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Water and international conflict

HELGA HAFTENDORN

ABSTRACT *This article deals with the origins of international conflicts over the use of rivers, lakes, or ground water aquifers. I ask what makes for a high conflict potential and whether there are significant differences between resource conflicts and conflicts arising from the degradation and pollution of fresh water resources. Another set of questions relates to the relationship of conflicts over water resources to other conflicts. Are conflicts over scarce water resources the source of international conflict, or do they contribute to intensifying conflicts which have arisen from other sources, (such as ethnic conflicts)? Does this matter for their solution? In the last part of the paper I draft a taxonomy of various water conflicts, their chances for regulation and/or solution and the role of international institutions therein. I further ask what prospects for the solution of water conflicts exist on a global or regional scale.*

The aim of this paper is to analyse the causes of international conflicts over freshwater resources and to attempt to identify the conditions under which such conflicts may be resolved. The paper establishes three central assumptions about water, namely, that water is the foundation of human life, is a finite and scarce resource and is a common and divided resource. It is from this final assumption that the paper makes the case that freshwater resources are prone to international conflict if they cross national boundaries.

Under international law, individual states are endowed with the right to control territorial resources. They may utilise rivers, lakes and aquifers in an equitable and reasonable manner (see United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses. Doc A/51869, 11 April 1997). Consensus, however, is difficult to reach on what constitutes an equitable and reasonable utilisation and when another state is adversely affected by such utilisation. In the past, different interpretations over the use of international freshwater resources have generated a great number of international conflicts in various parts of the world. Most significant have been those conflicts over access to water resources in arid regions where there is not enough water available to satisfy all needs.

The first part of the paper deals with the causes and conditions under which international conflicts arise as a result of the use of running water, be it rivers, lakes or aquifers. For analytical purposes, it distinguishes between conflicts over the use of water for human consumption, irrigation or generation of power and the resultant pollution arising from such activities. Furthermore, it deals with conflicts arising over access to scarce water resources. This scarcity is relative if water is plentiful but not distributed in an equitable manner, and it is absolute where there is not enough water available to meet all legitimate needs. The paper assumes that identifying these four conflict categories—on the use, pollution of,

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and access to either relatively or absolutely scarce water resources—will yield initial clues for their resolution.

The second part of the paper looks at the possibilities of cooperatively solving water conflicts. In order to deepen our search the paper looks into the structure of the conflict type and the surroundings within which the conflict is embedded. All running water conflicts are asymmetrical conflicts—so called rambo situations whereby there is a state or states that control a river's source or upper flow, placing the lower lying riparian states at a disadvantage. As such a state or states would profit from this situation it would be in their interest to maintain the status quo and not to attempt to reach an understanding with the lower-lying riparians. This leads us to a 'puzzle', that is, the case in which the upper-lying state or states relinquish their position of power and come to a suitable agreement with the lower-lying riparian states. In searching for an explanation for such behavior we can turn towards Game Theory, whereby a rambo situation, in which no co-operative solutions are available, can be transformed into a dilemma situation where solutions, although costly, can be achieved provided that the necessary information is available to all parties of the conflict. The dominant state relinquishes its hydrological advantage in return for specific rewards or political and material side payments. In this case, we assume that a crucial precondition for any solution of the conflict would be its linkage to other aspects of a bilateral or multilateral relationship.

Another possible explanation is the impact of international institutions. In this third part, the paper attempts to test the hypothesis that international institutions—regimes (international conventions, etc) and organisations—have an impact on the resolution of freshwater conflicts. To this end, international relations theory holds that international institutions enable the exchange of information between states, thereby increasing confidence, which results in the possibility of co-operatively solving conflicts. The paper analyses whether and how issue-specific, regional and global institutions are useful in constraining, resolving or preventing freshwater conflicts. The paper also briefly looks into the building of institutions as a result of the resolution of specific conflicts.

Causes of conflict

Conflicts can arise from the use of common water resources. In order to further our understanding of such conflicts it would be appropriate to distinguish between conflict arising through use, and conflict arising through pollution. A utilisation conflict, for example, could be the construction of a power-station on the upper-course of a river. The possibility of conflict increases in such cases where this construction has harmful consequences for the lower-lying states, for example, polluted waste water. The situation becomes more pronounced when the lower-lying states withhold their consent for such construction because of fears of, for example, water shortages. This could include a situation where the construction of a dam on the upper course of a river, that not only serves the electrical needs but also the major irrigational works of the lower-lying states, threatens to stem the flow of water. A relative conflict of distribution would present itself where a disparity over the use of water exists between the upper and lower-lying states. An absolute conflict of distribution would exist when there simply is not enough water to meet all the legitimate needs of the riparian

TABLE 1
Causes of conflict

<i>Conflict type</i>	Conflict through use	Conflict through pollution	Relative distribution conflict	Absolute distribution conflict
<i>Conflict causes</i>	Water use	Water quality	Water distribution	Water distribution and availability
<i>Example</i>	Parana, Danube Oder	Rhine	Euphrates, Nile, Ganges	Colorado and Rio Grande, Jordan

states (see Table 1) The distinction between the different causes of water conflict leads us to the supposition that conflicts arising from the use or pollution of a water resource would be easier to solve than those conflicts that arise from the distribution of a scarce and finite resource. In the first two cases there are contested costs which can be manipulated in order to come to an agreement. In the case of a distributional conflict we are faced with a different scenario whereby a solution is only possible when the privileged state agrees to give up certain of its advantages.

Conflict through use

One of the oldest uses of the seas and rivers is shipping. Today this activity rarely leads to conflict between states as a substantial body of agreements regulates shipping traffic in international waters. A conflict through use could nevertheless be found in a situation where one state using the river, for example as a waterway, clashes with another state citing environmental concerns over the other state's activities. Most frequently, activities such as the construction of a dam or the channeling of the river flow leads to international conflict.

Construction of power stations on the Parana and the Danube. A protracted conflict that engaged the international community was the Brazilian–Paraguay dam project on the Parana near Itaipu. The Parana acts as the border between Paraguay and Brazil, flowing through Argentina and then Uruguay before emptying into the La Plata Basin. The project was criticised, most vocally by Argentina, which feared the possible consequences for the lower basin region. Although the five so called La Plata states—Argentina, Bolivia, Brazil, Paraguay and Uruguay—signed an agreement in 1969 over the economic integration and joint development of the La Plata Basin, altercations between the states regarding the use of the Parana prevailed. While Brazil and Paraguay, as the upper-lying states, called upon their national right to act, Argentina in turn successfully obtained a resolution from the United Nations for the provision of sufficient information and consultation. At the beginning of the 1990s, this conflict was finally encompassed in Mercosur.

Likewise in the Danube region, an ensuing dam project placed a heavy burden upon the relationships between Slovakia, Hungary and Austria. It differed from the Parana conflict in that it was not primarily about an upper and lower riparian conflict; rather it dealt with a river that made up a substantial part of the shared border between the respective states. It dealt essentially with economic or ecological concerns that arose from the 1977 proposed dam project between

Hungary and Czechoslovakia at Gabčíkovo-Nagymaros. Because of environmental concerns, and as a reaction to internal political pressure, Hungary withdrew from the proposed project in 1992. In response, the Austrian banks and firms that were engaged in the project, called for compensation from the Hungarian government. Slovakia continued with the project, building a side channel that diverted the Danube from Hungarian territory. In 1992 Slovakia began production of electricity in Gabčíkovo. As a result of the diversion and subsequent construction, Hungary made a number of serious environmental damage claims. Further talks failed to resolve the conflict and eventually the two governments went to the International Court of Justice (ICJ) in the Hague. The court found in September 1997 that both parties were guilty of breaking their contractual duties, namely, the unilateral withdrawal of Hungary from the agreement as well as the unilateral decision taken by Slovakia to divert the Danube. The ICJ called on both the parties to find a shared solution. If no solution was forthcoming, the dam would be placed under a common regime in accordance with the agreement of 1977.

Water management on the Oder. The 1997 floods in the Oder region showed the disastrous results of international water mismanagement. Already by 1995 a project had been developed in the Oder region that was planned to overcome national borders and work towards a united effort to provide environmental and disaster protection. The Euroregion project, 'Pro Europa Viadrina', was seen as being particularly well deserving of financial support. At the time of the catastrophe in the summer of 1997, the district Markisch-Oderland and the Voivodina Gorzow, with EU funding, had drawn up a trafficking chart as well as planned the development of a standardised notification system. However, the planned German-Polish agreement for joint action against disaster was not yet signed. The subsequent rescue operation was therefore hampered by insufficient or inadequate information exchange and the incompatibility of technical equipment.

As a result of the conflict in the Oder region, efforts were intensified to improve the relationship between the Polish and Czech districts in order to facilitate collective action by the parties to the region. However, a German-Polish-Czech project for the development of the Oder region designed to combat future natural disasters was a failure because of the incompatible interests of the parties involved. While Poland was seeking to implement the 'Odra 2006' programme to model the Oder for shipping traffic by means of straightening the river and building new dykes, the then Brandenburg Environmental Minister, Mathias Platzeck, was seeking for ecological reasons to expand the overflow sector, particularly targeting areas in Poland. This was naturally rejected by the Polish side. To date, agreement on a joint project for the Oder basin, in spite of the declarations, seems not to be in sight.

Conflict through pollution: the Rhine

Besides the production of electricity and shipping, rivers and lakes also serve an industrial purpose. Not only do they act as reservoirs for the supply of freshwater but also as a means of disposing of waste water and industrial rubbish. With the increasing decline in the quality of the water crossing borders, the problem of cleaning the water takes on an international dimension. This is particularly well

illustrated in the case of the Rhine, a river whose drainage area falls in the richest, and probably most highly industrialised area in Europe. Furthermore, the interests of the upper and lower-lying riparians are particularly distinct as a result of their different uses of the Rhine. The primary cause of pollution is from the chemical industry in the upper-lying states of Switzerland and Germany, as well as the from French potassium mines in Alsace and the German coal works in the Ruhr and Lippe. The Rhine is polluted through the emission of a large mixture of chemical waste, salt and heavy metals. The costs are being carried by the lower-lying states such as the Netherlands, who primarily use the Rhine for drinking water and agriculture. Furthermore, rising toxic mud loads from the Rhine are placing an increasing cost upon the city of Rotterdam, which has to remove the unusable and toxic mud from Rotterdam harbour to special waste depots.

Although pollution caused by shipping traffic on the Rhine has been regulated by the Rhine Shipping Commission since the turn of the century, the conflicting interests of the upper- and lower-lying riparians have prevented the parties from reaching a quick solution. In 1950 the riparian Rhine states founded an International Commission for the Protection of the Rhine Against Pollution (IKSR). In 1963 the Berne Convention assigned the states the task of observing and investigating the scale of pollution, putting forward measures for the protection of the Rhine and the preparation of an agreement between the states. The Netherlands, being one of the most negatively affected lower-lying states, called for continued measures to combat the increasing pollution. In 1976 the Environmental Ministers from the riparian states signed two agreements for the protection of the Rhine against chemical pollution and the reduction of the salt loads. Under the Chemical Agreement a financing proposal was put forward with regards to the clean-up costs, whereby France and Germany assumed 30% each, the Netherlands 34% and Switzerland 6% of the costs previously assumed by France for the reduction of the salt levels. In exchange, the Netherlands agreed not to sue Germany and Switzerland for their salt emissions, as they were considerably lower as well as less easy to locate. In response to local resistance against the agreed measures, France declined to ratify the Chemical Agreement in 1979.

It was only after the 1983 change in government in France that the process of ratification was once again taken up. It is also interesting to note the workings of private actors and their influence on the decision-making process of the French government. In this case, pressure from actors such as Dutch nurseries had a decisive influence on the French government. In 1974 three large Dutch nurseries and the Pure Water Institution sued the Alsatian potassium works in the regional court in Rotterdam. They were arguing for compensation for the protective measures having to be taken against the high chlorine content found in the Rhine water. After the European Court of Justice (ECJ) ruled the procedure as admissible, a number of similar cases were brought against the potassium works. Furthermore, in addition to a series of secret talks among the parties, the city of Rotterdam embarked on an extensive public relations campaign in order to encourage the voluntary reduction of harmful substances. On a wider scale, transnational interest groups founded an International Waterworks Association in the Rhine area. To this end, three big regional water conservation associations amalgamated in 1970. These associations dealt directly with the significant emitters, such as the German Chemical Industrial Association, and influenced state actors through their public relations work. Above all, a series of chemical

accidents on the Rhine in 1986, by Sandoz and Ciba-Geigy in Switzerland as well by BASF. Hoechst and Bayer, increased public awareness and acted as a catalyst. In 1987 the Chemical Agreement finally came into force. In 1991 it was replaced by a second agreement calling for a higher reduction of the salt levels.

Distributional conflict: relative shortage

The river systems of the Euphrates, Nile and Ganges are characterised by a flow that, although plenteous in the upper basin, is drastically reduced in the lower basin because of the extensive use of the resource among the upper riparians. As a result of this arrangement, the needs of the lower-lying states are not being satisfactorily met. This is especially prevalent in the cases of dam construction, reservoirs or extensive irrigation works which reduce water availability. Examples would include the Anatolian dam project in Turkey, the Ethiopian highlands dam in Ethiopia, and the construction of the Farakka Dam in India. In these cases we find a conflict over distribution where the water flow to the lower-lying regions is seriously hampered.

In contrast to a conflict arising over pollution, which can result in tension between the states, a conflict of distribution can lead towards violence or military threats. In relative distributional conflicts, the situation is aggravated if the lower riparian cannot prevent a detrimental action by the upper riparian. In this case, the survival of the lower-lying state comes into question and this can lead to its use of military action. In the past, conflicts between Syria and Iraq over the Euphrates, between Israel and its Arab neighbours over the Litani and the Jordan water flow have led to violence on these grounds.

Euphrates and Tigris. The Euphrates and Tigris originate in Turkey. However, for geographical reasons (its population and industrial centre is in the north rather than the south), Turkey has to date only utilised a small part of this water resource. In contrast, the water needs of Iraq are almost totally dependent on the flow from the Euphrates and Tigris, while Syria depends heavily on the Euphrates. Both states need the Euphrates for human water-consumption, for irrigation projects and for the generation of electricity. As a consequence, all three states have erected a number of dams. Understandably, considerable political tension has arisen among these states. This was illustrated in the 1970s when the construction of the Assad Dam nearly ended in military conflict between Syria and Iraq. A standing source of conflict between the three is also the Kurdish problem.

Turkey's Greater Anatolia Project (GAP) has also added a new dimension to the conflict. The project involves a gigantic development scheme, including the erection of 22 dams on the Euphrates and Tigris in South Anatolia, 17 power stations with an output potential in excess of 8000 kW and a number of extensive irrigational projects. Turkey is hoping to fulfill the objectives of exporting electricity to its neighbours and building an agricultural export market by means of GAP. A further aim includes the development of its tourism industry. With the completion of GAP and the subsequent improvement in the living standards of the region, Turkey is also hoping to satisfy the Kurdish population and reduce the influence of the Kurdish Workers Party (PKK). However, the completion of GAP will diminish the flow of the Euphrates to Syria and Iraq by

one-third, while increasing Turkey's utilisation from less than 10% to more than 50%. Inclusion of the Tigris will reduce the flow to Iraq even more.

In spite of a number of talks between Turkey, Syria and Iraq, no agreeable settlement has been reached, even though such an agreement could offer a number of advantages to all three states. Although a Technical Committee has been established, to date it has only been used for the exchange of information and for the notification of measures to be undertaken. Failure to reach an agreement can be attributed above all to the conflicting interests of the three parties. While Iraq and Syria view the Euphrates and Tigris as international rivers to be commonly utilised, Turkey emphasises the usage of water resources on its territory as its sovereign right.

The deadlock over the introduction of an agreement is monthly increasing the waiting costs for Syria and Iraq while allowing Turkey to consolidate its position. Although Turkey, as the upper-lying state, is the dominant power, it too could gain from the signing of an agreement. An agreement could release the consent of the riparian states to the lifting of the blockade on international credit. Currently construction is financed by French concerns. Furthermore, Turkey could also proceed with the export of agricultural products, electricity and water to its neighbouring states, an issue which has till now been linked to and therefore hindered by the water question. Finally, a closer working relationship among the three states could result in a more readily achieved solution to the Kurdish problem.

However, to date there have only been a few bilateral agreements between the three states. With the 1987 agreement Turkey granted Syria 500 m³/sec of the available 950 m³/sec flow of the Euphrates. In 1990 Syria divided this share with Iraq 290 m³/sec to 210 m³/sec respectively. However, Syria and Iraq are calling for an increase to 700 m³/sec, an increase which would reduce Turkey's share from 450 m³/sec to 250 m³/sec.

The water conflict has also had a decisive influence on the power structure of the region. The formation of a common front against Turkey is bridging the barriers between Syria and Iraq and their previously incompatible leaders, Hafiz al Assad and Saddam Hussein. In turn, Turkey has strengthened its political, military and economic ties with Israel. A new power parallelogram is emerging which will have far reaching effects for the region as a whole.

The Ganges Basin. In the case of the Ganges, a water conflict that was embedded in a condition of political opposition and asymmetries, as well as extreme poverty and ecological degradation, we see a surprising contrast. Although facing these hindering factors, India and Bangladesh managed to come to an agreement at the end of 1996. Both sides have committed themselves to a complicated formula. During the low-tide period from 1 January until 31 May, both sides are committed to sustaining a minimum water level of 35 000 sec³. Should the available water flow drop further, then both sides be obliged to maintain this level in alternative 10-day periods. Furthermore, the agreement contains a reference to the desire to have a comprehensive settlement under the umbrella of the South Asian Association for Regional Co-operation (SAARC). The high degree of consent between the Indian Prime Minister, H D Deve Gowda, and the party leader of Bangladesh, S Hasina, at the time of concluding the agreement, may have played a role in securing the union between the two parties. A central

consideration for India was that a successful agreement could assist with the resolution of other outstanding questions, such as transit rights through Bangladesh and the stemming of the flow of poverty-stricken immigrants.

The conflict was originally sparked off with the construction of the Farakka Dam, which India erected in the 1970s not far from the Bangladeshi border. The dam was erected to reduce mud and salt emissions from the Bhagirathi–Hooghly Canal and Calcutta harbour. Bangladesh, which achieved independence from Pakistan with the aid of India, granted its consent in spite of doubts about the operation of the dam. In 1977 both states agreed to a five-year agreement, extended in 1982 by another five years, for the partition of the water supply during periods of low tide. At the same time, they expressed their intention to find a durable solution to the increase of the water supply during times of shortage. India suggested diverting the Bramaputra by means of a canal through Bangladesh to the Ganges. Bangladesh rejected the plan, fearing negative consequences for its own water system. Instead, Bangladesh proposed an arrangement, which included Nepal and Bhutan, to build a dam on the upper flow of the Bramaputra and Ganges in order to make fulfilling the water requirements of the region easier.

However, India was only open to a bilateral agreement, similar to that which it had concluded with Nepal a few months before, whereby it aimed for an extensive water management agreement. It therefore remains to be seen whether the SAARC succeeds in bringing India and Bangladesh to negotiations over a water management plan that includes measures to control the monsoon floods that devastate Bangladesh every few years.

The Nile Basin. The Nile system, together with the Nubian Aquifer, covers the northeastern part of Africa, encompassing not only a hydrologically, climatically and geographically, but also a politically and economically heterogeneous region. What this constitutes is an extremely asymmetrical situation relating to the utilisation possibilities of the resource. In 1891, with the colonial powers Britain and Italy, and in 1902 in agreements with Ethiopia, the lower-lying riparian Egypt, as the main user of the Nile, secured unhindered access to the Nile waters. Likewise, the 1929 Nile Agreement between the British—representing the Sudan, Kenya, Tanganyika and Uganda—and the Egyptian governments confirmed the importance of Egypt's right of access to the Nile. Egypt has 48 km³ of the water flow and full access to the spring high waters, while the Sudan only has a claim to 4 km³ of the water flow. The rights of the East African states were totally dismissed. With the end of the colonial regimes, Egypt continued to uphold the validity of these agreements, while the other riparian states saw the agreements as being null and void. However, with the signing of the Nile Water Agreement with the Sudan in 1959 and joint co-operation with Uganda through the Owen Falls Agreement, Cairo signalled a shift from its original standpoint. With the Nile Water Agreement, the Sudan granted its consent to the construction of the Aswan Dam. In return, Egypt agreed to a number of measures to reduce the harmful effects of the construction and to regulate the water flow. In the mid 1970s, both states agreed to the joint construction of the Jonglei Canal to assist with the straightening of the White Nile and the reclaiming of land from the southern swamps. However, the ensuing civil war in the Sudan has prevented this project from being realised.

The signing of an agreement between the Sudan and Ethiopia in 1991 over the joint use of the Nile waters, as well as the announcement by the Ethiopian government that it plans to construct a number of dams in the Ethiopian highlands have, however, triggered Egyptian fears that its access to the Nile waters could be hampered. In response, Egypt has threatened to combat such an event with military measures.

In the past few years there have been a number of attempts to reach an effective water management arrangement for the region. After a series of failures, the Organisation for African Unity (OAU) has attempted to bring the riparian states to the negotiating table. In the past, joint cooperation between the states has been thwarted by their respective involvement in the East–West conflict, as well as through the civil wars in Ethiopia and the Sudan. Currently, the relationship between the states is normalising. This has opened the possibility for future joint cooperation. However, the civil war in the Sudan is still a great stumbling block. The best chance for the region would be an agreement by the *Udugu* (in Swahili: brotherhood) groups under the auspices of the OAU. Thereafter a series of dams and power works should be constructed on the upper flow of the White and Blue Nile. With the generation of electricity the building of water reservoirs and irrigation systems on the lower flow could be financed. The realisation of such a project would, however, require the riparian states to abandon the principle of the right to act unilaterally over resources found on their respective territories.

Distributional conflict: absolute shortage

Far more acute are situations where there simply is not enough water, independent of its distribution, to meet all legitimate needs. This problem is most extreme in the semi-arid regions of the world, and is intensified in cases where differing levels of development between states lead to varying utilisation levels of the water resource. One example is the conflict between Mexico and the USA over the utilisation of the Colorado and Rio Grande. More intense is the Jordan Basin conflict, which, in addition to the problem of the distribution of a scarce water resource in a semi-arid region that only covers 50% of the water requirements of the population, is further complicated by the political and security issues of the region. These issues include the Palestinian struggle for an independent state and the political, economical and military security concerns of Israel.

Colorado and Rio Grande. In the past, a series of distribution- and pollution-generated conflicts over the use of the Colorado and Rio Grande (in Mexican: Rio Bravo del Norte), has brought Mexico and the USA repeatedly in to conflict. Both rivers originate in the USA, flowing through a number of US states where the rivers are extensively utilised before flowing either along short (Colorado) or longer (Rio Grande) stretches of the shared border between the USA and Mexico, and finally emptying into the Gulf of California and the Gulf of Mexico. This hydrological arrangement places the southern neighbour in a weaker position that is aggravated by the history of the region and the different levels of development between the two countries.

Already in 1895 Mexico had accused the USA of exploiting the Rio Bravo resulting in a reduction of the water flow. The response of the USA with its

so-called Harmon Doctrine, referred to international law claiming that it was the country's right in law to utilise resources found on US territory. In 1906 the two states came to an agreement over the distribution of the Rio Bravo flow whereby Mexico was secured a 40% share. A similar agreement for the Colorado was signed in 1928. Additionally, the two states established an International Boundary and Water Commission (IBWC). In 1944 the Mexican share of 40% was increased. However, this increase was subject to a clause that provided for the reduction of the new share in cases of extreme drought or extraordinary damage to irrigation systems. Furthermore, the agreement made no reference to the quality of the water and only specified that in the future Mexico would receive water 'from any and all sources'.

The reference to the amount of water Mexico was to receive as well as the interpretation over the quality of this water resulted in conflict between the two states. It was pointed out that the water flow quantity was exaggerated and that the building of various dams as well as the extensive use of the resource in the USA led to a much smaller flow than projected. Further, there was a considerable increase in the nitrate content of the water because of various irrigation schemes in the USA. As a consequence, there was a drastic reduction in agricultural yields in the Mexican border region. Negotiations in the IBWC in 1973 led to a protocol notice whereby the USA committed itself to a number of measures to reduce the salt content of the Colorado. In return, the USA expected Mexico to undertake measures to combat illegal immigration and drug smuggling into the USA. While the USA assumed most of the resultant costs of the 1973 agreement, future agreements, such as the La Paz Agreement of 1983, stipulated a more equal division of the costs irrespective of the origins of the water degradation.

However, together with the founding of the North American Free Trade Area, the two states have signalled a stronger desire to work together to combat the polluting of water resources. First, the USA and Mexico agreed to a five-year US\$8 million programme for the solving of the drinking and waste water problem in the border region. The project will be financed in part by the World Bank and the North American Development Bank. Furthermore, the 1993 North American Agreement on Environmental Co-operation (NAAEC) between Canada, the USA and Mexico led to the founding of a highly regulated administration which jointly decided laws and verification and sanction measures. With this arrangement, both states deviated from their previously held belief that commissions such as the IBWC; could only function as an advisory body and that problems arising should be dealt with at the national level.

The Jordan Basin

Right up into the 1990s, the Jordan basin conflict has been characterised by the unilateral actions of the different parties to the conflict. In 1961, with a mixture of military and diplomatic measures, Syria prevented the diversion of the upper Jordan waters and its utilisation by the Israelis for its national water supply. Under pressure from the UN ceasefire commission (UNTSO), Israel had to move the springs on the Northwest shores on the Tiberias lake. In response to the completion of the Israeli national water carrier, in 1964 the Arab League attempted to divert two tributaries of the Jordan—the Banias and the Hasbani—to the north.

Israel in turn prevented this by military action. Meanwhile, with international financial aid, Jordan built a side canal on the eastern Jordan shores, the Abdullah Canal, for purposes of irrigation of cultivated land in northwestern Jordan and to satisfy the water needs of Amman. In order to guarantee a continuous water flow, two dams were proposed for the Yarmuk, the most important tributary of the Jordan and the border with Syria, one of which was completed in 1967 and subsequently destroyed by the Israelis in the Six-Day War.

The Six-Day War of 1967 changed the entire water scenario in the region. With the occupation of the Golan Heights and the security zone in South Lebanon, Israel now controlled the Jordan waters. Furthermore, the occupation of the West Bank meant that Israel had unlimited access to the underwater reservoirs of the west Jordan lands. Before, Israel only had access to parts of this reservoir, namely where the waters flowed towards the north and west. In the new situation, Israel has access to the Eastern Aquifer which was previously exclusively utilised by the Palestinians. Furthermore, Israel also exploited the coastal aquifer which runs parallel with the coast to the Gaza strip. This reservoir secures Israel's main water supply for human needs (31%), agriculture (63%) and industry (6%). Agriculture has been largely geared towards providing self-sufficiency for the Israelis, as well as acting as a foreign exchange earner through the sale of surplus products. A prerequisite for bountiful production is, however, the watering of some 50% of the cultivated land. Gradually, Israel is changing its mode of agricultural production by moving towards a more intensive, as opposed to extensive, type of farming. The needs of a rapidly growing population in the late 1980s, bolstered by immigrating Russian Jews, was met by improved technology and the move towards agricultural produce that was less dependent on water.

With the 1994 Israeli–Jordanian Peace Agreement the division of the trans-boundary waters was contractually defined for the first time. According to the agreement, Jordan received the right to use the largest part of the Yarmuk, up to 45 million m³/year, and Israel the largest part of the Jordan waters, up to 40 million m³/year. To this purpose, both parties declared their intention of the joint construction of a dam on the Yarmuk on the Israeli–Jordanian–Syrian border, in spite of Syrian objections. In addition, a joint water commission was established.

In the Oslo agreement, the Israeli and Palestinian negotiators had espoused some general principles with regard to the water question. A concrete settlement was, however, postponed. The interim agreement of 1996, the Taba Agreement, has therefore to be seen as a political breakthrough in the water conflict between the two parties. Israel recognised the Palestinians' right over the water resources found on their territory. As in the case of the Jordanian agreement, a water commission was established that had wide-reaching powers, including the controlling of the drilling of new wells, the construction of waste systems, as well as the opening of additional water sources. Furthermore, Israel granted the Palestinians 60 million m³/year of the Eastern Mountain Aquifer in the West Bank and proposed the supply of water from the national water system, in particular in the Gaza Strip.

Both agreements signal important advancements in the water issue, notably the recognition by Israel of the necessity of a joint settlement. So far, however, Israel has essentially only conceded on changes in the future, that is, it has only made promises about additional amounts of water which can be achieved

through measures such as the building of dams and a more efficient use of the water supply. In the case of the joint water commission with Palestine, the Israeli government managed to secure control over the use of the West Bank waters. The agreements will, however, assist the Israelis and Palestinians in obtaining credit and international assistance for future projects. Possibly, a sense of trust can develop from such a base that could ease the attainment of a comprehensive political settlement. Currently, however, the withdrawal of Israeli troops from the occupied territories has been refused by the previous Likud government which perceived these territories to have strategic importance with regard to the supply of water.

To date there has been no agreement with Syria. Peace talks between Israel and Syria have not materialised because of Israel's refusal to give up a large part of the Golan Heights as well as control over the Jordan water resources. From the Israeli point of view, the securing of water supplies is an integral part of its security concept. A solution to this problem will therefore only be possible when Israel feels secure and, in turn, recognises the rights of the Palestinians. A prerequisite for this will be a comprehensive peace settlement, where military security is bound by a fair division of the scarce water resources and the obligation to protect the natural water resources of the region.

Conflict type and structure as well as settlement possibilities

Establishing the differences between use and pollution conflict on the one hand and distributional conflict on the other allows us to take the first steps towards finding a solution. The structural difference between conflict types highlights the difficulties of finding a settlement for distributional water conflicts. In the case of conflict through pollution, the upper riparian can, for example, be financially compensated for instituting anti-pollution schemes. In other words, the cost structure lends itself to finding a solution, as was seen in the case of the Rhine conflict. On the other hand, in the case of a scarce and finite resource, the use of financial resources as a bargaining chip is limited, as one cannot sell a resource that one does not have an abundance of.

Nevertheless, not all conflicts generated by use or pollution have been easily solved and neither have relative distributional conflicts always proved easier to settle than absolute distributional conflicts. This demonstrates the fact that additional factors come into play when seeking a suitable settlement. In all water conflicts we find an asymmetrical situation whereby the upper-lying riparian, through means of the hydrological situation, can control the quantity and quality of the water flow. The advantaged state would only be open to an agreement with the disadvantaged state if it received financial or political benefits in return. The conditions within which the conflict is embedded will therefore have a decisive influence on the achievement of a successful settlement. The asymmetrical structure of water conflict, in terms of Game Theory as a rambo situation, excludes the possibility of a co-operative solution. The interaction structure of the rambo situation makes the advantaged state prefer to maintain the status quo as opposed to seeking a compromise with the disadvantaged state.

An agreeable settlement would therefore only be possible when the rambo situation is replaced by a dilemma situation, that is, a conflict structure whereby the power of the advantaged state can be balanced or modified. As with a

security dilemma, in a dilemma situation it is in the best interests of all parties to the conflict to co-operate. Whether it will lead to a solution will depend upon whether a consensual division of the costs can be realised and the parties to the agreement can be trusted to uphold and respect the terms of the agreement. Symmetry between the actors will only exist as far as the hydrological asymmetry between the actors is balanced out by other factors.

In the case of the Euphrates, because of its hydrological advantage, Turkey can refuse to co-operate with the lower-lying states. The Nile situation, where Egypt, as the strange military and economic power in the region, can retaliate against the upper-lying states should they threaten to hinder the water flow to Egypt, is different. While the coupling of the Kurdish problem with the water conflict on the Euphrates intensified the regional conflict, in the case of the Nile, the coupling of the water conflict with the question of the military power relationship replaced the rambo situation with a dilemma situation. However, the extreme complexity of the Nile case has to date hindered achieving a structurally solvable situation.

The question that arises is if and in which manner the conditions within which the conflict is embedded can change the structure of the preferences of the parties sufficiently to lead to a co-operative solution. If the parties have a good bilateral relationship whereby problems are normally solved through consensus, then it seems likely that they will use a similar process in the case of a water conflict. Above all, they will probably strive to isolate the conflict in order not to burden the existing bilateral relationship. A similar scenario is likely among states with a high level of interaction. Such an example includes the European Union, where the achievement of consensus over the costs and risks of a settlement is easier to reach than between states lacking a tradition of cooperative conflict management.

Also helpful is the existence of a facilitator. This could be an international arbitrator, such as the ECJ in the case of the Rhine conflict or the ICJ with the Danube conflict, whose judgment is observed by the participating parties. A hegemonic power can also place pressure upon the conflicting parties to reach a settlement, as for example the British colonial power in East Africa, or the USA in the case of the Israeli–Jordanian peace agreement, did. In other cases, a change in the international or internal political framework could facilitate the achievement of a settlement. The end of the East–West conflict brought with it the possibility of solving previously deadlocked situations. In the case of the US–Mexican river border, it was internal political considerations, concern over non-ratification of NAFTA, that brought a conclusion to the NAAEC modelled on the US–Canadian border settlement.

Surprisingly, however, to date no settlement has been reached on the Oder problem, even though all three states espouse the desire to cooperate and it is the wish of both Poland and the Czech Republic to become members of the European Union. It seems, therefore, reasonable to suppose that the development of a water regime requires a lengthy time period. In the case of the Rhine regime, it took 50 years to achieve agreement on the ‘Rhine 2000’ collective action programme.

Generally speaking, a conflict that is embedded within a larger regional or global problem complex tends to be intensified. The argument between Israel and the Arab states over the division of water resources is intrinsically linked to

the Middle East conflict. The linkage between these two conflicts has prevented finding a comprehensive solution for the Jordan. However, the circumstances within which the conflict is embedded need not always lead to intensification.

The beginning of the 1990s, together with the peace settlement efforts between Israel, Jordan and the Palestinian authorities, has pointed to how such a coupling of conflict can also have an alleviating effect. It is, however, questionable whether both agreements can serve as a model for an extensive conflict settlement in the Middle East. In the Israeli–Jordanian peace agreement and in the Taba Agreement Israel used its dominant position to contractually secure its current use of the Jordan water supply and a large part of the underground water store, while the Jordanians and Palestinians essentially only obtained the surplus of future water resources and the offer of technical and financial assistance.

Likewise, in a number of other water conflicts only a restricted or partial solution has been possible. In the case of the Euphrates and Ganges, the politically powerful and domineering upper riparians that control the water resource, Turkey and India, both had an interest in maintaining the status quo. The agreement of 1987 between Turkey and Syria and that between India and Bangladesh in 1979 were both a testament to the interests of the upper-lying states. Bearing this in mind, it is surprising that in the 30-year Ganges Water Agreement, both states have guaranteed each other a fair share. The reason given was that the implementation was possible thanks to the converging political orientation of the two parties in government. However, this explanation is not adequate. Two further explanations may shed more light on the issue. First, India bound to the agreement the expectation that in the future an agreement for the construction of a new water passage from the top to the bottom of the Ganges through Bangladesh, including the Bramaputra, would be possible. This project was previously vehemently opposed by Bangladesh, which feared losing control over its water system. Second, an agreeable settlement could be seen as a prerequisite for securing credit from institutions such as the UNDP and the World Bank. This was the case with the agreement between India and Pakistan over the division of the Indus in 1960.

In order to ease the attainment of a settlement, a second structure should be aimed for whereby the advantaged state may be compensated for giving up its relative position and allowing the rambo situation to be replaced by a more co-operative dilemma situation. An important criterion for this is the 'default condition'. This is a situation where the parties cannot come to an agreement and this lack of co-operation leaves all parties to the conflict in a worse off position. A change in the default condition would therefore have a decisive influence on the development of the conflict and the willingness to reach a settlement in spite of the accompanying costs. The case of Mexico and the USA over the use of the Colorado and Rio Grande is a good example of a settlement that was achieved independently from the conditions within which the conflict was embedded. By binding other problems to the hydrological and power asymmetry between Mexico and the USA, the relationship was modified, allowing for a more co-operative situation where solutions could be more readily achieved.

As seen in Table 2, the type of conflict is not the decisive element for a successful settlement but rather the conflict structure and the circumstances within which the conflict is embedded. In conflicts characterised as rambo

TABLE 2
Structure and solutions of water conflicts

<i>Circumstantial effect</i>	<i>Conflict through use and pollution: not embedded</i>	<i>Conflict through use and pollution: embedded</i>	<i>Distributional conflict not embedded</i>	<i>Distributional conflict: embedded</i>
Conflict Intensifier: Rambo situation	Parana till 1990 and Danube till 1993	Oder till 1989	Ganges, Colorado and Rio Grande	Euphrates, Jordan and Nile till 1989
Settlement Probability	small	small	very small	very small
Modified Conflict: dilemma situation	Parana	Rhine, Oder since, 1990 and Danube since 1993	Ganges 1997 and Nile?	Colorado and Rio Grande 1944, 1992 and Jordan 94-96
Settlement Probability	good	very good	good	very good

situations, solutions are generally seen as unrealisable. This is most acute in situations where the surrounding circumstances exacerbate the conflict. In order to reach a settlement, it is therefore vital to transform the rambo situation into a dilemma situation, thereby allowing a balancing of the hydrological asymmetric structure through linkage to other problems.

Existence and impact of international institutions

The presence of water conflicts regularly gives rise to the building of international institutions. For purposes of clarification, we understand by international institutions conventions, regimes and international organisations. It would therefore seem logical to test the hypothesis that the attainment of settlements and the solving of conflicts are better served by international institutions than by a process of transformation from an asymmetrical to a symmetrical conflict.

The establishment of international institutions

One could speak of a water regime when the affected states to a conflict observe a set of rules designed to reduce conflict caused by use, pollution or division of a water resource or the reduction of the standing costs and the observance over time of these rules. One should, however, distinguish between regimes that are drafted to deal with all future water conflicts and those that are specifically connected to a particular conflict.

Two examples for general water regimes are the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes, (the Helsinki Convention) and the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses. The aim of both these conventions is to establish general principles for the use of transboundary water resources.

The leading idea of the UN Water Convention is the principle that all states bordering an 'international watercourse' can utilise the resource in an 'equitable and reasonable manner' in order to achieve 'optimal and sustainable utilisation'. The state is, however, obligated to undertake all necessary measures to ensure

that such utilisation does not lead to any of the other riparian states suffering 'significant harm'. However, the other states also need to tolerate some disadvantages caused by the legitimate use of the water resource by the other riparians, as long as this damage is not 'considerable'. In order to minimise such damage, the riparian states are called upon to share information and to work together. In contrast to the 1982 Law of the Sea Agreement concluded at the third Law of the Sea Conference (UNCLOS III), the UN Water Convention, however, embodies no supranational element nor the possibility of sanctions. It is limited to the codification of international customary rights. The convention does embody a broad interpretation realm that offers the opportunity for differing interpretations in the future. To date there is still no consensus among states as to how far they may exercise authority over water resources on their territory without having to bear the interests and rights of the other states in mind. It is also far from certain whether all states party to a conflict will accede to the convention.

For the development of norms and principles on the use of transborder water systems, the participation of international organisations is necessary. The United Nations and its special organisations, in particular the International Law Association, as well as international conferences play an essential role in the future development of water rights. Global conventions have mainly been prepared by private institutions such as the Institute for International Law. They build expert regimes or epistemic communities which concentrate on further developing the current law. However, the specific problems related to transborder waters, lakes and aquifers has resulted in a high degree of generality and non-binding global norms.

On many water systems commissions have been founded by the riparian states to deal with standing problems. Their purpose is to ease the exchange of information, to identify possible solutions, to obtain scientific and technical advice and to prepare an agreeable settlement. The oldest institutions are the shipping commissions, such as those for the Rhine, Danube and the Nile. After the second world war we see the establishment of institutions such as the International Commission for the Protection of the Rhine against Pollution (IKSR), the International Boundary Commission between Mexico and the US (IBWC) and the International Joint Commission (IJC) between Canada and the USA for the settlement of problems arising from transborder rivers. There has been an excessive demand for international commissions in view of their role as a link between states, and their advisory character. This has even been evident in distributional water conflicts or comprehensive water management projects, such as the Water Ministers of the Nile Riparian States Conference (COM).

The impact of international institutions

The question of the effectiveness of international institutions offers a contradictory picture. As seen in Table 3, conventions have had the most success in conflict resolution where a convention was designed to deal with a specific conflict. Many conventions in turn have led to regime building, that is, by embodying norms, principles and procedural rules, they have provided the means to build trust among states and to encourage the development of friendly relations. An example is the Rhine regime, which was developed from the

TABLE 3
Effectiveness of international institutions

<i>Conflict type</i>	<i>Conflict through use and pollution</i>	<i>Conflict through use and pollution: embedded</i>	<i>Distributional conflict: not embedded</i>	<i>Distributional conflict: embedded</i>
<i>Institutional effect</i>	<i>not embedded</i>	<i>embedded</i>	<i>not embedded</i>	<i>embedded</i>
<i>International organisations</i>	UNO, ILC, ICJ, ILA			
<i>General water agreements</i>	Congress of Vienna Final Act of 1815;		ECE Heisinki Convention 1992, UN Water Convention 1997	
<i>Regional organisations</i>	Danube 1846 Rhine 1886 , IGH; Danube	EWR, ECJ; Rhine 1983 ; Mercosur, Parana 1992	QAU- Nile SAARC: Ganges	NAFTA: Colorado and Rio Grande 1983
<i>Specific water convention</i>	Rhine 1963; Oder 1919	Rhine 1976, 1983 and 1990	Nile 1891/1902 and 1959; Colorado; Rio Grande 1928	

Note: Entries in bold represent a higher degree of effectiveness.

foundations of the successful chemical and chlorine agreements. Furthermore, the different water commissions have managed to keep problematic water issues on the agenda, to assist with and improve the transfer of information among members and to offer expert advice. In this manner they have eased the achievement of settlements.

The contribution of regional organisations, whose role it was to find a settlement for a specific water problem, has been less effective. Particularly surprising was the fact that the EC/EU was not able to find a solution to the pollution problems on the Rhine. The absence of Switzerland, as one of the important parties to the conflict, from the EC/EU does not offer a concrete explanation for this failure. Rather it was the inability of the members of the European Union to reach a consensus on strict standards for the pollution problem, since not all of them are affected to the same degree. Nevertheless, the high level of connectivity between the members of the EC/EU and the EWR eased the achievement of a settlement. In North America, the NAAEC water regime was a side product of the economic integration process. Since NAFTA was not yet operative at the time of signing the agreement, one cannot talk of a direct institutional influence but of an anticipated effect, a 'shadow of the future'.

In some cases, the attainment of a settlement acted as a model for the solving of other specific problems. With the signing of the NAAEC in 1993 between Canada, the USA and Mexico, a common administrative body was established that could be used as a springboard in dealing with the previously deadlocked water issues on the southern border between the USA and Mexico. Here one sees a bilateral solution being modelled on a multilateral settlement.

With the exception of the final act of the Vienna Congress of 1815, which provided a number of navigational agreements in Europe and the colonies of the European powers, to date no general river conventions have had much influence. The fact that running water refers to a divided water resource as opposed to a

common resource such as the seas, makes the attainment of binding settlements all the more difficult. Each general regulation needs to be feasible or applicable to a number of differing conflict scenarios, as well as having to embody the general preferences of the participating states. The various conventions embody principles that act more as orientation markers. However, these are open to interpretation in the future and can serve as concrete guidelines.

Summary

In concluding, one needs to establish that conflicts dealing with international rivers, lakes and underground water stores belong to a category that in its structure makes it distinct from other political conflicts as well as from other environmental conflicts. As all running water conflicts are asymmetrical conflicts, whereby the upper-lying state controls the quality and quantity of the water flow through hydrological means, settlement of the conflict will be determined by the structure of the conflict and not its causes. In the search for a settlement, it becomes clear that the water conflict needs to be tied to other problems in order to seek a manner in which to replace the asymmetrical structure with a more co-operative symmetrical structure. A new structure allows for the possibilities of trade-offs between economic, ecological, social and political benefits. A conflict settlement is eased when there exists a high level of interdependence among the parties to the conflict. Strategies that have proved themselves as particularly effective include:

1. the improvement of information exchange and the promotion of confidence;
2. embedding the conflict in a positive interactive complex;
3. creation of package solutions by constructing linkage strategies;
4. the use of arbitration, mediation and intervention.

Most surprising is the fact that, although water conflicts promote the building of international institutions, the latter's effect in turn is relatively small. Their role has been most significant in the case of regional water regimes and as reactions to a specific conflict, whereby their integrative context motivated their continued existence. This in turn served to ease the settlement of new conflicts. They are least effective as general conventions with worldwide validity. These may serve as orientation markers but have no influence on the specific use or cost structure of a water conflict.

As a vital resource water will continually dwindle in the future as a result of economic development, population growth and a rise in the standard of living. It is therefore increasingly important to research the causes and structure of water conflicts and the possibilities of cooperative settlements, since future international water conflicts will not only quantitatively increase but also become increasingly violent.

Notes

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