing provisions.

To reach an agreement that meets all competing and fluctuating demands for water in an international basin is in fact a very difficult task. Hydro diplomacy thus needs to adopt a total resource view where river water is seen as a key input for development and growth in the basin. The challenges are limited not only to technical and economic sectors, but also to crucial water sector reforms, which is political by nature. Moreover, the task of hydro diplomacy will no longer be limited to basin-based regimes and institutions; it must achieve effective water management in the face of climate change and must influence the supporting pathways from local, national,

and international policies and practices. In the past, river sharing matters could be effectively covered by a few negotiators trained specifically to deal with water issues. But today, hydro diplomacy needs not only to involve itself in an increasing range of fields (such as energy generation, food production, human rights, and health issues) but also to take into account the possible impacts of climate change (such as precipitation pattern, glacier melting, temperature increase, and rising sea water encroachment on fresh water systems).

Water Resource Governance and Managing Water Scarcity

There have been numerous endeavors to establish and strengthen international institutions and create an international legal framework for the management of international rivers. Global initiatives on the matter of fresh water have brought the international river sharing problem to the fore. International community is engaged in an on-going process toward establishing a common legal framework for the sharing of international watercourses at the global level.

In the first part of this century, the Territorial Sovereignty Doctrine (absolute sovereignty over waters flowing within a country) and the Natural Water Flow Approach (the river belongs to all the riparian states) came up in addressing the issues over the sharing of international rivers. Unfortunately, neither the territorial sovereignty nor the natural water flow approach provided a solution as they were based on an individualistic and anarchical conception of international law. The failure of these two legal approaches led some to think of sharing the rivers on an economic basis. According to this approach, the whole river basin is regarded as an economic unit irrespective of state boundaries and the waters are vested in the community of the users or divided among the co-riparian states. This joint approach includes joint planning, joint construction, joint management, and sharing of expenditure on construction and maintenance.

The idea of a single basin approach is attractive to economists and water engineers because it allows them to consider the international rivers as single hydrological units and plan accordingly. However, there are many difficulties involved in sorting out the externalities among the various riparian nations. The regulation and management of international river basins with so much concentration of power in the hands of nonpolitical commissions is an exception rather than the rule in the interstate practice. Owing to obvious limitations of states actually agreeing to joint development, not many examples are found employing this approach.

All these three above approaches were adopted and implemented in individual cases and due to their various limitations were not feasible for international practice. In the absence of any law to regulate international river systems, the International Law Commission after about 25 years of deliberations has submitted its draft in 1996 for the consideration of the UN General Assembly. Finally, the Convention on the Law of the Non-Navigational Uses of International Watercourses, adopted by the UN General Assembly on 21 May 1997, was submitted to the member states for their ratification. However, the process of ratification is moving along at a very slow pace.

By having both the principles of 'equitable utilization' and 'not to cause significant harm' in the text, the UN Convention was able to obtain a majority support in the UN General Assembly. Stephen McCaffrey describes the Convention as "a basket of Halloween candy: there is something in it for everyone" (McCaffrey, 1998). Even if this Convention is ratified by member states and becomes a legal framework, it will not be sufficient to address the problem of water sharing in different parts of the world. The sharing of international rivers among the riparian countries in different geographical regions is a problem of huge magnitude. Complex water disputes can only be solved by cooperation and compromise, not by a strict insistence on rules of law.

For successful and lasting cooperation on shared waters, there is need for a comprehensive approach to address the water scarcity issue. This comprehensive approach includes a number of measures to be taken at the basin level. The basin-focused measures include treating the river system as a single unit, involvement of both state and nonstate actors in water management, recognition of social and cultural contexts in water use, clear appropriation rules in water sharing, and an information sharing network among the riparian countries (Swain, 1999).

An international river, lake, or aquifer does not, by definition, respect national boundaries and as such, shared water systems should be treated as single units as regards the maximum utilization of their resources. The development of these shared water resources occurs most optimally at the basin-wide level and the whole basin should be regarded as one economic, ecological, and political unit irrespective of state boundaries. The regulation and management of basin organizations should be entrusted to an independent body, which is outside the political control of any single riparian state. Management of international freshwater systems should grow beyond the sphere of national sovereignty to achieve the best possible use of water, i.e., efficiency, equity, and environmental sustainability.

Not only states, but also nonstate water users must be eligible to participate as decision makers in the basin-based organizations. The sustainable use of fresh water requires user participation in all aspects of water policy and management in the basin. In order to construct sustainable basin-based water management institutions, contextual considerations are of the utmost importance. Existing traditions of rain water harvesting, water storing practices, and agricultural patterns are some of the issues to be taken into particular consideration while formulating basin management policy. It is necessary to have a set of clear rules and regulatory measures in the basin regarding water rights and environmental obligation. Basic needs for water must be identified and given priority. In several cases, riparian countries have unequal access to data and information due to differing data accessibility and asymmetric competence to process data. This asymmetric information can be scientific and/or strategic. For the smooth running of a river basin management regime, a functional information-sharing framework is required.

These basin-based initiatives need to be augmented and supported by various nation-state and international measures. Most of the developing countries are exposed to water stress or even water scarcity. The adoption of a supply management

strategy addressing only water shortage in the region is not nearly sufficient. To meet growing demands there is a need to minimize water use, particularly in the agricultural sector. Riparian states may opt for a planned allocation of agricultural activities to improve the productivity of water in their various regions in order to meet the future demand for food. There is a need to restrict and regularize the demand for the increasingly scarce water resources in the basin. The full-cost pricing of the water will create quantity restrictions for competing users. It will also force consumers to use water more efficiently than if there were no price tag on it or if it were available at a highly subsidized price. (For a detailed description of good water management, please see the article Water Resources and Sustainable Water Management).

External intervention and assistance can sometimes facilitate the negotiation of water resource sharing agreements. Riparian countries in the South are unable to establish institutional cooperative arrangements because of their concern regarding existing and future water rights. Mutual suspicion and uncertainties of reciprocal action obstruct constructive engagement. To overcome such obstacles, international actors can possibly provide credible and impartial international assistance to start the process of cooperation. Gradually, it could help to increase mutual trust and confidence among the basin riparian states in order to achieve collective action. Formation of river basin organizations encourages international collaboration and assistance for the river water development. As constraints on the resource grow, the opportunity cost for not cooperating is becoming clearer. The increasing scarcity of available fresh water per capita and lack of financial strength in the developing countries may gradually encourage the basin countries to cooperate in order to achieve an optimal benefit of the shared water. Basin-based development of irrigation, hydropower, water diversion, or flood control projects can provide riparian countries greater net benefits than what they could have achieved through purely state-centric development.

Conclusion

Water resource scarcity can be both the cause and the consequence of armed conflicts. In an armed conflict, as part of military strategy, the deliberate targeting of water projects may be directly responsible for inducing water scarcity or reducing the water quality of the opponent. Water supply is affected and polluted by conflicts, and fresh water resources also have the potential to cause or contribute to the creation of new conflicts. Nearly half of the global fresh water is to be found in more than 260 international basins. Many believe that the serious dependence of many countries on an external water supply may force them to reorientate their national security concerns in order to protect or to preserve such availability.

Shared water is expected not only to increase competition and conflict, but also to contribute to build engagement and

cooperation among the riparian states (Wolf, 1998). The last 50 years have witnessed many water treaties being negotiated and signed. However, these water treaties face danger to their survival if they fail to receive support from effective institutional arrangement for proper water. Allotted water in the existing sharing agreements in most of the cases is unable to meet the increasing demand. The scope of further augmentation of river water in the arid and semiarid regions of the world is becoming limited due to possible impacts of global climate change. Global climate change has the potential to alter the water security landscape in a very significant manner in the near future.

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