

*Promoting effective water management  
cooperation among riparian nations*

By Dan Tarlock

**Global Water Partnership  
Technical Committee (TEC)**



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Global Water Partnership (GWP)  
PO Box 24177  
SE-104 51 Stockholm, Sweden  
Phone: +46 8 1213 86 00  
E-mail: [gwp@gwp.org](mailto:gwp@gwp.org)  
Websites: [www.gwp.org](http://www.gwp.org), [www.gwptoolbox.org](http://www.gwptoolbox.org)

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## **FOREWORD**

Cooperation in transboundary river and aquifer management is a continuum of stages ranging from informal exchanges of information between riparian states to participation in formal, on-going allocation and management legal frameworks. Cooperation has been endorsed by countless international, governmental, and non-governmental organisations. But too often the extensive literature on cooperation accepts that all interaction among basin states is good regardless of whether it is beneficial or not and it focuses mostly on ‘input’ cooperation. This paper argues that this focus must shift towards ‘output’ cooperation. Cooperation for cooperation’s sake is not enough. It needs to be effective, it must produce improvements in water security among all basin states, and the benefits must be measurable to have meaning. Some benefits may be readily quantifiable, such as shared hydropower revenues, while others may be more difficult to measure, such as improved ecosystem services. But whatever the benefits, standards will be needed to measure this type of cooperation which are consistent with achieving basin-wide and state water security. The framework provided by international water law can play an invaluable role in encouraging this process.

This paper makes an important contribution to the literature on transboundary water management and to GWP’s work in this area. It complements the formal, largely aspirational, measures of cooperation, such as framework conventions and other expressions of future cooperation, by focusing on effective cooperation.

I am grateful to the author, Professor Dan Tarlock, member of the GWP Technical Committee for this landmark paper. I would like to acknowledge Professor Patricia Wouters, former Technical Committee member, for laying the groundwork for this paper. My thanks also to other GWP Technical Committee members for their invaluable comments and suggestions during the drafting stages. I am very appreciative of the editing support provided by Melvyn Kay.

Dr Mohamed AIT KADI  
*Chair, GWP Technical Committee*





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## ACRONYMS

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EIA	Environmental impact assessment
GCM	Global climate model
GWP	Global Water Partnership
IBWC	International Boundary and Water Commission
ICJ	International Court of Justice
IJC	International Joint Commission
IMBO	International Network of Basin Organizations
IWRM	Integrated water resources management
NGO	Non-governmental organisations
OKACOM	Okavango River Basin Water Commission
ORASECOM	Orange-Senqu River Basin Commission
PNPCA	Procedures for Notification, Prior Consultation, and Agreement
TIA	Tripartite Interim Agreement
TWRM	Transboundary water resources management
UNECE	United Nations Economic Commission for Europe
UNWCC	United Nations Convention on the Non-Navigational uses of Transboundary Waters, also called 1997 UN Water Courses Convention
USAID	United States Agency for International Development
USBR	United States Bureau of Reclamation
ZAMCOM	Zambezi Watercourse Commission
ZRA	Zambezi River Authority

## EXECUTIVE SUMMARY

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ransboundary river and aquifer cooperation among basin-aquifer states is a central element of the merging water security framework endorsed by the GWP. Cooperation has been endorsed by countless international, governmental, and non-governmental organisations. But a large gap exists between aspirations and actions that lead to improved water security. The reasons for the lack of cooperation that yields measurable water security benefits range from the geo-political to the lack of resources available to individual states and existing basin organisations to take the necessary steps to build mutual trust among those involved.

This paper builds on BP No 17 International Law – Facilitating Transboundary Water Cooperation (Wouters, 2013). It argues that we need more refined measures of effective cooperation and examples to provide nations with possible models to adapt to a specific basin. Too often, the extensive cooperation literature accepts almost all interaction among basin states as cooperation, regardless of whether the interactions produce measurable benefits. Potentially, benefits are many. They can be quantifiable, such as new water allocations, or unquantifiable, such as reduced tensions between two basin nations. But they must be measurable. Cooperation for cooperation's sake will not necessarily provide the benefits. Some benefits, such as shared hydropower revenues or a firm allocation, will be immediately measurable, while others, such as restoration of ecosystem services, will take more time to measure. Measurable cooperation benefits generally require a legal framework. The role of international water law provides a three-pronged framework for cooperation:

- The core principle of equitable and reasonable use prohibits any one basin state from monopolising the supply of a river, lake, or aquifer
- Riparian states' understanding of an activity is subjected to specific cooperation duties with affected states
- Where there is a binding basin use and management instrument, there is an emerging customary duty upon all basin nations to cooperate to achieve the objectives of the instrument.

This paper offers a definition of effective cooperation that focuses on providing measurable water security benefits to individual basin states. It recognises that effective cooperation is a multi-stage continuum of relations between basin states and that many tentative, preliminary steps, such as agreeing to discuss problems and to share data collection and distribution, are

necessary to make progress towards improving water security throughout the basin. More formal steps may follow, such as agreeing water allocations and developing a legal management framework.

There are many examples of ‘paper’ or incomplete cooperation as well as where states have failed to cooperate. Nevertheless, there are also examples of good cooperation. Some have produced immediate benefits, others promise benefits in the future, while some provide a framework to adapt to changing conditions, such as climate change-induced drought.

The paper does not examine in depth the big, long ‘deadlocked’ basins, such as the Nile, Tigris–Euphrates, Jordan, and Amu Darya basins; or basins with some, but limited, cooperation, such as the Mekong. Rather it focuses on examples of ongoing cooperation, such as the Mexico–United States Colorado–Rio Grande Treaty, including Minute 319 to restore the Colorado Delta; the Columbia Treaty between Canada and the United States; and the Danube Convention. It also focuses on less-studied basins with strong GWP ties, such as the Incomati Rivers in southern Africa; the Angola, Namibia, and Botswana Okavango Process; the Indus River; and the Senegal River in Central Africa.

These examples provide useful precedents for river basin authorities and riparian states trying to better manage a shared water resource to promote water security.

## 1 ASPIRATION VS. EFFECTIVE COOPERATION

### 1.1 The imperative of cooperation

**T**he world's 263 transboundary river and lake basins cover almost half the Earth's land surface and 145 nations have territory in a transboundary water basin. Overlying aquifers are also shared among nations. There is no accepted number of the world's transboundary aquifers, but efforts are underway to identify them (Wada and Heinrich, 2013; Puri and Aureli, 2005). Using and managing these water resources, especially in stressed basins with 'bad' hydrology (Briscoe, 2009<sup>1</sup>; Wolf et al., 2003<sup>2</sup>), is crucial to the development, if not survival of many nations. Several existing surface and groundwater stresses are likely to increase in the future as the demand for water increases and climate change adds to the stress on supplies. There is almost universal acceptance that greater cooperation is needed among riparian nations to better manage these stresses and to use and manage transboundary rivers, lakes, and aquifers to promote water security, including the conservation of biodiversity (see Brels et al., 2008).

Transboundary water resources management requires shared responsibilities and cooperation. The main problems in managing these shared resources are rooted in the differences between riparian countries in terms of socio-economic development, water use objectives, political orientation, and administrative and management capacities to nationally manage water. Joint resource management at transboundary level must have special features among which equity, ethics, transparency, mutual respect, trust, and justice play important roles<sup>3</sup>.

#### Box 1. Water stress and water security

Water stress is a combination of a country's hydrology and its institutional capacity to manage water.

Water security is an aspirational goal both for nation states and for transboundary basins. The goal is to ensure that each nation in a transboundary basin has sufficient good quality water for all consumptive uses; has sufficient water for non-consumptive uses, including protection of aquatic ecosystems; can enjoy these uses without

<sup>1</sup> Briscoe defines it as a climatic situation where available, variable, supply and demand do not balance.

<sup>2</sup> See Wolfe et al. for a methodology to identify at risk basins.

<sup>3</sup> <http://www.gwp.org/en/ToolBox/CROSS-CUTTING-ISSUES1/Transboundary>

competing, unresolved claims from other basin states; and can mitigate the risks of floods and droughts. Water security has three linked dimensions. The economic dimension seeks to increase water productivity. The social dimension seeks to ensure equitable access to water services and resources – both within individual states and in the basin – and to promote resilience to extreme weather events. The third dimension is environmental and includes sustainable water use and the restoration of degraded ecosystem services. In short, the goal of water security is to enable each basin state to pursue a sustainable water development programme consistent with those of other states. For example, a state can choose to exploit its green water (rainfall) or its blue water (water in rivers, lakes, and aquifers). Or, a state can use virtual water (water used to produce imported food and other products) to ensure its water security. Water security policies may conflict with other basin states, and so cooperation among basin (or out-of-basin) states is an essential element of water security.

Source: GWP, 2014; Chaves, 2014

## 1.2 Towards a more refined measure of cooperation

Riparian cooperation is not new. States have long cooperated to manage shared rivers and, more recently, to manage shared aquifers. Some 3,600 transboundary agreements are currently in force. But, in many basins there is still a gap between cooperation initiatives and institutions, and the allocation and management which address specific stresses. According to UN-Water (2014), existing agreements need “...workable monitoring provisions, enforcement mechanisms, and specific water allocation provisions that address variations in water flow and changing needs.” This conclusion echoes many studies which conclude that nations practice ‘soft’ rather than ‘hard’ cooperation (Kitissou et al., 2007; Wolf, 1999). ‘Soft’ cooperation can range from informal bilateral discussion to framework conventions that leave hard choices to the future. ‘Hard’ cooperation involves discrete, concrete actions ranging from exchanging information or environmental assessments to agreeing allocations and creating permanent shared management institutions. Nonetheless, the range of activities that can count as cooperation needs to be narrowed to focus on the steps that effectively address water stress and thus promote water security, especially in Africa, Asia and Eastern Europe.

Efforts to measure cooperation are made difficult because there is no single accepted definition of riparian cooperation. Indeed, a single definition is not possible because the range of activities that count as cooperation is large.

The purpose of this paper is to supplement the formal, largely aspirational, measures of cooperation, such as framework conventions and other expressions of future cooperation. It argues that the objective of cooperation should be to produce measurable benefits that promote water security.

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*...the range of activities that can count as cooperation needs to be narrowed to focus on the steps that effectively address water stress and thus promote water security...*

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The paper draws a distinction between ‘input’ and ‘output’ cooperation, but suggests that the main focus should be on output cooperation and the benefits this produces, both quantifiable, such as new water allocations, and unquantifiable, such as reduced tensions between two basin nations. Standards are needed to enable this type of cooperation to be measured and assessed against their ability to lessen water stresses and to ensure that all nations within a basin receive useful water security benefits from cooperation.

The paper first identifies the range of conflicts among riparian states and stakeholders (real and potential) that exist in many basins and how these issues impact existing cooperation efforts. Examples of basins that have achieved some measure of output cooperation, or are moving in that direction, are used as models.

This paper builds on these many studies to construct a model of cooperation as a process along a continuum of different stages from non-cooperation to outcomes with measurable benefits. Discussions about cooperation rarely try to define the term or offer metrics to measure the outcomes (Mianabodi et al., 2015). Most analyses adopt either a formal or process-oriented definition. The formal measure defines cooperation by the existence of a treaty or other agreement between two or more states that calls for cooperation. The existence of institutions to facilitate and manage cooperation is crucial in fostering effective cooperation. It is often combined with explanations for non-cooperation (UNECE, 2009). The process-oriented measure looks at riparian states’ practices, but does not systematically assess the results of the cooperation (Earle and Wouters, 2015). These are important contributions to developing principles and standards to measure effective cooperation.

### **1.3 A typology of cooperation**

Common stages in many on-going initiatives among basin states begin from a position of non-cooperation for which no discussion is needed. Cooperation usually begins with an agreement to cooperate, but often there is no immediate specific objective, such as allocating unallocated transboundary waters, adapting to changing conditions, or seeking to jointly manage existing allocations. The next step is preliminary cooperation, which may be informal or take place within a transboundary institutional structure. Some of the most common issues include:

- One state protests the action of another and requests some form of future cooperation
- Two or more basin states agree to discuss the needs of other riparian states
- Two or more states agree to exchange relevant hydrological, economic, and environmental information
- The basin states agree to jointly study emerging problems.

### **1.3.1 Single issue cooperation**

Single issue outcome cooperation refers to either a unilateral action by one state that resolves a conflict or a joint agreement among basin states to address a specific problem. The cooperation can be a one-off action or more permanent. Examples include:

- One state abandons or modifies a proposed impoundment/diversion based on the objections of another riparian state
- One state allows another to use its storage facilities
- Two or more states agree to provide the necessary in-situ flows to stabilise or restore a stressed aquatic ecosystem
- Mainstream states agree to include tributary states in the institutional structure
- Continuing cooperation with indeterminate outcomes
- Two or more parties agree to participate in a long-term basin planning process without specifying a substantive outcome
- Parties agree to a joint planning process with a specified substantive outcome, such as an allocation or management regime
- States agree to reduce tensions among them.

### **1.3.2 Outcome cooperation**

Outcome cooperation refers to decisions that take meaningful steps to allocate, reallocate, or manage shared water resources. Examples include:

- One riparian state agrees to share financial benefits with an upstream or downstream state, such as sharing power revenues, sharing reservoirs, or agreeing payments by one state to another to forego a water use
- Riparian states agree to an initial allocation of river flows
- Riparian states agree to reallocate river flows to provide fairer access among all basin states
- States change an existing allocation regime to adapt to changed conditions, such as environmental damage or climate disruption.



## 2 TO COOPERATE OR NOT?

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**T**ransboundary watercourse cooperation has been intensely studied and a vast literature on the subject exists. Much of the literature either explains why cooperation has not succeeded or details examples of ‘paper’ coordination. That is the signing of agreements among basin states, but with little attention given to implementation. In addition, much of the social science literature ignores or gives short shrift to the potential role of international waters in inducing more effective cooperation among riparian states. This paper draws two lessons from the literature. First, cooperation is usually the result of mutual self-interest. Second, a process of trust building among political leaders and water professionals can lead to cooperation. This paper also augments the existing literature by focusing on the three primary international water law instruments and the potential role that they can play in inducing more effective cooperation. They are:

- The 1997 UN Convention on the Non-Navigational uses of Transboundary Waters (UN Watercourses Convention – UNWCC)
- The 1992 UN Economic Commission for Europe Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention)
- The UN Draft Articles on Transboundary Aquifers (Transboundary Aquifers Articles)<sup>4</sup>.

Other international agreements complement these, such as the Convention on Biological Diversity (Brels et al., 2008), the Ramsar Convention, and the UNESCO World Heritage Convention.

### 2.1 A typology of conflicts

Understanding the causes of conflict between riparian states can help nations to understand the strengths and weaknesses of the law as they move from conflict to cooperation. Most conflicts fall into three broad categories:

- Competing demands between upstream and downstream watercourse states
- Activities which pose a risk of transboundary pollution or aquatic ecosystem damage
- Groundwater withdrawals which threaten to reduce or stop withdrawals in another state.

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<sup>4</sup> Resolution 63/124 of the United Nations General Assembly on the Law of Transboundary Aquifers.

The most intense conflicts occur when water use by one state threatens to forcibly close its use by another state, and when there are asymmetries in the ability of upstream and downstream states to fund the infrastructure (e.g. dams, reservoirs, and canals) required to put the water to use. Typical conflicts include hydroelectric development vs. agriculture, upstream vs. downstream hydroelectric development, and upstream vs. downstream agricultural use.

An example of competing demand is the long-running conflict between Egypt and Sudan and their upstream neighbours (Tvedt, 2004/2006). Egypt and the Sudan claim almost the entire flow of the Nile, and have the capacity to build large multi-purpose dams to enjoy these claims (Conniff et al., 2012). Frustrated upstream states, such as Ethiopia, unilaterally reallocated the river in 2010 and began to build large dams<sup>5</sup>.

The Lower Mekong River in Vietnam is an example of concerns over ecosystem stresses which are principally the result of upstream dams constructed in China, Laos, and Cambodia. The dams reduce the flood pulse flows and transported sediment that downstream fisheries and riverside gardens and 40 million people rely on for their diet and livelihood. The Lower Mekong also faces serious pollution problems from increased soil erosion, various untreated factory and farm discharges, and salt water intrusion (Shueeli, 1999).

The Arabian Peninsula provides an example of the conflict which can occur among states when groundwater withdrawals, mostly from non-renewable aquifers, threaten to reduce or stop withdrawals in another state<sup>6</sup>. Over-exploitation can also reduce river flows fed from groundwater sources.

## 2.2 Cooperation and self-interest

States often have powerful reasons both to refrain from cooperation and to cooperate. The main barrier is hydro-geopolitics based on national sovereignty claims over waters within their borders (Delbourg and Strobl, 2014). The decision to cooperate is usually grounded in self-interest, such

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<sup>5</sup> The 2010 Agreement on the Nile River Basin Cooperative Framework, [http://www.internationalwaterlaw.org/documents/regionaldocs/Nile\\_River\\_Basin\\_Cooperative\\_Framework\\_2010.pdf](http://www.internationalwaterlaw.org/documents/regionaldocs/Nile_River_Basin_Cooperative_Framework_2010.pdf), replaces water quotas with a clause that permits all activities provided they do not 'significantly' impact the water security of other Nile Basin states. Five upstream countries – Ethiopia, Kenya, Uganda, Tanzania and Rwanda – initially signed the accord, and Burundi signed a year later.

<sup>6</sup> [http://www.caee.utexas.edu/prof/mckinney/ce397/Topics/Groundwater/Transboundary\\_Aquifer\\_2012.pdf](http://www.caee.utexas.edu/prof/mckinney/ce397/Topics/Groundwater/Transboundary_Aquifer_2012.pdf).

as financial gain or the fear that litigation/arbitration will produce a worse result (Dombrowski, 2005). Cooperation may also be part of a larger political strategy to foster good relations with other basin states. The overarching benefits are:

- Increased water security for basin states (GWP, 2014) including better, equitable, and fair access to an international or transboundary watercourse<sup>7</sup>
- Tangible benefits include:
  - Reduced risk of unilateral state action, which may prejudice other states
  - Increased opportunity for ‘victim’ states to influence the design and operation of major projects at the planning stage
  - Ability to develop coordinated adaptation strategies to changed hydrologic conditions, such as global climate change
  - Ability to incorporate new uses, such as aquatic ecosystem protection, into existing allocation and management regimes
  - Ability to negotiate mutually beneficial basin allocation and management regimes
  - Removal of legal clouds on development
  - Increased access to donor project financing
  - Ability of states to forego water use in return for shared benefits
  - Ability to access less costly alternatives to meet a water objective (Sadoff et al., 2013)<sup>8</sup>.

Although these are immense benefits, in many basins they have not yet been accessed because one or more of the basin states may have considerable incentives not to share or to cooperate with its neighbours. The main reason for this lack of cooperation is hydro-geopolitics<sup>9</sup>. The disincentives include:

- Real or imagined fears of lost development opportunities because cooperation will disrupt the favourable status quo for an uncertain or less favourable future
- Political and ethnic rivalry

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<sup>7</sup> The role of equity in international law generally and international water law has been recognised by the ICJ and commentators but the contours of the principle remain unsettled. This paper equates equity with proportionality. In maritime boundary cases, the ICJ has vacillated between defining proportionality as a means to adjust boundaries among states with irregular coastlines, North Sea Continental Shelf cases, and Gulf of Maine case, and, as a substantive principle to allocate a scarce resource, Tunisia/Libya Continental Shelf case. Franck (1995) reads Tunisia/Libya for the proposition that the court “...has the discretion to allocate resources according to conditions of fairness . . . .” However, one of the reporters for the United Nations Convention of the Non-Navigational Uses of International Watercourses posits that, at best, equity is procedural principle. (McCaffrey, 2001).

<sup>8</sup> Sadoff et al. (2013) suggest that the controlled increased use of groundwater pumping may be a less expensive way to provide flow augmentation in the Lower Ganges than expensive storage reservoirs in Nepal.

<sup>9</sup> There is an extensive literature on this topic, especially with respect to the Middle East. (See, for example, Kiberogu et al., 2013; Zeitoun, 2008; Waterbury, 1979).

- Asymmetrical power relationships when riparian hegemony exists in the basin (German Federal Foreign Office, 2014)<sup>10</sup>
- A lack of treaty provisions or basin institutions to manage conflicts or to distribute benefits (Giordano and Wolf, 2003)<sup>11</sup>.

South Asia is a case in point. This region is dealing with some of the world's most difficult transboundary river disputes. Sharing water resources and, at the same time, sustaining riparian ecosystems has become increasingly complex because of intra-regional power imbalances, mutual hostility, suspicion, and the absence of an endorsed universal legal regime. None of the South Asian countries has joined the 1997 UN Watercourses Convention. India and Pakistan abstained from the vote on the Convention at the UN General Assembly, while Afghanistan, Bhutan, and Sri Lanka were absent. Bangladesh, Maldives, and Nepal voted in favour of the Convention, but none has ratified or acceded to the instrument. India officially noted its objections during its adoption, and so it is not surprising that it has not become a party to the Convention<sup>12</sup>.

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<sup>10</sup> China, for example, is a riparian hegemon in the Mekong Basin, the Brahmaputra and Salween basins, but is reluctant "...to engage in multilateral legal instruments ...."

<sup>11</sup> Giordano and Wolfe (2003) surveyed many of the major water treaties and concluded that they reveal "...an overall lack of robustness. Water allocation, for example, the most conflictive issue area between co-riparian states is seldom mentioned." (p. 168).

<sup>12</sup> <http://www.internationalwaterlaw.org/blog/2014/07/14/dr-kishor-uprety-a-south-asian-perspective-on-the-un-watercourses-convention/>

### 3 THE ROLE OF INTERNATIONAL WATER LAW

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#### 3.1 The drag of state sovereignty

**I**nternational law cannot compel states to cooperate, except in limited circumstances. Law alone cannot ensure cooperation. Cooperation is ultimately achieved when basin nations trust each other. Trust is a combination of factors, such as a shared history of relations between nations, availability of good technical information to avoid fears that a nation will be disadvantaged through cooperation, and good working relationships among water professionals (see Bernauer, 2002). But, through a combination of incentives and penalties (the “carrots and sticks” approach), international water law is an essential element of ‘hard’ or effective cooperation. Law can foster the needed trust by ensuring that each nation has a relatively secure entitlement to the use of a river or aquifer and by creating institutions that provide a process for responding to changed conditions. There is an emerging duty of greater cooperation that can serve as a model for basin management.

The major barrier is the bedrock rule of state sovereignty over its territory, including natural resources. State sovereignty is the legal foundation for the practice of hydro-geopolitics. Sovereign nation states became the building block of international law after the Peace of Westphalia (1648), and state control of natural resources as a core attribute of sovereignty was reaffirmed in several major post-colonial era UN resolutions<sup>13</sup>. Both upstream and downstream states assert the principle to block developments in other basin riparian nations and to limit cooperation and to practice hydro-geopolitics. For example, Turkey distinguishes between international and transboundary rivers to assert limited sharing duties over the former (Kiparoglu, 2005).

Sovereignty is more pronounced in the UN Draft Transboundary Aquifers Articles. Article 3 provides: “Each aquifer state has sovereignty over the portion of a transboundary aquifer or aquifer system located within its territory. It shall exercise its sovereignty in accordance with international law and the present draft articles.” Other articles reaffirm the importance of interna-

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<sup>13</sup> General Assembly Resolution 1803 (XVII) of 14 December 1962 on Permanent Sovereignty over Natural Resources.

tional cooperation and good neighbourliness, but sovereignty, not sharing, remains the bedrock principle. Thus, the fact that nations often do not want to cooperate effectively is understandable. Cooperation requires a nation to limit its use and management of transboundary water resources for the benefit of other riparian nations and this compromises its sovereignty.

### 3.2 Embedded sovereignty principles

Cooperation is embedded both in the customary substantive rules that allocate the use of transboundary waters and in the procedural duties imposed on states that undertake actions that may foreclose the use and management options of other basin nations (Leb, 2013). However, international water law still encourages unilateral action and does not put sufficient stress on the duty of the acting nation to cooperate. The rules contain embedded sovereignty principles that encourage states to unilaterally make important water use and development decisions. Thus, other riparian states seeking to prevent the action or to negotiate an alternative are at a major disadvantage. For this reason, the great project of international water law has been to curb unilateral state action and to encourage basin nations to cooperate to share the benefits of transboundary waters.

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*...the great project of international water law has been to curb unilateral state action and to encourage basin nations to cooperate to share the benefits of transboundary waters*

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Three aspects of embedded sovereignty law discourage cooperation. These are weak/incoherent water allocation norms; allowing unilateral action assessments of the impact of a state's existing or planned uses on other riparian states; and the focus on one-off allocation rather than long-term cooperative and adaptive management.

The major counter-balance to sovereignty are the substantive and procedural allocation and use rules. International water law posits that each riparian nation has a right to a share of a transboundary river or lake (Brown Weiss, 2007; UN, 1997, Articles 5 and 6). This sovereign right is limited by the duty to use the river in "...an equitable and reasonable manner" (UN, 1997, Article 5(1)) and "...the duty to co-operate in the protection and development" of the watercourse (UN, 1997, Article 5(2)). States also have a duty not to cause significant harm to another basin state (UN 1997, Article 6(1);

see also Salman, 2010).<sup>14</sup> These are substantial limitations to state sovereignty. The duty to share aquifers is less a limitation. A transboundary aquifer is subject to a similar duty. Article (a) of the Draft Aquifer Articles provides that a nation “...shall utilise transboundary aquifers or aquifer systems in a manner that is consistent with the equitable and reasonable accrual of benefits therefrom to the aquifer states concerned.”

The duty to share transboundary rivers contained in the three major international legal instruments is widely accepted as a codification of contemporary, customary law, although actual practice of sharing and cooperating lags behind the law (Warner and Zawahri, 2013). Asymmetrical power relations (Daoudy, 2009) continue to encourage nations to practice ‘hydro-geopolitics’ (Waterbury, 1979) by adopting positions that benefit the state at the expense of other states (Akhter, 2013; Saroch, 2003).

The duty to share, recognised in the 1997 UN Convention, is also recognised in three International Court of Justice (ICJ) decisions, although the Court has never apportioned a river or construed a true apportionment treaty. The major case is *Republic of Hungary v. Slovak Federal Republic* (ICJ, 1997). In brief, Hungary repudiated a Soviet era treaty – based in part on environmental objections – to build a series of locks and dams on the Danube River. Former Czechoslovakia made a unilateral decision to proceed with its part of a dam and lock project upstream on the Danube. The project diverted up to 90 percent of the river flow and the Court held that the project deprived “...Hungary of its right to an equitable and reasonable share of natural resources of the Danube.” The Court also ordered the two parties to settle the dispute. The *Hungary v. Slovakia* decision was reaffirmed in two opinions in *Argentina v. Uruguay* (see *Pulp Mills* case described below).

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<sup>14</sup> There is an unresolved tension between the right of a state to use a share of a river and the duty to ensure that the use does not cause harm to another state. India’s use of the Indus River has been cited by Pakistan as a potential case of a state’s claim to equitable and reasonable use that unreasonably injure it. A report prepared by the staff of the US Senate for its Foreign Relations Committee by Senator John Kerry, its chairman, says that in South and Central Asia, particularly in Afghanistan and Pakistan, water scarcity is fuelling dangerous tensions that will have repercussions for regional stability and the US foreign policy objectives. The report titled *Avoiding Water Wars: Water Scarcity and Central Asia’s Growing Importance for Stability in Afghanistan and Pakistan*, however, substantiates Pakistan’s concerns that India is violating the Indus treaty by building dams on western rivers. According to Foreign Office spokeswoman Tahmina Janjua, India has 33 projects, including the controversial Kishanganga, at various stages of completion. Although no single dam along the rivers controlled by the treaty may affect Pakistan’s access to water, “...the cumulative effect of these projects could give India the ability to store enough water to limit the supply to Pakistan at crucial moments in the growing season.

### 3.3 The procedural rules

International water law largely defines cooperation by compliance with a number of customary and treaty specific procedural obligations as well as a general duty to cooperate (UN, 1997, Article 8). The general duty is not yet either a customary rule or an established rule *erga omnes* binding on all states. There are too many examples of non- or incomplete cooperation to characterise it as a customary rule. The major duties are prior notification of other basin states' planned measures (UN, 1997, Article 12); a six-month period to allow the notified state to study and evaluate the possible effects of the planned measure (UN, 1997, Article 13); and the duty of the notifying state to provide the notified state with 'available' information for an 'accurate evaluation' (UN, 1997, Article 14). The notified state must communicate their findings to the notifying state (UN, 1997, Article 15). If the notifying state determines that the project or other planned measures are inconsistent with the substantive allocation rules, it must enter in to good faith consultation and negotiations "...with a view to arriving at an equitable solution" (UN, 1997, Article 17). The UNECE Water Convention contains more precise cooperation duties.

The duty of the state initiating a project or permitting an activity that may adversely impact transboundary waters now includes the duty to prepare an environmental impact assessment. This is now a customary or general rule of international law. But the duty is not absolute. In the Pulp Mills case (ICJ, 2010), discussed below, the ICJ imposed a threshold standard. An environmental impact assessment (EIA) is required when the activity "...may have a significant adverse impact in the transboundary context, in particular on a shared resource." (ICJ, 2010) (*Nicaragua v. Costa Rica, San Juan case*)<sup>15</sup>. An EIA can be a basis of cooperation, but the law does not always guarantee this. However, Pulp Mills limited the duty by holding that the initiating state has the discretion to define the scope of the impact assessment.

The initiating state does not have the discretion to ignore downstream or upstream impacts or otherwise overly narrow the scope of the assessment. Assessments must be proportionate to the likely harm. In the Indus Waters Kishenganga Arbitration (*Pakistan v. India*), the Court of Arbitration had to decide which of two EIAs was more suitable to help manage the river. Pakistan had prepared a comprehensive aquatic ecosystem assessment while India's EIA focused only on fish habitat impacts. The Court suggested that

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<sup>15</sup> Paragraph 204. The ICJ reaffirmed its position in *Construction of a Road in Costa Rica along the San Juan River (Nicaragua v. Costa Rica)* certain activities carried out by Nicaragua in the border area (*Costa Rica v. Nicaragua*) [provisional measures].



Pakistan's approach be used in future assessments of the environmental impacts of hydroelectric facilities.

The formal and often ineffective result of compliance with procedural duties is illustrated by a study of Laos' compliance with the notification and stakeholder participation requirements of the Mekong River Agreement for the construction of the proposed Xayaburi hydroelectric dam project – the first dam on the Lower Mekong River mainstream. “The notification activated the Procedures for Notification, Prior Consultation, and Agreement (PNP-CA) Process. Under this process a number of national stakeholder consultations took place in each country.” Pressure from downstream states forced Laos to conduct an outside review of the project which “...included aspects relating to fisheries, sediment management, water quality, navigation, and dam safety. However, social aspects, such as the results from stakeholder consultations, were not included. This demonstrates that regardless of whether consultations took place with any affected stakeholders, the results were not linked to any final decision-making process and are generally treated as a parallel process. Because of this exclusion, it may be concluded that any stakeholder consultations were unlikely to have changed any substantial follow-up action (Vanh, 2015).”

In 2010, the ICJ decision on Pulp Mills took a major step towards expanding the duty to cooperate. It recognised that the distinction between procedural and substantive duties is artificial. Argentina objected to a pulp and paper mill on the Uruguay River and the process by which Uruguay approved it, on the basis that it would threaten water quality. Although there is a treaty and a body set up by the two countries to deal with such issues, Uruguay did not make use of them. It only provided an informal notice to Argentina that plans for the mill were going forward. In the first opinion, the Court observed that all uses of the river should allow for sustainable development taking into account “...the need to safeguard the continued conservation of the river environment and the rights of economic development of riparian States.” In the second opinion on the merits, the Court held that Uruguay's failure to use the treaty and the body breached both the treaty and customary international environmental law duties to notify and negotiate with the possible victim state before proceeding to approve a project which could be an unreasonable use of the river under customary international water law. The Court linked substantive and procedural duties by observing that the object of procedural duties is to implement the substantive obligations of an applicable international or transboundary watercourse agreement

(ICJ, 2010, paragraph 281). Notification sets in motion a response procedure that ultimately allows the notified party to object to the work and may trigger a duty to avoid damage.

States affected by the activity have a right to expect a certain level of cooperation from the acting state. GWP (2014) argued that "...the UNWCC provides an operation framework for the duty to cooperate in the use of international watercourses based on the substantive and procedural provisions of the instrument, and its requirement for consultations and recommendations for joint institutional mechanisms. Watercourse states undertaking an activity have a duty to cooperate on all aspects – from use-allocation, watercourse protection, ecosystem preservation, flood protection, pollution abatement, and a right to expect cooperation." (Wouters, 2014, p. 40).

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*Integrated water resources management (IWRM) is a useful tool to encourage cooperation...it provides a road map for cooperation*

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Integrated water resources management (IWRM) is a useful tool to encourage cooperation. Although, IWRM is still in various stages of adoption in Africa, Asia, and South America, it provides a road map for cooperation.

The Pulp Mills case aptly expresses the duty of all to cooperate in peacefully managing the world's water resources (Wouters and Tarlock, 2013). The procedural duties to cooperate must be reinforced by two substantive rules, which penalise non-cooperation and push states to form the necessary permanent management institutions before undertaking substantial dams, diversions and other projects. These are:

- No state has a right to develop its waters without taking into account the interests of other watercourse states
- The duty to cooperate in the peaceful management of the world's water resources shall not be compromised by any state

The first rule discourages unilateral development by erecting a presumption that the proposed activity is unreasonable and inequitable and placing the burden of proof to defend the legality of the action on the state undertaking the unilateral action. In contrast to the result in Pulp Mills, the second rule opens the possibility that the proper remedy for an injured state might be the removal or modification of the project. "At a minimum, the burden would be on the acting State to demonstrate that such a remedy is disproportionate to the harm suffered. The harshness of these results can be easily avoided by effective compliance with the duty to cooperate." (Wouters and Tarlock, 2013, p. 64).

The enhanced duty could also include IWRM in appropriate cases. This can help to promote greater sharing cooperation among basin nations because it encourages planning at larger scales and considers a wide range of relevant interests. It also requires that marginal interests and communities be given a voice. IWRM is not well integrated into existing international water agreements, such as the 1997 UN Convention on the Non-Navigational Uses of International Watercourses and the 1992 UNECE Convention on the protection and Use of Transboundary Watercourses and International Lakes, and the Draft Articles on the Law of Transboundary Aquifers. There is no customary or general obligation to practice IWRM prior to initiating a new use of a transboundary river. However, the duty to cooperate could be breached if basin states or a basin organisation has implemented an IWRM process, but has not used it to address and resolve conflicting claims.

## 4 PRELIMINARY COOPERATION

The first step towards cooperation is a request that another state either ceases a planned project or cooperates. Examples are Mongolia's unilateral plans to divert water away from Lake Baikal in Russia, by building the Shuren dam on the River Selenge – the lake's main source of fresh water – and diverting Orkhon River water through a large pipeline from north to south to supply the dry mines in Mongolia's southern Gobi region (Figure 1) (Withanachchi et al., 2014). The legal options to protest the actions, in addition to a formal request by Russia, and the number of parties that could be involved in the assessment are examples of the modern state of water management and environmental protection. State actors remain central, but there are many other relevant potential participants available to address the conflict.

The World Bank is funding the projects and so this will trigger the Inspection Panel process. Lake Baikal is a UNESCO World Heritage Site and a “wetland of international importance” under the Ramsar Convention. As of early 2015, Russia has stated that “Russia is concerned about plans for the construction of hydropower plants on the River Selenga, which may affect the ecosystem of Lake Baikal [and] Mongolia needs to involve competent Russian organisations to assess the impact of the project.”<sup>16</sup>

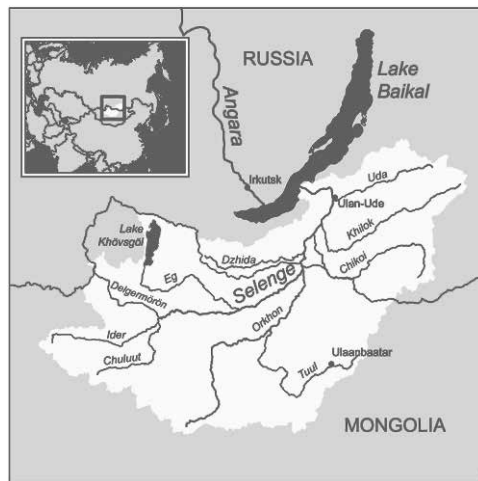


Figure 1. The Selenge basin includes China and Russia

Source: [http://en.wikipedia.org/wiki/Selenga\\_River](http://en.wikipedia.org/wiki/Selenga_River)

<sup>16</sup> <http://siberiantimes.com/ecology/casestudy/news/n0121-new-threat-to-baikal-with-plans-for-new-hydroelectric-plants-in-mongolia/>

## 5 OPEN-ENDED COOPERATION

### 5.1 Promises to cooperate in the future

**C**hina offers an interesting example of promising cooperation in the future. The lesson that post-Imperial China drew from history was to defend its sovereignty and so the country has a long history of defending unilateral actions. Thus it is no surprise that China takes a national sovereignty approach to transboundary water management. China has entered into a number of agreements with other riparian states that can be described as agreements to ‘cooperate in the future’ rather than structures to engage with neighbours in cooperative river allocation and management. It is too early to determine if these will lead to more engaged cooperation. But commentators suggest that China is well placed to develop its approach to transboundary water cooperation in ways that match its global foreign policy strategy (Box 2).

#### Box 2. The cultural context of limited coordination

“China appears to be edging closer to demonstrating its commitment to take into account other countries’ transboundary water needs, albeit in an incremental way. A recent example is the Sino-Kazakhstan Joint Declaration on Further Deepening Comprehensive Strategic Partnership, concluded during a high-level visit to Kazakhstan in 2013, which allows discussions on transboundary water allocation. This issue has been problematic for at least the past decade, despite bilateral transboundary water agreements and bilateral joint commissions, which did not deal with allocation – an issue persistently raised by Kazakhstan, where water scarcity and diminished water quality affect its economic development. With respect to its southern riparian neighbours, China has recently signed an agreement with India to share hydrological data and to address transboundary water issues. This step-by-step approach to building trust and encourage cooperation seems to be the *modus operandi* for expanding transboundary water cooperation, the Chinese way. Nonetheless, issues remain, especially with respect to the transboundary waters shared across China’s southern borders where there is an absence of treaty practice. How does a foreign policy of ‘good-neighbourliness’ influence transboundary water relations where no treaties exist?”  
Source: Wouters and Huiping, 2011.

### 5.2 Cooperation to coordinate basin use and management

The management of the still pristine Okavango River, shared among three states, each with different views of its use, illustrates a promising cooperative regime (Böge, 2005) (Figure 2). Angola, the headwaters state, emerged from decades of civil war in the 1990s and is still in the process of evaluating water use options, which include hydroelectric projects. Downstream

Namibia and Botswana are among the driest countries in the world, but derive great consumptive and non-consumptive benefits from the river. Namibia views the river as the only dependable source of water and proposes to construct a pipeline to divert water to the country's arid centre where most of the population is concentrated. Arid Botswana depends on the river for both existing and planned agriculture. But the river's primary function is to sustain a vibrant ecosystem and the attendant tourism industry in the spectacular, wildlife-rich Okavango Delta, the world's largest wetland under the Ramsar Convention.

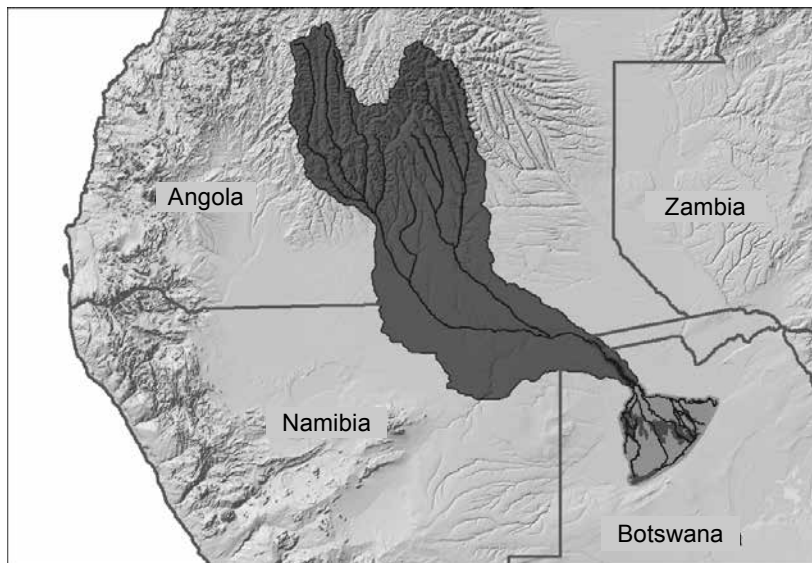


Figure 2. Okavango Basin in Southern Africa

Source: [www.future-okavango.org](http://www.future-okavango.org)

In 1994, the three countries signed the OKACOM Agreement<sup>17</sup>, creating a commission to develop criteria for the equitable use and sustainable development of the resource. This has evolved into a more ambitious, broad-based, long-term, cooperative effort to collect and share the data necessary to develop a coherent management regime for this aquatic treasure (Soderstrom et al., 2015). The management effort began in earnest in 2004, and the nascent regime, very much a creature of foreign support, is still in the capacity development and modelling stage, although the initial reports on progress are positive (Andreini et al., 2007)<sup>18</sup>.

<sup>17</sup> Agreement of the Governments of the Republic of Angola, the Republic of Botswana and the Republic of Namibia on the Establishment of a Permanent Okavango River Basin Water Commission, Angl.-Bots.-Namib., art. 4.3, Sept.

<sup>18</sup> In this work the authors identify the successful steps as well as some challenges facing the project, such as ensuring the institution's technical and financial stability, bridging differences between USAID and other regional partners, the uncertain support of the Global Financial Facility and better communication with Angola through bi-lingual English-Portuguese personnel.

Project activities are evident throughout the basin, but equally important were the initiatives in the upper basin in Angola to collect reliable hydrological data to inform future development. Also stressed was the "...the inter-connectivity of water resources management and biodiversity conservation. Sustainable use and management of terrestrial resources significantly affect the quality, quantity, and availability of water to all users within the basin." This approach has led to an improved understanding of the resource base and its use patterns, which inform future protection and management decisions, particularly in the Mucusso reserve, and has helped to develop the capacity for locally-engaged protected area monitoring and planning (ARD Inc., 2009). In Botswana, a land use plan for both the Ramsar and non-Ramsar parts of the Ngamiland District was produced (ARD Inc., 2009, pp. 35–36).

## 6 SPECIFIC ISSUE COOPERATION

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here are many examples of cooperation to achieve a specific objective, from joint climate change mitigation schemes to cooperation on infrastructure development and operation.

### 6.1 Flood-warning data exchange

European countries are implementing early flood-warning protocols, driven largely by the EU Floods Directive and the EU Cross-Border Cooperation Programme (EU, 2003). Turkey and Bulgaria have developed three joint projects – one to exchange information and real-time data and two for flood forecasting and warning. These are the first common forecasting projects in the region. Information is shared on a common website including real-time information from two hydrometric stations. The transboundary forecasting and early warning system will be used as input for local and regional preparedness and emergency response plans (UNECE, 2009).

### 6.2 Dam operation

In 1955, Zambia and Zimbabwe began a joint development programme to construct the Kariba Dam on the Zambezi River, which borders the two countries. In 1987 the two countries created the Zambezi River Authority (ZRA) to operate, monitor, and maintain the Lake Kariba dam and reservoir. The ZRA ensures that the hydro-electricity generated is shared equally between the two countries, provided that they take the power<sup>19</sup>. This cooperation has been criticised for its single purpose focus and for excluding the other five basin states. The Agreement “...does not allow for equitable sharing of resources between Zambia and Zimbabwe and between hydropower generation and other water uses in the Kariba catchment.” (Sustersic, 2007; see also Tumbare, 2010). However, since 1987, the countries have moved towards a more integrated approach to river management (Louka, 2006). With the support of Norway, the seven basin countries have created the Zambezi Watercourse Commission, which became operational in 2015.

### 6.3 Climate change adaptation

The impacts of climate change are not confined within nation states. Both studies and adaptation measures require transboundary river cooperation.

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<sup>19</sup> Agreement between the Republic of Zimbabwe and the Republic of Zambia concerning the utilisation of the Zambezi River, Art. 23(1). Available at <http://www.fao.org/docrep/W7414B/w7414b17.htm>



Freshwater sources are especially vulnerable to climate change and although increased warming of the planet does not cause droughts, it can make them more severe when they occur (Trenberth et al., 2014). Droughts thus threaten food production and lead to a less secure supply (INBO, 2015). To be legitimate, there should be early and continuing involvement of both decision-makers and stakeholders in the study process. Any study process needs to be supported by good science, which includes a common and integrated database and a basin-wide monitoring network. A study will not be effective unless there is a regional body which is capable link policy recommendations produced by the study process to management decisions at the regional or national level.

Climate change adaptation should ideally progress through various stages:

- Recognition among all basin states of the possibility of water stress in the basin
- A basin-wide study, including exchange of relevant scientific and other information, to identify scenarios about the likely magnitude of the stresses over a reasonable time horizon
- Agreement among all basin states, within the bounds of agreed upon uncertainty ranges, on the magnitude and geographical distribution of the stresses
- Agreement on measures needed at basin and national levels
- Agreement on implementation, including actions to be taken by an existing basin-wide management authority, creating a new authority, or expanding the powers of an existing authority.

### **6.3.1 Harmonised and coordinated national actions**

In many basins, the first and second stages of climate adaptation have been reached. The Parties to the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the International Network of Basin Organizations (INBO) surveyed climate change adaptation measures in basins to extract lessons for the future and examples of good practices (UNECE and INBO, 2015; UNECE, 1997).

In Moldova negotiations are moving from the first to the second stage on the Lower Dniester (UNECE and INBO, 2015, p. 17). At the Sava River Commission in Central Europe the parties have adapted the Framework Agreement<sup>20</sup> to undertake a study of the reduction of flood risks, which includes climate change. In the south Caucasus a climate change impacts study (UNDP, 2011) has produced a vulnerability analysis for four areas of

<sup>20</sup> [http://www.savacommission.org/dms/docs/dokumenti/documents\\_publications/basic\\_documents/fasrb.pdf](http://www.savacommission.org/dms/docs/dokumenti/documents_publications/basic_documents/fasrb.pdf)

the region. Some countries have progressed to the third stage. In Belarus and Lithuania a jointly conducted study has assessed future stream flows in the Neman River Basin.

#### *THE COLORADO RIVER*

Ongoing basin studies in the arid west of the United States illustrate the links among data analysis, scenario construction, and developing science-based policy options. Pursuant to legislation enacted by the United States Congress, the United States Bureau of Reclamation (USBR) (which manages a number of reservoirs and irrigation projects in the western United States), has completed several basin studies which contain harsh warnings about climate. On the stressed Colorado River, shared by Mexico and the United States, the study concluded that "...under the downscaled General Circulation Model Projected scenario, the median of the mean natural flow at Lees Ferry over the next 50 years is projected to decrease by approximately 9 percent, along with a projected increase in both drought frequency and duration as compared to the observed historical and paleo-based scenarios." (USBR, 2012a). Similar conclusions were reached for the Lower Rio Grande River, also shared between the two countries (USBR, 2013) and on the St. Mary and Milk Rivers, shared between Canada and the United States (USBR, 2012b).

#### *THE DANUBE BASIN*

For the Danube (UNECE and INBO, 2015, p. 15) and the Rhine, the parties have developed impact scenarios for the major uses and adopted an adaptation strategy. (UNECE and INBO, 2015, p.14). The Danube Basin is likely to experience temperature increases from 0.7° to 2.1°C between 2021 and 2050 (ICPDR, 2013). Temperature increases will be greater in the drier, lower Danube. The lower reaches, starting in south-eastern Austria, are likely to experience decreased rainfall. The result is that "...droughts and low-flow situations are expected to increase. Especially in the summer and in the south-eastern parts of the basin..." (ICPDR, 2013, p. 28). These events are likely to be more intense, last longer, and be more frequent. Groundwater storage will also decline in central and eastern Europe. Thus, the whole range of the river's uses from irrigation to aquatic ecosystem conservation will be stressed.

The basin needs to adopt basin-wide vulnerability metrics and to conduct a vulnerability assessment using the previously developed models. The Danube is an unallocated basin, but water scarcity will be a more pressing issue in the future. For example, climate change will require the "...harmonisa-

tion of international basin-wide legal limits and threshold values (UNECE and INBO, 2015, p. 28).”

Other basins are at a much earlier stage. These include the Bugesera, shared between Burundi and Rwanda<sup>21</sup>, and the Bodrog River shared among Hungary, Slovakia, and the Ukraine<sup>22</sup>.

#### THE CANADA–UNITED STATES GREAT LAKES

The Great Lakes, shared between Canada and the United States, contain 20 percent of the world’s fresh water (Figure 3). Together the countries have developed a unique, non-treaty regime that curbs unilateral action by a United States federal state or a Canadian province to remove water from the basin. This regime is partially justified by the need to exercise precaution in the face of the risks to the Great Lakes navigation and ecosystems that global climate change poses. Rather than amend an existing Boundary Waters Treaty<sup>23</sup>, the basin states decided to devise an allocation-protection regime

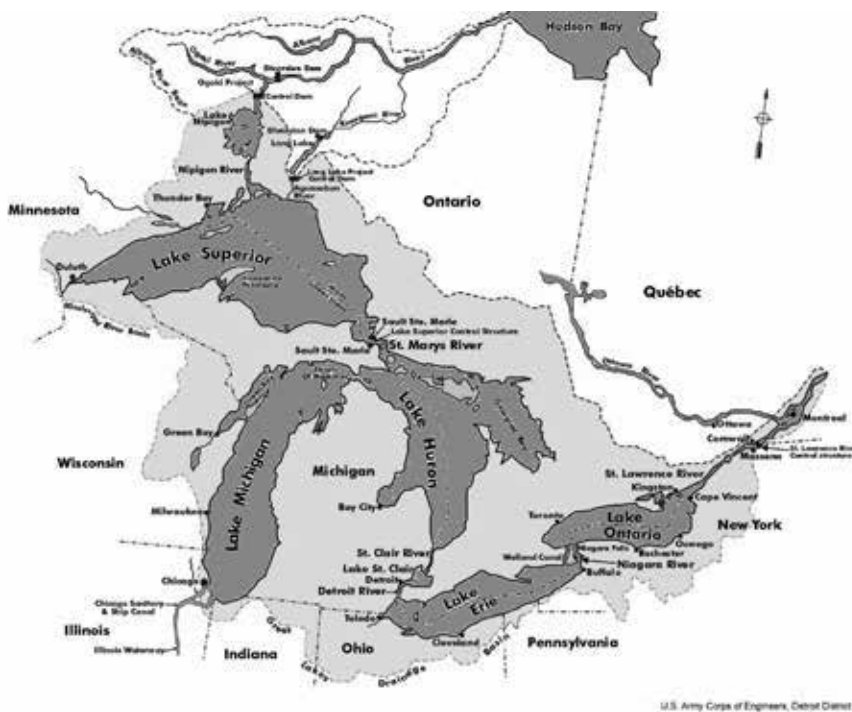


Figure 3. The Great Lakes between the Unites States and Canada

<sup>21</sup> <http://www.gwp.org/es/WACDEP/NEWS-AND-EVENTS/News-Archive/Situation-Analysis-for-Bugesera-trans-boundary-catchment-kicks-off/>

<sup>22</sup> [http://www.gwp.org/Global/ToolBox/Case%20Studies/Europe/Transboundary.%20Making%20space%20for%20water%20in%20the%20Bodrog%20River%20Basin%20\(%23398\).pdf](http://www.gwp.org/Global/ToolBox/Case%20Studies/Europe/Transboundary.%20Making%20space%20for%20water%20in%20the%20Bodrog%20River%20Basin%20(%23398).pdf)

<sup>23</sup> No Treaty dispute existed. Articles II and III of the Treaty impose a high burden of proof on any assertion of ICJ jurisdiction. The victim country must prove either injury or a lowered lake level.

themselves in close cooperation with the provinces of Ontario and Quebec (Dellapenna, 2007). In practice, the provinces and states have a long history of sub-treaty agreements.

Between 2001 and 2005, the eight Great Lakes states negotiated an innovative Interstate Compact, which makes it very difficult to divert water outside the Great Lakes basin. The Compact is a particularly interesting example of sub-constitutional foreign affairs initiatives by states and their foreign federal counterparts that occurred with informal national government sanction. The Compact adopts, with little fanfare, directly and indirectly, several contested key principles of international environmental law, such as precaution and the recognition that the lakes are a common heritage of humankind. Even small communities that straddle the divide between the Great Lakes and other drainage basins, which often includes a small part of a state, must show that no feasible alternative supply exists to gain access to water located only a few miles away. Similar anti-diversion prohibitions exist in Canada. The Compact comes close to a binational treaty because Ontario and Quebec adopted parallel legislation and in 2002 Canada enacted a strong federal anti-diversion law.

To defend their actions, Canada and the United States had to explain why they could prevent almost all out-of-basin diversions and dedicate the Lakes to non-consumptive uses. The Compact can be criticised as politically, constitutionally, hydrologically, and economically unfair, inefficient and irrational. For example, the numbers get worse because the Great Lakes account for 95% of the United States surface supplies, but only 10% of the population lives in the basin. Given the shift of population from cold to warmer, more arid areas of the country, it can be legitimately asked: What is the rationale for this action, especially since all the diversion treats, which stimulated the Compact and Canadian legislation, were small and speculative at best and highly unlikely to come to fruition for environmental and economic reasons?

The body created by the Boundary Waters Treaty, the International Joint Commission (IJC), was able to influence the Compact and Canadian legislation through its Reference process. The IJC was able to influence the Compact's negotiation by leveraging the Reference process. The Treaty allows it to investigate issues referred to it by the two governments. Once the two nations agree to refer a matter to the Commission, it can investigate the issue, hold public hearings in the basin and issue a report. In 1999, the two governments agreed to an IJC Reference. Reference reports have often laid

the foundation for Canada–United States cooperation on major issues or at least provided broad, relatively neutral analyses of issues superior to studies subject to the immediate pressures of national politics. Thus, state practice has made the Reference process the Commission’s most important function and the major source of its political influence. They have influence because the custom of joint Canada–United States requests, create “...at least an implied obligation on both of them to deal with the report in a responsive manner.”<sup>24</sup>

The resulting 2000 report (IJC, 2000) examined both the scientific and legal issues raised by the diversion threats. It marshalled available scientific evidence to underscore the need for a strong anti-diversion regime. The report blended a synthesis of the available science of the lakes’ hydrology with the emerging, and much contested, international environmental law precautionary principle to counsel that the Great Lakes states and Canadian provinces establish a strong anti-diversion regime. The foundation of this conclusion is the report’s mixed scientific economic classification of the Great Lakes as a fragile, fully allocated “...non-renewable resource.”

Initially, the idea that the Great Lakes are a no-renewable resource used almost exclusively for non-consumptive uses is a surprising and non-intuitive conclusion to anyone who has seen them or even looked at a map of the basin. Non-renewable resources are usually deep aquifers and mineral deposits rather than rainfed water bodies. Rivers and lakes are classic renewable resources and the conservation objectives and strategies are different. With non-renewable resources, the issue is the optimum rate of mining. With renewable water resources, the trick is to balance consumptive uses with minimum flow demands constrained by estimates of average dependable supplies. Nonetheless, the Lakes have a fundamental non-renewable characteristic, a long renewal time that makes them analogous to a deep aquifer. As the report noted, less than 1 percent of the total volume is renewed annually by precipitation and the levels remain relatively constant “...with a normal fluctuation ranging from 300–600mm in a single year.” (IJC, 2000, p. 6).

The line between a renewable and non-renewable resource is a matter judgment, and the classification of the Lakes as fully allocated is a normative conclusion, which the report was careful to underscore. An allocation of a river or lake can refer either to a situation where recognised property rights

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<sup>24</sup> The Right Honourable Herb Gray, Canada and U.S. Approaches to the Great Lakes, 31 *Can-United States L. J.* 287, 290 (2005).

exceed the available dependable supply or to the dedication of a resource to a suite of uses to the exclusion of others. The latter, which is the case of the Great Lakes, is an economic or normative choice rather than a hydrologically constrained situation. To justify the classification, the report concluded that not only are the Lakes a non-renewable resource, but they are fragile and so change involves risks. The basis of the fragility is that lake levels fluctuate based on precipitation and evaporation cycles and even small seasonal fluctuations can have dramatic and costly consequences for the ecosystem and the maintenance of the primary commercial, non-consumptive use of the lakes, which is navigation. Natural level cycles have been altered by human interventions, such as diversions, over time. Chicago's diversion to reserve the flow of the Chicago River is the largest. The outflow from Lakes Superior and Ontario is regulated with locks and dams, but only Lake Ontario's levels are significantly altered by the regulation. Sand and gravel dredging have also affected lake levels (Quinn, 2000).

The report is notable because it factored in global climate change and urged the Great Lakes states and provinces to adopt a precautionary approach to climate change adaptation. The report concluded that the Lakes are "... highly sensitive to climatic variability." (IJC, 2000, p. 6). It synthesised the various projected, but inconsistent, climate change scenarios to reach the bold conclusion that "...climate change suggests that some lowering of water levels is likely to occur... [and] the Commission believes that considerable caution should be exercised with respect to any factors potentially reducing water levels and increasing outflows." (IJC, 2000, pp. 21–22).

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*All examples of successful cooperation may be unique. In the case of the Great Lakes, there was a unique alignment of interests between the two nations*

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The precautionary principle is an evolving international environmental law norm. But the core idea is that the state has the power to limit activities that pose a risk of future harm when the available scientific evidence about the likelihood and magnitude remains uncertain and inconclusive.

All examples of successful cooperation may be unique. In the case of the Great Lakes, there was a unique alignment of interests between the two nations. The major uses are non-consumptive and there are no substantial in-basin pressures to increase consumptive uses. In addition, the United States' federal states were concerned that their political power would continue to decrease as the region fell behind most of the country in population growth. Thus, it was a case of 'strike while the iron is hot', especially when there was no serious opposition to the Compact in Congress or the rest of the country. In Canada, a substantial portion of the population thinks that

Canada's waters are under perpetual threat from United States 'grabs' and thus the Compact and parallel legislation, while not perfect, has made such grabs more difficult. This has helped to reduce tensions between the two countries.

## 7 ALLOCATION AND COOPERATION

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“...sound legal framework is essential for stable and reliable cooperation.” (UN-Water, 2008). However, relatively few transboundary river flows have actually been allocated among all basin riparian nations (Cooley and Gleick, 2011). Even when all basin states are included and an allocation exists, it may foster conflict rather than cooperation. Thus, the existence of an allocation does not guarantee stability and may impede cooperation.

Fixed quantity allocations can impede adaptation to changed conditions. Two Nile agreements dating from 1929 and 1959, allocated the flow between Egypt and Sudan, but excluded upstream states. This is a problem yet to be resolved. Allocations without a strong institutional framework to manage the river can also encourage nations to exceed their allocations to the detriment of other riparian nations. Under a 1944 treaty, the United States is entitled to one-third of the flow of several Mexican tributaries,<sup>25</sup> but Mexico has failed to meet its full delivery obligations for many years.

Allocations formulas often lead to different interpretations among the parties. If the parties can resolve the dispute peacefully, this may encourage further cooperation or at least reduce tensions between the parties. The post-World War II allocation of the River Indus between India and Pakistan that emerged after the partition of British Imperial India illustrates this possibility. Pakistan needed both to preserve the extensive irrigation economy that the British had built and to construct new large storage facilities to expand irrigation for a burgeoning national population, but the headwaters were controlled by India. In the 1950s, the World Bank attempted to broker an agreement between the two nations. However, both countries refused to adopt the Bank’s experts’ recommendation of a comprehensive river basin authority, run by engineers, modelled on the United States Tennessee Valley Authority. Instead, the treaty that was finally concluded, with considerable assistance from the World Bank, involved a more modest ‘equal’ sharing of the transboundary water resources. The use of the three primary eastern tributaries was allocated to India and the three western tributaries to Pakistan (see Verghese, 2003; Gulhati, 1973; Aloys, 1967). India’s decision

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<sup>25</sup> Art. 4B(c). The amount is capped at 350,000 acre feet per year which can be delivered in five year cycles.



to build a dam on one of its rivers ultimately led to an arbitration, which confirmed India's right to build the dam, but produced downstream flow benefits for Pakistan.

Experts have drawn an important lesson from older allocation agreements: adjustment and cooperation mechanisms must be built into allocation agreements. The best example of an allocation agreement that anticipates cooperative adjustments is the 2002 Tripartite Interim Agreement (TIA) on water sharing of the Maputo and Incomati River in Southern Africa (Singer et al., 2010). The river is shared among Swaziland, Mozambique, and South Africa. The agreement apportions withdrawals among the three countries, and allows each country to increase its withdrawals by almost 30 percent (Zaag and Vaz, 2003). The three countries practised the politics of distribution by pushing shortage problems into the future. But they did not ignore the risks and provided a shortage allocation mechanism, which has yet to be tested.

These shortages will have to be resolved by relying on Article 1 and Clauses 5 and 6 of Article 4 of the flow regime annex of the TIA, which define procedures for managing water use during droughts. Article 1 assigns priority to water for domestic, livestock, and industrial use, as well as to ecological water requirements. Implicitly, runoff reduction as a consequence of afforestation also takes priority, since this type of water use cannot be altered overnight. This means that in case of water shortage, the irrigation sector (with 51 percent of withdrawals and being by far the largest water user in the basin) will have to decrease its abstractions. (Vas and Zaag, 2003).

### **Box 3. The Orange-Senqu River Basin Commission: an important but limited first step**

The Orange River has been studied intensely and cooperation efforts supported by European donors. The 2,300 km river rises in the Lesotho Highlands and flows through South Africa, Botswana, and Namibia. South Africa contributes 55 percent, Lesotho 41 percent, Namibia 4 percent, and Botswana almost nothing of the river's water budget. The basin is a classic wet-dry one. The Lesotho Highlands receives some 2,000 mm of rainfall annually, but the bulk of the basin is arid with an annual average rainfall of only 44 mm. There are extensive irrigation abstractions in South Africa; Namibia wants to expand irrigation, and Botswana has plans for a dam on the Lower Orange.

There is a long history of bilateral cooperation in the basin which culminated in 2000 with the formation of the Orange-Senqu River Basin Commission (ORASECOM) among the four riparian states. ORASECOM reflects contemporary norms of fair allocation and cooperation. For example, it explicitly recognises the UN Convention



and imposes numerous cooperation duties on the four states. However, ORASECOM has not yet evolved into a truly international river management organisation. South Africa is both the dominant contributor and user. It has not been able to build a high level of trust among the basin states or resolve pre-2000 conflicts about how the river should be shared among them. A recent survey of ORASECOM's performance concluded that the "...discursive structures established by South Africa ... keep major bilateral infrastructure projects beyond the realm of acceptable discussion at ORASECOM meetings, limit the opportunities for meaningful basin-wide planning, and consequently, constrain the ability of riparian states to recognise and respond to changing circumstances." (Keller, 2012). For example, the study reports that South Africa and Lesotho blocked Namibia's request to participate in the planning process for upstream irrigation projects, a clear violation of contemporary norms of riparian state cooperation.

Source: Sebastian, 2008; Scheumann and Nuebert, 2006.

## 8 COOPERATION THROUGH COST AND BENEFITS SHARING

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**S**ome of the most successful examples of effective transboundary watercourse cooperation involve benefit sharing, primarily electricity generated from hydropower. The shared benefit approach substitutes monetary benefits, such as hydropower revenues, for blue water, and is derived from welfare economics and game theory. Water is valuable only as a scarce resource with alternative values. The transcendental objective of efficiency requires that the resource be allocated to the most valuable suite of uses regardless of political boundaries. Game theory teaches that it is possible to change water allocation from a zero to a positive sum game through cooperation among riparian nations (Hensengerth, 2012). In practice, this means that some nations will have to forego direct water, but are entitled to monetary compensation for making it possible for other states to put the water to more efficient use and provide benefits for other riparian nations.

### 8.1 Sharing the Columbia River development

The concept of shared benefits originated in the 1961 Canada–United States Columbia River Treaty (see Krutilla, 1967)<sup>26</sup> and is now an established general principle of international water law and environmental law (Paisley, 2002). Both countries wanted to dam the Columbia River for power generation and flood control after they experienced substantial flood damages. Proposed downstream dams in the United States would have deprived Canada of opportunities for power generation, whereas Canada's planned dams would have provided substantial flood control benefits to the United States. The Parties agreed to allow the major development in the United States (Muckleston, 2003), but Canada was compensated for lost power revenues and received a one-off payment of USD64.4 million for the downstream US flood control benefits that its dams would provide. Canada was allowed to construct three projects with 19 billion m<sup>3</sup> (15.5 million acre-feet) of storage<sup>27</sup>. Both nations have received considerable benefits; Canada in the form of cost savings and the United States in terms of flood damages avoided (Yu, 2015). The benefits from this arrangement provided the funding for three upstream dams in Canada.

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*Some of the most successful examples of effective transboundary watercourse cooperation involve benefit sharing, primarily electricity generated from hydropower*

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<sup>26</sup> Treaty Between Canada and the United States of America Relating to Cooperative Development of Water resources of the Columbia Basin, Jan. 17. 1961, 542 U.N.T.S. 244 (1964)

<sup>27</sup> Columbia River Treaty, Art. VIII

This Treaty could have ended in September 2024 provided either country gave notice of termination to the other by September 2014. Neither Canada nor the United States has given notice, but it is likely that the Treaty will be amended or renegotiated to address excluded issues, such as environmental protection and Native American rights as well as a wide range of Canadian concerns. Most of the Treaty provisions will continue indefinitely if there is no termination. However, after 2024, Canada will still be required to provide some operations for flood control in the United States whether or not the Treaty is terminated, and the United States will be required to provide additional reimbursement to Canada for their lost power opportunities (see USACE and BPA, 2009).

## **8.2 Shared power revenues and costs on the Senegal River**

Shared benefits can be coupled with shared river management to address issues such as ecosystem conservation, which were not initially considered in the benefit sharing regime. The use of the Senegal River between Mali, Mauritania, Guinea and Senegal is a prime example of a limited distribution of shared benefits and costs that has evolved from shared management. Initially, the four countries allocated the costs and benefits of two large dams among themselves (Yu, 2015, pp. 12–26). After certain benefits, such as irrigation, failed to appear and with the disruption of the river's ecosystem, the countries adopted a Water Charter. This allocates water for a wide range of non-consumptive as well as consumptive uses and includes stakeholders in the Permanent Water Commission.

Hydropower benefits are now shared throughout the basin, but aquatic ecosystems are still under stress. The Manantali Dam on the Bafing River has had both negative and positive effects. The Senegal Basin's flood plain ecology has changed from a salty and brackish aquatic environment with marked seasonal changes to a low-flow perennial freshwater ecology. Some of the main negative effects are population displacement, a degraded ecosystem, and proliferating water-borne diseases. But the dams have enabled year-round freshwater availability in sufficient quantities, which has enabled irrigation development and drinking water installations for populations near the dams<sup>28</sup>.

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<sup>28</sup> [http://webworld.unesco.org/water/wwap/case\\_studies/senegal\\_river/](http://webworld.unesco.org/water/wwap/case_studies/senegal_river/)

### 8.3 Aquatic ecosystem conservation

#### 8.3.1 Duty to conserve

The construction of dams, diversions, and other infrastructure, has stressed aquatic ecosystems (Brels et al., 2008). International water allocation treaties routinely deal with the duty of upstream states to maintain minimum flows for the benefit of downstream ones, but these flows are usually intended for power generation and consumptive uses. Customary international law imposes no overall duty to protect aquatic ecosystems. The best that can be said is that modern formulations of customary international law recognise the need for such a duty. The duty can be derived from the international environmental law of state responsibility regarding transboundary harm. The duty not to cause harm has been limited to air and water pollution, but the foundation principle, that states have a duty not to allow state agencies and private parties subject to the state's regulatory jurisdiction to use their territories in a manner that causes substantial harm to other states and their nationals, can encompass ecosystem risk. The 1997 UN Convention on the Non-Navigational Uses of Waters extends the duty not to cause harm from a negative to a positive one. It recognises that the shared use of international waters includes ecosystem protection. However, there is no judicial interpretation of this duty. Yet, the 2012 arbitral decision in *Pakistan v. India* sets an important precedent implying that a customary duty to maintain minimum environmental flows may exist.

Pakistan initiated proceedings against India pursuant to Article IX and Annexure G of the [1960 Indus Waters] Treaty over the construction of the Kishenganga Hydroelectric Project in India. One of the two questions concerned India's duty to maintain downstream flows. Article III(2) of the Treaty requires India to "...let flow all the waters of the western rivers and not permit any interference with those waters." Although India had agreed to ensure a minimum environmental flow, the panel went further and opined that India had a customary duty to maintain those flows and that this duty was incorporated into the Treaty<sup>29</sup>.

Well before the Treaty was negotiated, a foundational principle of customary international environmental law had already been enunciated in the

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<sup>29</sup> The tribunal offered the following justification: "[T]he International Court of Justice in *Gabčíkovo-Nagymaros* ruled that, whenever necessary for the application of a treaty, "...new norms have to be taken into consideration", and "... new standards given proper weight." It is therefore incumbent upon this Court to interpret and apply this 1960 Treaty in light of the customary international principles for the protection of the environment in force today."

Trail Smelter arbitration case (Special Arbitral Tribunal, 1941). There, the Tribunal held that “...no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.”

A broader restatement of the duty to avoid transboundary harm is embodied in Principle 21 of the 1972 Stockholm Declaration (UNEP, 1972), pursuant to which states, when exploiting natural resources, must “...ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.”

There is no doubt that states are required under contemporary customary international law to take environmental protection into consideration when planning and developing projects that may cause injury to a bordering state. Since the time of the Trail Smelter case, a series of international conventions, declarations, and judicial and arbitral decisions have addressed the need to manage natural resources in a sustainable manner. In particular, the ICJ expounded upon the principle of ‘sustainable development’ in the *Gabčíkovo-Nagymaros Project* case (ICJ, 1997), referring to the “...need to reconcile economic development with protection of the environment.”

Applied to large-scale construction projects, the principle of sustainable development translates, as the ICJ recently put it in *Pulp Mills*, into “...a requirement under general international law to undertake an environmental impact assessment where there is a risk that the proposed industrial activity may have a significant adverse impact in a transboundary context, in particular, on a shared resource.” The ICJ affirmed that “...due diligence, and the duty of vigilance and prevention which it implies, would not be considered to have been exercised, if a party planning works liable to affect the regime of the river or the quality of its waters did not undertake an environmental impact assessment on the potential effects of such works.” Finally, the ICJ emphasised that such duties of due diligence, vigilance and prevention continue “...once operations have started and, where necessary, throughout the life of the project.”

Similarly, this Court recalls the acknowledgement by the Tribunal in the *Iron Rhine* arbitration of the ‘principle of general international law’ that states have ‘a duty to prevent, or at least mitigate’ significant harm to the

environment when pursuing large-scale construction activities. As the Iron Rhine Tribunal determined, this principle "...applies not only in autonomous activities but also in activities undertaken in implementation of specific treaties..." such as, it may be said, the present Treaty.

### 8.3.2 Mexico–United States Colorado River Delta

In 2012, Mexico and the United States agreed to provide flows to help restore the Colorado River Delta in Mexico, and in 2014 water flowed into the Gulf of California for the first time in decades. This evolving regime is a good example of the final stage of cooperation, an altered allocation, and management regime. The agreement also illustrates that pre-environmental treaties can be adapted to environmental demands. Minute 319 sets three important precedents, broadly defined. First, it is a de facto implementation of the ecosystem conservation mandates of the 1997 UN Convention on the Uses of Non-Navigational Waters and other recent attempts to incorporate such a duty into customary international water law. Second, Minute 319 is equally a recognition of the emerging duty of riparian nations to cooperate in the long-term management of shared rivers. Third, although Minute 319 de facto amended a treaty through sovereign to sovereign negotiations, it would not have happened were it not for the efforts of non-governmental organisations (NGOs). Mexican and United States environmental NGOs both prodded the two nations to address the Delta's problems. More importantly, they helped to provide the financing to acquire the necessary water for the flows on an over-allocated river system. Thus, Minute 319 illustrates the important role that NGOs can play in implementing 'postmodern' international environmental and water law.

#### **Box 4. Restoring the Colorado River Delta set a major international precedent**

The Colorado River originates in the United States Rocky Mountains, enters Mexico at the Arizona–California border, and drains into the Gulf of California. The Colorado River is fully allocated in a way that allows both countries to dry up the river before it reaches the Delta. In 1922, the seven federal United States basin states entered into an Interstate Compact to allocate the river between the upper and lower basins. The allocation of the river provided a legal basis for the federal government to construct large carry-over storage reservoirs to ensure that the states, especially the three lower basin states of Arizona, California, and Nevada received their Compact entitlements. Mexican uses were only indirectly recognised in the Compact. However, during World War II the United States feared that Mexico might declare its neutrality. As part of a strategy to keep Mexico in the allied camp, the two countries negotiated a treaty that allocated 1.85 million m<sup>3</sup> (1.5 million acre-feet) to Mexico, primarily for irrigated farms across the border from Arizona and California. In 1944, the two countries adopted

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*This evolving regime is a good example of the final stage of cooperation, an altered allocation, and management regime. The agreement also illustrates that pre-environmental treaties can be adapted to environmental demands*

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the Mexico–United States Water Treaty (Treaty) which allows users in both nations to divert the entire average flow upstream from its mouth, thus cutting off both the necessary seasonal sediment deposits and water flows to sustain the Delta.

Until 2012, remnant Delta marshes survived precariously on wet year surplus ‘pulses’ and upstream agricultural return flows. In the 1990s, NGOs in both countries began to publicise the plight of the Delta, but both Mexico and the United States took the position that the degradation of the Delta was an un-remedial consequence of the Treaty. This position was consistent with both the Treaty and customary international water law, which does not recognise a nation’s right to the pre-dam flow of a river. But, in 2012, after a two decade-long campaign by NGOs to protect the Delta, the two countries de facto amended the Treaty to provide a modest experimental Delta flow maintenance regime.

The Mexico–United States Treaty has a modification process. The parties can modify the treaty without formally amending it. The parties use ‘interpretive’ Minutes negotiated through the International Boundary and Water Commission (IBWC) to de facto amend it. The IBWC traces its roots back to the 1848 Treaty of Guadalupe de Hildago by which Mexico ceded much of the present south-western United States, including California, to the United States, but its current authority derives from the 1944 Treaty. Article 25 renamed the previous boundary commission the IBWC and charged it with interpreting the Treaty. Article 25 allows IBWC decisions to “...be recorded in the form of minutes” which become effective unless either Mexico or the United States object to them.

As Lake Powell filled in the 1960s, little water reached the delta except in exceptionally wet years, thus cutting off both the seasonal sediment deposits and water flows necessary to sustain it. Beginning in the 1990s, Mexican and United States NGOs began a campaign to restore the Delta. However, both nations refused to consider the possibility. There is a cooperation regime on the river. The international Boundary Commission has the power to modify the 1944 Treaty through Minutes approved by both nations. However, the two nations have a long history of regarding the treaty allocation as fixed. Both nations long claimed that they had no legal obligation to provide flows to restore and sustain the Delta. But, in 2012, the two nations used a procedure to supplement the 1944 Mexico–United States Colorado River Treaty to create an experimental flow regime. Minute 319, Interim International Cooperative Measures in the Colorado River Basin through 2017, and Extension of Minute 318, Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California (November 20, 2012), create a pilot programme to deliver a 195 billion m<sup>3</sup> (158,088 acre-feet) base flow to the Colorado River limitrophe and Delta. The water will come from two sources, a one-time pulse flow of 130 million m<sup>3</sup> (105,392 acre-feet) and a base flow of 65 million m<sup>3</sup> (52,696 acre-feet). In March of 2014, approximately 130 million m<sup>3</sup> was released into the dry river bed below the Morelos Dam, which straddles the US–Mexico border just west of Yuma. The restoration water will come entirely from water saved in Mexico by the construction of more efficient water infrastructure to replace the earthquake damage facilities. The base



flow is being assembled in Mexico through NGO purchases of Mexican water rights. A water trust was established in 2010 and as of 2013 about 40 percent of the amount had been acquired. The expectation is that by the end of 2016, Minute 319 will be replaced 'by a comprehensive Minute that extends or replaces the substantive provisions of this Minute'.

Water sharing agreements are hard to negotiate because entrenched entitlement holders, as in the case on the Colorado River, tend to see them as zero sum games. Thus, at least one of three conditions must be present. First, the entitlement holders must perceive that a non-agreement would make them worse off. Second, the agreement must minimise the risk that entitlement holders will not be seriously injured. Third, the agreement must provide benefits to a wide spectrum of entitlement holders, benefits that they could not otherwise obtain. Minute 319 did not meet the first condition because there is little political risk that either the Compact or Treaty would be renegotiated to include Delta flows. But, Minute 319 did meet the second two conditions.

Minute 319 provided both countries with benefits in addition to the restoration of the Delta. The Minute abandoned the long held United States position that Mexico is entitled to its 1.85 million m<sup>3</sup> whether it needs it or not. The United States was afraid "...that Mexico's eyes could reach north of the border...". Thus, Mexico was not allowed to store surplus water in the United States' upstream reservoirs. Mexico can now decide to leave water in Lake Mead rather than taking delivery at the border in wet years. It provides for storage from 19 billion m<sup>3</sup> to 247 billion m<sup>3</sup> in wet years. Thus, Mexico is not forced to take its yearly allocation, whether it needs it or not, nor see the water used by the United States. The United States first changed its position in 2010 for humanitarian reasons. Mexican canals and water storage infrastructure were damaged by a 7.2 magnitude earthquake, and Mexico was allowed temporarily to store water in Lake Mead.

United States users benefit in several ways. Both basins benefit from the prospect of high levels in Lake Mead, especially as the predictions are that climate change will permanently reduce the flow of the Colorado. Upper basin states benefit because they may not have to release as much water into Lake Mead as required by the 2007 reservoir balancing agreement. In addition, in the Linear basin, the water-short Metropolitan Water District of Southern California (which supplies the Los Angeles area), can make a onetime purchase of more than 58 million m<sup>3</sup> (47,500 acre-feet) from Mexico at a cost of USD5 million. The Southern Nevada Water Authority and Central Arizona Water Conservation District can also make purchases. Mexico, in turn, will use part of the revenue from those water sales and funding from other sources to repair the earthquake damage. Finally, Minute 319 shifts some of the risks of curtailing uses in a drought year to Mexico.

The environmental core of Minute 319 is the creation of a pilot programme to deliver some 195 billion m<sup>3</sup> (158,088 acre-feet) of base flow to the Colorado River limitrophe and Delta. The water will come from two sources, 130 million m<sup>3</sup> (105,392 acre-feet)

and a base flow of 65 million m<sup>3</sup> (52,696 acre-feet). The pulse flow is to take place by 2016 at the latest and will come entirely from water saved by Mexico by building more efficient water infrastructure to replace the earthquake damage facilities. The base flow is being assembled in Mexico through NGO purchases of Mexican water rights. The water trust was established in 2010, and as of 2013 about 40 percent of the amount had been acquired. Minute 319 is only an interim measure, but it is first step towards a permanent adaptive management regime for the Delta. The expectation is that by the end of 2016, Minute 319 will be replaced by "...a comprehensive Minute that extends or replaces the substantive provisions of this Minute..." The Minute expressly calls for an evaluation of the success of the programme in contributing to the Delta's sustainability and restoration. The first of three planned pulse flows was a success.

As provided in Minute 319 of the U.S.-Mexico Water Treaty of 1944, a pulse flow of approximately 130 million m<sup>3</sup> (105,392 acre-feet) was released to the riparian corridor of the Colorado River Delta from Morelos Dam at the US–Mexico border. The water was delivered over an eight-week period in 2014. Peak flows were released early in this period to simulate a spring flood. Some pulse flow water was released to the riparian corridor via Mexicali Valley irrigation canals.

Base flow volumes totalling 65 million m<sup>3</sup> (52,696 acre-feet) are also being delivered to new and pre-existing restoration areas during the term of Minute 319 through December 31, 2017. Regeneration of native vegetation was promoted by clearing and grading 129 ha (320 acres) of non-native vegetation in the Laguna Grande area. Portions of the site were hydro-seeded with native vegetation and 38 ha (94 acres) of the site were planted with native trees. In the Miguel Aleman restoration site, 35 ha (86 acres) were cleared and graded and of these, 10 ha (25 acres) were planted with native trees.

The monitoring programme, established by Minute 319, assembled baseline information on the hydrology and biology of the riparian corridor and deployed binational, multi-agency teams of scientists during and after the pulse flow. Results of these efforts through July 24, 2014 are reported in this interim report (IBWC, 2014).

Ground-based and remotely-sensed data were collected to evaluate the ecosystem response to the pulse flow.

Surface water from the pulse flow rapidly infiltrated into the sandy subsurface in the first 60 km (37 miles) downstream of the Morelos Dam. Scour and deposition modified the channel bed topography, but bank erosion of the existing channel was minor.

Smaller volumes inundated the river channel farther downstream, including areas that had been prepared for the restoration of native vegetation. Pulse flow surface water reached the Gulf of California in May.

### **8.3.3 Murray–Darling River Basin, Australia**

Australia's management of the Murray–Darling Basin, while not technically international transboundary watercourse management, is an important example because it is an ambitious effort to restore lost ecosystems services on a river that crosses sub-national political units. The basin is plagued with

environmental problems from saline land to degraded aquatic ecosystems, largely caused by upstream agricultural withdrawals.

In 1992, the Commonwealth government and the four basin states agreed to the Murray–Darling Initiative to conserve the river's ecosystem. The Initiative led to adopting the federal–state Murray–Basin Agreement and creating a joint federal–state commission overseen by a federal–state ministerial council. The Agreement both allocates water among the basin states and vests the Murray–Darling Commission with the power to control releases from specified upstream storage facilities. To restore lost ecosystem services, the Commission has adopted an artificial base flow regime and imposed a use reduction regime on existing users.

The Commission ultimately set environmental flows for ecosystem restoration based on the impacts of different flows on the riverine environment. Both the federal and state governments recognised the need to limit water withdrawals, establish base flows, and stabilise and restore productive agricultural areas, especially those degraded by salinity. The Commonwealth of Australia government has no direct power to manage water and initially had to rely on the four basin states to distribute the necessary withdrawal reduction burdens. To do this, in 1996, the Commission announced that the ‘cap’, which imposes yearly diversion limits on the four basin states and the Australian Capital Territory, would be the status quo. Then gradual and modest rollbacks in existing uses would be promoted to meet fair, efficient, and environmental objectives.

The slow progress in restoring the basin's ecosystem services led to more aggressive Commonwealth government intervention. The Commonwealth invoked its international obligations under the Convention on Biological Diversity to enact the Water Act of 2007. The Act replaced the Commission with the Murray–Darling Basin Authority. The Authority has developed a Living Murray Water Recovery Programme, which follows a three-pronged approach to restore the lost ecosystem services – infrastructure measures, market-based measures (water licence purchases), and regulatory measures. The Authority must prepare a plan which imposes limits on the amount of water (both surface and groundwater) taken on a sustainable basis – known as long-term average sustainable diversion limits – identifies risks to basin water resources, such as climate change, and the strategies needed to manage those risks. It establishes the requirements that a state water resource plan must include to be accredited under this Act. It creates an environmental watering plan to optimise environmental outcomes for the

basin by specifying environmental objectives, watering priorities, and targets for basin water resources. It also establishes a water quality and salinity management plan, which may include targets, and sets rules about trading water rights in relation to basin water resources.

The Living Murray Water Recovery Programme has already produced many measurable benefits, including a comprehensive planning process, and expended over USD 0.73 billion (AUD 1 billion) to purchase more than 4,500 individual water trades<sup>30</sup>. However, the ultimate measure is whether the continuing decline of the basin can be halted and the ecological benefits of restoring ecosystems can be calculated (CSIRO, 2012).

### 8.3.4 Guarani Aquifer in Latin America

Argentina, Brazil, Paraguay, and Uruguay share this aquifer. In 2003, after decades of non-cooperation, the four states launched a World Bank-funded

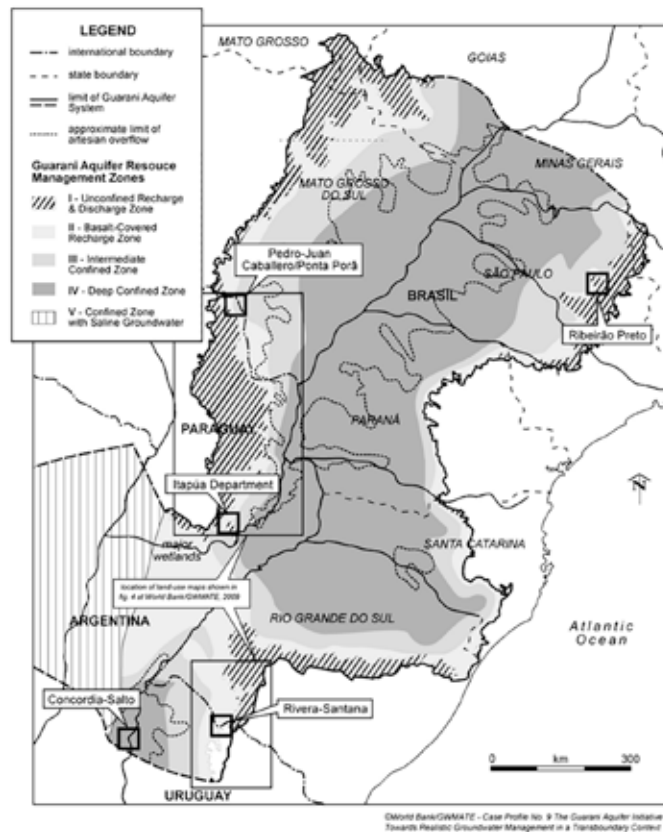


Figure 4. Guarani aquifer system in Latin America

<sup>30</sup> <http://www.environment.gov.au/water/rural-wat>

project for environmental protection and sustainable development. The initial objective was to collect basic data about the various segments of the resource. But, the project led to an agreement to implement a shared institutional, legal, and technical framework to preserve the Guarani Aquifer System for current and future generations. In 2010, the aquifer states signed the Guarani Aquifer Agreement, but it is not yet in force because only Argentina and Uruguay have ratified it.

State unilateral groundwater management is less constrained than surface water management. The Draft UN Groundwater Articles limit states to equitable and reasonable use, but the factors favour overlying state management. Article IV provides that Aquifer states shall utilise transboundary aquifers or aquifer systems according to the principle of equitable and reasonable use, as follows:

- They shall use transboundary aquifers or aquifer systems in a manner that is consistent with the equitable and reasonable accrual of benefits therefrom to the aquifer states concerned
- They shall aim at maximising the long-term benefits derived from the use of water contained therein
- They shall establish individually or jointly a comprehensive use plan, taking into account present and future needs of, and alternative water sources for, the aquifer states
- They shall not use a recharging transboundary aquifer or aquifer system at a level that would prevent continuance of its effective functioning.

The Guarani Agreement recognises that the aquifer is a transboundary water resource, but Article 2 provides that “...each party exercises sovereign territorial control over their respective portions of the aquifer system in accordance with their constitutional and legal arrangements, and in agreement with the norms of applicable international law.” The major limitation on state sovereignty imposes fewer duties compared to the UN Convention. Article 3 provides “...[t]he Parties exercise in their respective territories the sovereign right to promote the management, monitoring, and sustainable utilisation of the Guarani Aquifer System water resources, and shall use such resources on the basis of reasonable and sustainable uses criteria, respecting the obligation of not causing significant harm to the other Parties or the environment.”

The Agreement is, nonetheless, the major groundwater agreement that imposes duties on nations to share data and work towards cooperation on aquifer management. It will be a model for other agreements, but it is too early to evaluate the benefits of cooperation.

## 9 CONCLUSIONS

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**T**here is a rich literature to explain why transboundary river and aquifer cooperation happens or does not happen. However, with few exceptions, the literature does not distinguish among the many levels of cooperation.

Transboundary river and aquifer use and management cooperation is a continuum of stages that range from informal exchanges of information between riparian states to participation in a formal, on-going allocation and management legal framework.

Transboundary river and aquifer cooperation among basin-aquifer states is a central element of the merging water security framework endorsed by the GWP.

The standard of cooperation measurement most consistent with the achievement of basin-wide and state water security is an output standard.

To contribute to the water security of basin states, cooperation must produce measurable benefits. Cooperation for cooperation's sake will not necessarily provide the benefits. Some benefits, such as shared hydropower revenues or a firm allocation, will be immediately measurable while others, such as the restoration of ecosystem services, will take more time to be measured, but can still be significant.

Measurable cooperation benefits generally require a legal framework.

International water law provides a three-pronged framework for cooperation:

- The core principle of equitable and reasonable use prohibits any one basin state from monopolising the supply of a river, lake, or aquifer
- Riparian states undertaking an activity are subject to specific cooperation duties with the affected states
- Where there is an existing binding basin use and management instrument, there is an emerging customary duty upon all basin nations to cooperate to achieve the objectives of the instrument.

There are many examples of paper or incomplete cooperation as well as numerous examples of the failure to cooperate. However, there are examples of cooperation that have produced immediate benefits, promises in the future,

or provide a framework to adapt to changed conditions, such as climate change-induced droughts or floods.

These examples provide useful precedents for river basin authorities and riparian states trying to better manage a water resource in a manner that promotes water security.

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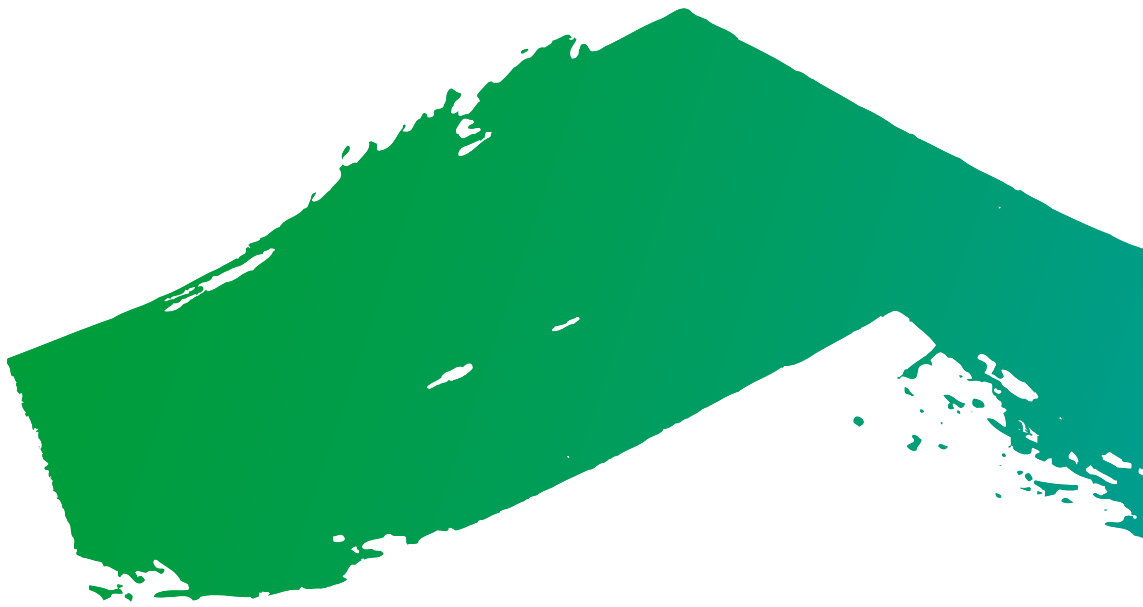
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