VOLUME 2

WATER SECURITY

Edited by
Anders Jägerskog, Ashok Swain
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Introduction: Water Security – International Conflict and Cooperation

Anders Jägerskog, Ashok Swain and Joakim Öjendal

Introduction – Security and Its Relation to Water

The classic definitions of security have shown little concern for the environmental aspects of security. In the spirit of Machiavelli, Morgenthau, Carr and Waltz, to mention a few from different eras, 'security' was always thoroughly enmeshed in a realist mindset and the associated nation-state system. When 'security' was mentioned, it concerned the nation-state's security, was pre-occupied with territory and borders, and the means to uphold the nation's security was through military power. The 'other's' military power became then a threat creating a security dilemma commonly triggering an arms race and conflict escalation. This is not the only perception of security that this set of volume deals with. Rather we tap into the emerging debate on 'alternative security' and its widened security concept; a security concept more geared towards human wellbeing and the risks to that wellbeing. Secure access to water has in this process become a significant component of security and development (see further below). Hence, in this work, we go beyond the classic security debate and widen considerably its scope, which has been commonly attempted in various fields in the last two decades (cf. Buzan, 1991; UNDP, 1994, and below).

In this perspective, natural resources – the hunt, competition, exploitation and development of them – make and break nations. Whereas oil is an obvious case for this, the most well-known examples regarding water are to be found in Karl Wittfogel's seminal work which aimed in a historical odyssey to explain how the control and allocation of water was the very foundation for power and empires, using the concept of 'hydraulic civilizations' for ancient China and Sumeria, explaining their political stability and their rulers' might (Wittfogel, 1957). Hence resource management and the struggle for access and control of water is a stranger neither to state-building nor to high politics. It is also growing in significance as an inevitable part of human security. Let us briefly backtrack and see how these changes emerged historically.

In the latter half of the 20th century, the understanding of the precariousness of the global environment rose slowly, through the Club of Rome in 1957,

the Stockholm environmental conference in the 1970s, the Brundtland report on sustainable development in 1987 and finally the Dublin and Rio meetings in 1992. Publications like *The Silent Spring* (1962), *The Tragedy of the Commons* (1968) and *Gaia: A New Look at Life on Earth* (1979) emerged in great numbers, effectively placing the debate on global resilience on the political agenda. These milestone events bit by bit moved environmental issues into the centre of global politics, emerging as a security problem of sorts. This was subsequently emphasized through the growth of knowledge on the global water crisis effectively starting in the 1990s, which since then has grown considerably in significance (Falkenmark, 1990; cf. UNDP, 2006). Still, environmental concerns were not primarily seen as security issues, being subdued by the cold war and the hard-core realism that was fostered during that era. The nuclear arms race, Mutually Assured Destruction (MAD), and Star Wars were instead what monopolized the security agenda, reinforced by manifest regional conflicts driven by cold war interests and military rationales. It was only when the 'overlay' (Buzan, 1991) of the cold war was lifted in 1989/91 that other issues (including water) could be credibly seen and addressed as security problems. By 1991 the emergence of water wars (cf. Starr, 1991) had been proclaimed, rushing water into the global security architecture.

But water made it also into the security debate through the back door. In the post-cold war environment, a so-called 'alternative security' debate arose, asking whose security, securing what (Buzan, 1991; Tickner, 1992; Waever, 1993; UNDP, 1994) Once the nation-state and their armed forces no longer monopolized the security concept, the focus on territory and military power had to give way (a little) to other very real security problems humanity undeniably faced, be they forced migration, hunger, gendered violence, biodiversity or global climate change. As such, water may be one of the absolutely most crucial commodities for safeguarding people's wellbeing. This is not the place for number crunching, but the simple fact that inadequate access to safe water is said to be the main reason for three million people per year (UNDP, 2006) makes it a more significant security problem than all violent conflicts combined globally. The emerging global food crisis is also water-driven, and so is the entire global climate change process (Earle et al., 2014). Water is increasingly emerging as the resource in short supply when seeking investments in the agricultural field, and it is increasingly acknowledged as a key in development efforts across the board. In short, in order to consider people's wellbeing – popularly termed human security (UNDP, 1994) – and to enhance water access, better water governance is absolutely the top priority (Falkenmark et al., 2007).

Below we will briefly show how water rose into a global concern of major significance and how it was subsequently securitized and adapted to the classic security agenda. However, the journey also travels through a review on how water and the perception of its security dimension spread itself to many societal sectors and development efforts. Finally, we look around the corner,

and start to identify which security threats the accelerating global water crisis holds for the near to medium future.

Global Water Crisis

As noted above, the discussions on the environment being a cause of concern, and water being one of the key ones, gained momentum during the 1980s and 1990s. Through an improved understanding of the global water crisis, pointing to increased competition for dwindling resources, attention from policy makers increased. The water scarcity in the Middle East and North Africa, parts of Asia and Africa was highlighted in seminal works by Shiklomanov (1990) and Falkenmark (1986). Reigniting Malthusian fears, the research illuminated an increasingly harsh dilemma – increasing global population coupled with increasing demands and a static water resource, in some places even decreasing because of pollution making it unfit for most relevant uses. Demands were not only increasing due to a rising global population, but also due to changing consumption patterns 'demanding' more water.

Yet a global crisis of sorts, focussing on the functioning of the hydrological cycle and its impact on communities, nations and regions, has led to improved understanding of where hotspots may be located. The policy responses at various levels had hitherto primarily focussed on increasing the supply through the drilling of wells, construction of dams, and the building of canals and pipelines. As such the solution had to a large extent been within the engineering field. Subsequently, it was realized that in many regions where water scarcity was more acute a focus on managing the demand was warranted, indeed necessary, turning it essentially into a governance and management issue (Falkenmark et al., 2007). This meant that decisions on water were made more political and prone to conflict as decisions on allocation and access, and later on quotas and pricing, came to determine nations' and peoples' ability to live full and secure lives.

There was also a generally rising sense of competition for dwindling water resources; water was mapped, locked into major development schemes, sometimes to safeguard an individual state's access to a particular water source. In this process, water as an energy source was also made explicit, making hydropower increasingly attractive. The connection between water and energy also works the other way round, where it is noted that water productivity in food production tends to require more and more energy input. Overall, claims on a valuable and increasingly scarce resource were made by a wide range of sectors, nations and economic interests, all serving to reduce availability, and raising demands on its governance. With increasing awareness of the relative scarcity of water, and with an increasing sense of competition for it, water came to be politicized, 'securitized', and to a

higher degree subject to international conflicts, a security dilemma to which we turn now.

Water as a Classic Inter-state security issue

A major – but far from the only – reason for the focus on water security is the fact that much of the accessible fresh water of the world (more than 40%) is shared between two or more countries. When water is plentiful and relatively controllable sharing is generally easy. However, such a situation is often not the case, and, as we saw above, it is increasingly rare with increasing consumption and a growing sense of competition. In many parts of the world the rivers, lakes and aquifers that cross borders are subject to dispute and controversy of varying intensity. Think of examples such as the Nile River; the Ganges; the Zambezi, the Jordan River; the Euphrates-Tigris rivers; the Amu and Syr Darya that drain the shrinking Aral Sea and the groundwater being shared by Israel and Palestine. These water systems are a few examples of many where conflicts have emerged over the equitable sharing and use of shared water systems.

Some 276 river basins cross the political boundaries of two or more countries and there exist way over 300 shared groundwater aquifer systems (Transboundary Freshwater Dispute Database). As water scarcity in many of these basins increases, coupled with increasing climate changes meaning more water in some basins (but often at the wrong time or place) and less water in others, the onus is on states to avoid violent conflicts and to find cooperative solutions to the challenges that this poses. Still, progress in finding sustainable cooperative solutions is slow. Today, about two thirds of the transboundary rivers lack cohesive frameworks for cooperation (TFDD). The fact that it is hard to agree on cooperative frameworks is from an international relations perspective understandable. States are under increasing pressure and are less willing to sacrifice the well-being of 'their own' people (which is how it might be understood if they entered into compromises and were seen to lose from cooperation, whether that was true or not).

In addition, where cooperative mechanisms for the management of transboundary waters do exist they are often under-financed, disparate or lack a solid mandate upon which they can act and work (Earle et al., 2010). While much earlier research on the issue of water, conflict and cooperation focussed on whether the fact that two or more states shared a river, lake or groundwater resource led to conflict (and war) or cooperation and harmony (see also Volume II in this Major Works for more elaboration), it is noted that often it is not a question of either-or but that conflict and cooperation co-exist at various levels (Mirumachi, 2010). Earle et al. (2010) have noted that transboundary water management and the interactions between states may take the form of continuous negotiation rather than the more traditional approach

of trying to solve all issues once and for all in an agreement. In the academic debate on the topic during recent years an increasing focus has been to improve the understanding of the quality of cooperation, with a focus on issues such as equitability, hegemony, justice and power(im)balances between states sharing the resource (Zeitoun and Mirumachi, 2008).

Increasingly, the debate on water security has broadened from the classic IR field (discussed above and outlined in Volume II of this series) to wider areas including development; rights perspectives on water; legal aspects and the water, food and energy nexus (treated in Volume III). These issue areas all point to an important aspect of water security – namely that of trade-offs. Whether one is developing shale gas or trying to preserve crucial ecosystem services, access to sufficient amounts of water of appropriate quality is crucial. Hence, the security dimensions of water go beyond mere division of water between states. Various actors will argue for the importance of their specific use. Therefore the water security dimension needs to have appropriate (water) governance systems in place to address the trade-offs in a wide range of sectors, something that is discussed in Volume IV.

Broadened Security Debate – Water and Human Security as the Core Concern

As noted above, often trade-offs have to be made in situations of water scarcity when there is not enough water in a country or region to sustain for example intensive irrigation of agriculture while at the same time providing WASH (Water, Sanitation and Hygiene) services to a burgeoning population, and simultaneously developing an industrial sector. These aspects of societal development aiming to satisfy basic everyday life as well as development aspirations are, drawing on the broad security concept of Human Security, discussed in Volume III and also to some extent in Volumes I and IV. In this regard the governance systems put in place to govern the water resources at our disposal well are central. Many studies at international level have indeed identified the water crisis not as one of scarcity but as one of governance (UNDP, 2006; WWAP, 2003).

From a broadened security perspective, which includes a plethora of angles, water is obviously a central component. Not only does it invoke traditional/realist thinking as a resource crossing national borders, it also – primarily, some would say – raises security challenges as it relates to issues such as food security, health issues, development and livelihood challenges, to mention just a few. For instance, from a health perspective access to clean water and adequate sanitation – or rather lack thereof – is a killer of enormous proportions. From a human security perspective the challenges are major, and while change is heading in the right direction with the partial fulfilment of the MDGs – with more people accessing clean water as well as

improved sanitation – the pace of progress is far too slow, too uneven, and possibly not sustainable (at least not stable).

The scarcer the water resource, the more obvious it becomes how dependent we are on water for virtually every human activity, and how relative access to it is crucial for the kind of life we live (Hellberg, 2014). Hence, absence of water (or inadequate management of it) soon threatens a wide range of sectors in society. The general health situation deteriorates rapidly without proper access to water and so does medical care; investments in the food production sector are not feasible without a secure water supply (and the more secure the more efficient); and many industrial ventures are heavily dependent on reliable and ample water access. In addition, already vulnerable groups (e.g., ethnic minorities, children, the urban poor) are those who typically suffer most when there is a problem with allocation. In many parts of the world (notably rural Africa), water access is also an explicit gender issue, since tradition has it that women are responsible for collecting water (irrespective of how far away and inaccessible it is). There is no denying any more that water in an everyday and developmental sense has major human security implications.

Water Security as a Future Issue – New Challenges, New Solutions

Water has from many perspectives been seen as an issue of low politics and been approached from that perspective. However, during the last few decades we have seen a development that has been multi-faceted and in some ways described water as a high politics issue (cf. the water wars discussion) while in other aspects it has been treated as more of a development challenge. Ahead of us we can assume that the focus on water as a major issue of concern will not go away. It is argued that it will be the other way round, bound to grow in significance. More people with higher demands will have to share a fixed global volume of water. Development aspirations will increase the need to make trade-offs between sectors within countries as well as tougher debates on sharing water between nations. Climate change will imply decreasing amounts of water in some places (some where water scarcity is acute already) and more water in places where flooding and other water-related hazards are already a fact of life, putting further stress on emerging tension relating to water, as well as higher demands on its governance.

Projections of the water requirements for the food needed to sustain a growing global population (with increasing demand for water-intensive foodstuffs such as meat) look challenging when coupled with the need for water for industrial production and ecosystems. Water conservation, demand management and sometimes changes in lifestyles may be required (Lundqvist et al., 2008). People, societies and nations will have to be better at governing

and managing the water resources of the world. Just as water has an inbuilt complexity to it, moving through the landscape and the atmosphere in complex ways and forms, the solutions to the water challenges are often complex and requires a range of activities involving management of land, energy policy, food processing and transport, to mention only a few. However, simultaneously, there are also some rather simple solutions available which may not be applied as widely as they should be – again, governance appears as a resource in short supply.

It comes as no surprise that water security has been raised by a wealth of UN agencies and the US government as a major issue of concern globally and has also been highlighted by the Security Council of the UN. Underlining this, the UN has just released a policy brief on water security (UN Water, 2013) and the OECD has produced a report on the topic (OECD, 2013). We also have Kofi Annan and his successor as UN Secretary-General Ban Ki-Moon warning on the record of the dire consequences of national and international conflicts around water resources (UN News Centre, 2008; Wolf et al., 2005). It is to be hoped that the four volumes described below will assist in further bringing clarity to the issue of water security as well as providing some leads to what can be done to address the challenges we are confronted with.

A Set of Four Volumes on Water Security

The four volumes in this major work aim to outline the major challenges that have emerged in the water security discourse over recent decades. While water scarcity has been discussed and analysed with increasing frequency since the 1980s, the linkages to conflict and security were not made until the 1990s, primarily by authors such as Starr (1991). While the four volumes generally lean on security discourses, a comprehensive volume on water security needs to incorporate aspects from a range of disciplines such as hydrology, engineering, geography, political science, international relations, development studies, sociology, international law and economics. This debate and development of a broad discourse on water security deserves a holistic undertaking aimed at bringing clarity and a direction to the evolving discourse. While water security is linked to the broad and traditional definitions of security it is, as discussed above, not limited to the state-centric national security paradigm as it carries significance for a wide range of everyday activities.

In the four volumes we seek to broadly outline the debate as it has developed during the last two decades both from a policy and an academic perspective. It is believed that this major work will bring conceptual clarity as well as provide an account of how the water security discourse has developed. Naturally the IR focus of a SAGE Major Works is strong, but to get a good understanding of the water security debate and emerging paradigm it

is argued that it is necessary to have a more natural science-focussed first volume with a historical perspective in order to lay the ground for what is to come in Volumes II–IV. Therefore Volume I will outline the scientific and interdisciplinary basics of water security and how the water issue came to grow into a global security concern. This first volume will set the natural scientific scene for water security and will address issues such as water scarcity at global as well as regional levels; surface and groundwater considerations; green and blue water considerations; threats and challenges to water security in terms of water pollution, over-use with subsequent impacts on ecosystems as well as the resilience of water and ecosystems. It will also discuss water and climate variability and change.

Volume II will illuminate the debate over the last few decades on the issue of water, conflict and cooperation, primarily, but not exclusively, within an International Relations paradigm. Starting out with the classic references to water as a potential source of new wars (primarily but not limited to the MENA region) where the understanding focussed on the fact that in parts of the world there simply was not enough water to sustain its populations, coupled with fierce political rhetoric from politicians about coming wars over water, the conclusion that future wars over water would come seemed natural. However, that proved to be far-fetched since it overlooked the potential of virtual water being traded into regions of water scarcity thereby ameliorating the risk of wars, and also underestimated the often interdependent nature of water, where clear incentives exist for cooperation. Some quantitative research in the last decade asserted that states that shared a river, lake or aquifer more often tended to choose cooperation instead of conflict and war. Thus the debate moved on to perspectives of water as a source of cooperation. At a certain point the pendulum in the international discussion swung to the extent that the fact that two or more states had a shared water system was seen as a reason that this could also lead to peaceful relations in other areas – something of which there is less substantive evidence. After that, the debate has again moved to a more nuanced picture, of water being a subject both of conflict and cooperation simultaneously. In addition, a more developed understanding of water cooperation emerges as the quality of cooperation is discussed.

Volume III will address water security and development in the broad sense. It will cover areas such as water, health, food and energy considerations and trade-offs; the role of virtual water and the global food market; water rights and water as a human right; water resources development and poverty reduction and linkages between human water security and biodiversity/ecosystems. In that sense the volume will move beyond the traditional IR concerns in that it will take a broader perspective. Human security aspects are relevant in this context to outline the issues at stake, and with the help of that concept the prevalent security concerns widen into broader development issues. While often observing contexts of a minor scale in this volume – such

as individual countries, villages and/or individual households – the issues addressed have nevertheless severe implications on a global scale. While this problematique for long was referred to debates of minor importance, it is now commonly discussed within a security framework and often on a global scale.

The fourth volume will cover emerging and future challenges to water security at global as well as regional levels. Among other issues relating to the threat that climate change poses, what that means for transboundary water agreements is discussed. In many cases agreements are based on multi-year averages and with the increased impacts of climate change many agreements will become obsolete. In addition, population growth (meaning less water becoming available on a per capita basis); the increased prevalence of land acquisitions (or 'land grabbing'); and how its water impacts affect not only national but also cross-border relations are emphasised. The increasing water footprint of a burgeoning global middle class as well as challenges in the food supply chain are important new developments with potential effects upon the well-being of people, communities and even nations.

Volume II: Water Wars and Water Cooperation

The water crisis is of such a magnitude that it is growing into an issue of common global concern, and water is increasingly being called the oil of the 21st century. Global water consumption is rising steeply, and the lack of adequate and reliable supplies of water is a problem in many parts of the world. Water tables are falling increasingly on every continent. Several countries, particularly in the South, already face serious problems in meeting rapidly increasing water demand. In order to meet such demands, further pressure is being placed on water resources.

Many water-scarce countries are increasingly meeting growing water demand by building reservoirs for storage, using canals to divert water from one area to another, or unsustainably extracting groundwater. The requirement for hydropower and commercial fishing has also contributed towards human intervention in common water resources. Poor management and distribution systems also further add to the problems of water scarcity. In most countries, some of the deepest divisions over water use are between rural and urban areas, both having different priorities. For political and economic reasons, urban and industrial water demands usually take precedence. With greater pressure being placed on scarce water resources, water has increasingly become a source of social tension, bringing further competition and creating conflict.

In an armed conflict, the deliberate targeting of dams and other storage facilities may be directly responsible for inducing water scarcity or reducing the water quality of the opponent (Gleick, 1993). Thus, water scarcity

becomes part of a military strategy and military behaviour. It is not only the water supply that is affected and polluted by conflicts; fresh water resources also have the potential to cause or contribute to the creation of new conflicts. Even though such conflicts are present within state boundaries, they tend to be more complex and difficult when concerning international freshwater resources.

Nearly half of the global fresh water is to be found in more than 276 international basins. Many believe that the serious dependence of many countries on an external water supply may force them to re-orientate their national security concerns in order to protect or preserve such availability (Cooley, 1984; Haftendorn, 2000; Swain, 2001). Some of the inhabitants of river systems such as the Indus, Euphrates-Tigris, Nile and Zambezi are currently in dispute over the sharing of their common water. As early as the mid-1980s, United States intelligence services estimated there were at least ten places in the world where war could break out over the shortage of freshwater supplies, with the majority located in the Middle East (Starr, 1991). Since the early 1990s, that has prompted many political leaders, international civil servants and policy analysts to regularly proclaim that while the previous war was about oil, the next war will be about water. Disputes over shared river water usually arise between riparian states on three issues: quantity, quality and control. The disagreements over quality and control issues are relatively easier to address compared to the quantity issue. Water is not easily replaced, so the problem of its reduced quantity is more difficult to address and in many cases forces the riparian countries into adversarial positions.

Transboundary water is not only expected to increase competition and conflict, it can also contribute to building engagement and co-operation among the riparian states. Due to mutual dependence, the withdrawal or pollution of the 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 towards establishing regimes and institutions for cooperation (Wolf, 1998). According to the widely cited Oregon State University data set, the last 50 years have seen only 37 serious water-related violent disputes; of those, 30 were between Israel and one of its neighbours. However, during the same period, 157 treaties were negotiated and signed. The signing of the agreements on these important rivers in conflict-prone regions has been regularly cited to downplay the possibilities of 'water war' scenarios.

However, these water treaties face danger to their survival if they fail to receive support from effective institutional arrangements to ensure an adequate water supply. The allocated water in the existing sharing agreements in most cases is unable to meet the increasing demand. The scope for further augmentation of river water in the arid and semi-arid regions of the world is becoming limited due to the possible impacts of global climate change. Thus

the compliance part of the shared water agreements poses real challenges. The water 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 disgruntlement 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, these 'hydro hegemons' challenge upstream rights over the river flow. As a matter of fact, research indicates that power is more important than geographical location in determining the division of water (Zeitoun and Warner, 2006).

If water stress can lead to conflict, it can also bring cooperation. By realizing the dangers and threats of water scarcity, groups and countries might keep protesting other's water use and abuse, while at the same time engaging them in some forms of cooperation to be able to use and develop the shared water resources (Zeitoun and Mirumachi, 2008). Cooperation is an interactive process, which turns a situation from potentially destructive conflict into something productive. Cooperation over water resources does not mean that there is an absence of conflict, but it implies that there is a mutual will to address the disagreement over the water use through communicative and peaceful means. In other words, water cooperation generates willingness among the riparian countries to think creatively about their problems, consider mutual problem-solving mechanism, and negotiate commitments. This has led to the emergence of a new area of research on analysing spin-off advantages of water cooperation to regional peace.

The discussion regarding the causal relationship between water scarcity and conflicts or cooperation has yet to produce consensus. Identifying the causal pathway, which follows from water scarcity to the formation of actors, issues and actions that then may escalate hostility into violence or cooperative behaviour, is cumbersome and not necessarily very direct. In limited cases some sort of causal links can be traced, but this has not been sufficient to establish the kind of knowledge that would result in firm prediction. However, on the basis of the existing research it can be safely argued that the increasing scarcity of natural renewable resources may not generate conflicts or cooperation in itself, but that it can, and in some instances already does, act as a multiplier, that is it interacts with other factors (complex societal dynamics, geo-politics) in tending towards causing conflicts or cooperation.

This volume draws on the published work of a variety of scholars who will provide an outline of the scholarly debate on whether the increasing scarcity of freshwater resources might lead to national and international conflicts or provide opportunities for cooperative arrangements. The article by John K. Cooley, a news correspondent covering the Arab world, in his influential piece in *Foreign Policy* way back in 1984, was probably the first to coin the water war concept. He argued that the constant struggle for the shared

waters of the Middle East rivers was a principal cause of the 1967 Arab–Israeli war and could be the trigger that would ignite a new all-out conflict. Highlighting the precarious nature of water insecurity in the region, the piece further argues that water can be used to cement peace. However, for that to happen, riparian countries in the region need to practice planned water sharing and joint water management.

The article by Joyce R. Starr is another piece from *Foreign Policy*. This widely cited work was written in 1991 in the immediate aftermath of the end of the Cold War and at the time of the first Gulf War. The timing of its publication coincided with the increasing research interest in resource scarcity challenges to global security. Taking transboundary rivers of the Middle East and North Africa as cases, Starr has predicted that a water crisis will erupt in the region in the near future and concludes that for their economic and political survival, countries in the region need a creative response to achieve water cooperation.

The article written by Helga Haftendorn deals with the causes and conditions under which international conflicts arise in the use of freshwater from rivers, lakes or ground water aquifers. While analysing water conflicts, there has been an attempt to investigate whether water has been the source of the conflict or has acted as a conflict multiplier. The second part of the article looks at the possibilities of cooperatively solving water conflicts with the help of negotiation and the role of international institutions in the process.

The article written by Ashok Swain, *Water Wars: Fact or Fiction*, argues that though there are many on-going disputes between the countries of transboundary river basins, very rarely do these disputes turn into violent conflicts. The lure of further water resource exploitation leads to agreements among the disputing riparian countries. However, to find a lasting cooperative solution, the article argues for a comprehensive water management approach to be adopted in the basin, addressing both the supply and the demand side of the resources.

Erik Mostert's article, *Conflict and co-operation in international freshwater management: a global review*, is an authoritative review of the management frameworks adopted in 35 international freshwater basins in different parts of the world. Despite riparian conflicts, the basins have witnessed water-sharing agreements and also the establishment of some river basin commissions. However, the article sees the desire for good neighbourly relations as the reason for the riparian countries to opt for agreement. To be effective, the article argues that the water cooperation framework needs to involve local governments, civil society and individual stakeholders.

Karin R. Bencala and Geoffrey D. Dabelko in their article *Water Wars: Obscuring Opportunities* argue that though state leaders have engaged in considerable posturing over water, they have not escalated conflicts to violent wars between states. While increased water scarcity could lead to conflict, this scarcity also provides opportunities to shape a cooperative future.

If addressed properly, water scarcity can bring parties together in order to jointly manage resources. In order to properly understand the dynamics of water conflict and cooperation, there is a need for further research not only on what drives water conflict, but also on why some similar situations instead produce cooperative arrangement.

Neda A. Zawahri's article *Capturing the nature of cooperation, unstable cooperation and conflict over international rivers: the story of the Indus, Yarmouk, Euphrates and Tigris rivers*, critically analyses the existing definitions of conflict and cooperation over international rivers and argues that an underlying weakness with existing definitions is an insufficient examination of the problem structure that states confront. The sharing of international rivers involves management challenges and disputes, which require riparian states to engage in constant dialogue and negotiation. Existing bilateral relations are reflected in the way riparian states manage their water disputes.

Mark Zeitoun and Jeroen Warner's article, *Hydro-hegemony – a framework for analysis of trans-boundary water conflicts*, discusses the conceptual framework of hydro-hegemony at the river basin level. Examining transboundary basins such as the Nile, Jordan and Tigris and Euphrates, they find strong evidence of power asymmetries influencing inequitable water sharing which sustains an on-going low-intensity conflict. However, by adopting a positive role and following an integration strategy, hydro-hegemons can also move away from domination towards basin-based cooperation.

Frederick W. Frey's article, *The Political Context of Conflict and Cooperation Over International River Basins*, argues that there is an urgent need for a predictive theory of cooperation and conflict over transnational rivers. For that there is a need for a more focussed power analysis of transnational water basins within a systematic framework. With the help of this analysis, the article argues that the most conflict-prone situation arises when a basin has a powerful downstream riparian partner with the stronger interest in the water, while the upstream partner also needs the water for its own use. However, in a basin where the upstream partner is more powerful and has little interest in the water, that can provide a stable and peaceful water-sharing arrangement.

Mark Zeitoun and Naho Mirumachi's article, *Transboundary water interaction I: reconsidering conflict and cooperation*, finds that conflict and cooperation co-exist in the vast majority of transboundary river water-sharing cases. The authors find that interaction over transboundary water resources is an inherently political process shaped by the broader political context. Traditional forms of cooperative arrangement of water resources usually sustain conflict rather than transforming it. Effective and successful water cooperation can be achieved only through the riparian states complying with the agreement, adjusting goals and interests and solving problems.

Stephen C. McCaffrey's article, *The Need for Flexibility in Freshwater Treaty Regimes*, argues that declining freshwater supplies pose particular

threats in international freshwater basins. Many of these basins are governed by riparian treaties. Unlike international law, the water treaties are not flexible enough to adapt to increasing demand and decreasing supplies of water resources caused by growing populations, economic development and climate change. The article argues that basin countries need to emphasize flexibility while designing water-sharing regimes in their transboundary basins.

Aaron T. Wolf's widely cited article, *Conflict and cooperation along international waterways*, with the help of an analysis of the datasets of conflict, finds that in the 20th century riparian states did not fight a single war over water and had signed 145 water agreements. The preference for cooperation is due to the fact that basin countries do not find war over water as 'strategically rational, hydrographically effective or economically viable'. The article also finds cooperative water regimes are tremendously resilient even within a very hostile bilateral environment.

Claudia W. Sadoff and David Grey's article, *Beyond the river: the benefits of cooperation on international rivers*, argues that international rivers have the potential to elicit cooperation or conflict, but the riparian states' choice will be based mostly by their assessment of possible benefits. The article presents a framework for potential benefits in areas such as ecosystem management, increased food and energy production, reduced bilateral tension and increased regional cooperation. However, the basin countries opt for either conflict or cooperation primarily because of existing political, geographic, economic and cultural circumstances. The article, arguing for the better management of transboundary rivers, pleads for proper identification and understanding of the shared benefits made possible through water cooperation.

David K. Kreamer in his article, *The Past, Present and Future of Water Conflict and International Security*, provides examples of struggles over fresh water throughout the world and transboundary water disputes posing as serious security challenges in several regions. Climate change and climate variability further increase the uncertainty of fresh water demand and supply. The article suggests establishing mechanisms for early warning of water conflicts and stresses the needs for effective policy and regulatory structures to achieve cooperation among water users.

Dan Tarlock and Patricia Wouters in their article *Reframing the Water Security Dialogue* argue against limiting the water security discourse within the mindset of individual sectors and disciplines, which leads to the defining of water issues as matters of security. International water law adheres to the principle that transboundary rivers should be shared by all the riparian states. This is a significant contribution to the protection of national security and the promotion of sustainable development.

Almost all the articles in this volume try to find out why and under what conditions states cooperate or fight over their shared water resources. Their attempt towards finding a theory which can capture the dynamics has been mostly influenced by the limited experiences drawn from their study of one