

INTERNATIONAL WATERS, GOOD GOVERNANCE AND DATA & INFORMATION SHARING & EXCHANGE

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I. Introduction²

“International waters,” are waters that are shared by two or more sovereign states and include international freshwater, international groundwater and international Large Marine Ecosystems (LMEs).³ The world's 263 or more global transboundary international freshwater river basins and lakes, also known as international drainage basins, alone cover nearly one half of the world's land surface, account for an estimated 60 percent of global freshwater flow and support roughly two billion people globally.⁴ International waters link populations within and between countries, as well as foster hydrological and economic interdependencies.⁵

The utilization of transboundary waters is also a potential source of friction among basin states vying for scarce resources. Sharing water resources creates intricate diplomatic challenges... '[often linking] states in asymmetric upstream/downstream relationships, at a time when pressures on the world's water supplies are increasing substantially'.⁶

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³ LMEs are regions of ocean space of 200,000 km² or greater that encompass coastal areas from river basins to estuaries to the outer margins of a continental shelf or the seaward extent of a predominant coastal current. LMEs are defined by ecological criteria, including bathymetric, hydrographic, productivity and trophically linked populations: as described in Kenneth Sherman, *Large Marine Ecosystem of the World*, Elsevier Editions, In UNESCO Intergovernmental Oceanographic Commission technical series (2008), a leading text on the subject. See also: Kenneth Sherman, Marie Christine Aquarone and Sara Adams, (Eds) *Sustaining the World's Large Marine Ecosystems*, available at http://www.lme.noaa.gov/lmeweb/downloads/book_sustain.pdf. See also: Kenneth Sherman and Gotthilf Hempel, (Eds), *The GEF UNEP Large Marine Ecosystem Report: A Perspective on Changing Conditions in LMEs of the World's Regional Seas*. UNEP Regional Seas Report and Studies No. 182. United Nations Environment Programme. Nairobi, Kenya. (2008).

⁴ United Nations-Water, *Transboundary Waters. Sharing Benefits, Sharing Responsibilities* (2008) UN Thematic Paper, available at http://www.unwater.org/downloads/UNW_TRANSBOUNDARY.pdf.

⁵ United Nations - Water, *Transboundary Waters. Sharing Benefits, Sharing Responsibilities* (2008) UN Thematic Paper at 1, available at http://www.unwater.org/downloads/UNW_TRANSBOUNDARY.pdf. See also: International Bureau of the Permanent Court of Arbitration, *The Resolution of International Water Disputes: Papers emanating from the Sixth PCA International Law Seminar 08 November 2002* Kluwer Law International, The Hague/London/NewYork at xix; See also: Aaron T. Wolf, *Development and Transboundary Waters: Obstacles and Opportunities*, in *River Basin Management: Its Role in Major Water Infrastructure Projects*, World Commission on Dams Thematic Review, (2000) at 30.

⁶ Ken Conca, Fengshi Wu & Ciqi Mei, *Global Regime Formation or Complex Institution Building? The Principled Content of International River Agreements*, 50 *International Studies Quarterly* 263 (2006).

Good governance of international waters is critical to help ensure stability, security and prosperity in regions that increasingly depend on international waters. The manner in which conservation and management challenges are confronted in an international waters governance context will determine future patterns of development⁷

The objective of this paper is to critically review but one particular aspect of good governance⁸ in an international waters context. That aspect is data and information sharing and exchange.⁹

Good governance of global transboundary international waters requires that basin states and institutions have access to credible and reliable data and information regarding the state of the resource and how conservation and management of international waters are affected by resource use and development, land use practices and climate change. (Gerlak, Lautze and Giordano 2011; see also: UNESCO 2009; Wolf 2007; Grossman 2006). Establishing and maintaining data and information sharing and exchange agreements and networks among basin states and institutions maximizes securitization in riparian regions by facilitating trust and building a shared vision for the resource (UN-Water 2008). Absent such sharing and exchange, it becomes extremely difficult for basin states and institutions to manage water uses, formulate basin-wide policies, or take steps to minimize floods, droughts and pollution (Eckstein 2010). Data and information sharing is considered a precondition for data integration, joint modeling and common monitoring protocols—key characteristics of successful institutional arrangements for unified and adaptive water governance (Karkkainen 2006; Raadgever et al. 2008). Data and information exchange is also widely seen as a basis or starting point for more comprehensive cooperation regarding shared resources (Chenoweth and Feitelson, 2001).

This paper presents 24 case studies of data and information sharing and exchange in a global transboundary international waters context and concludes with thoughts regarding the possible scope and content of an idealized agreement for data and information sharing and exchange for global transboundary waters governance.

II. Data and Information

*“If you can’t measure it you can’t manage it”*¹⁰

Adequate and effective data and information sharing and exchange is one of the key principles behind an emerging good governance framework for shared river basins.¹¹ Gerlak, Lautze and

⁷ Hala Qaddumi, *Practical Approaches to Transboundary Water Benefit Sharing*, Working Paper (2008) available at <http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/2576.pdf>

⁸ The term “good governance” is increasingly being used in development literature. In an international waters context, it is defined as the process of decision-making and the process by which decisions are implemented or not implemented. Six aspects of good governance are: benefit sharing, data and information sharing and exchange, dispute resolution, funding, resilience and institutional architecture. These six aspects represent the best combination of where the need is greatest and where various lessons learned and experiences are readily available.

⁹ This paper draws in part on materials originally researched and prepared in 2009 by Richard Kyle Paisley and Dr. Abdulkarim Seid for the WRPM (Water Resources Planning and Management) division of the Nile Basin Initiative.

¹⁰ This ubiquitous quote is ascribed to various sources, including Peter Drucker, as found at <http://blog.marketculture.com/2009/03/20/if-you-cant-measure-it-you-cant-manage-it-peter-drucker/>.

¹¹ See: Andrea K. Gerlak, Jonathan Lautze & Mark Giordano, *Water Resources Data and Information Exchange in Transboundary Water Treaties*, 11 Intl Environ Agreements. 179 (2011).

Giordano (2011) conducted an exhaustive review of the advantages and obstacles to data and information sharing in a transboundary waters context.¹²

Some of their findings are presented below:¹³

Advantages

- Once an agreement is created, exchange of data and information can form a basis for coordinated management (Wouters 1997; Feitelson and Haddad 1998; van der Zaag and Savenije 2000; Chenoweth and Feitelson 2001).
- The exchange of water resources data and information can provide a first step toward broader transboundary cooperation and agreement formation (Kliot and Shmueli 1997).
- Data and information exchange can form a basis of transparency and trust, providing mutual assurance of joint compliance (Young 1994; Burton and Molden 2005)
- Information sharing and joint or transparent information acquisition and interpretation can also help to develop a sense of reciprocity between states (Keohane 1986).
- Disputed claims about water availability and use, or effluent levels in rivers, can most efficiently be resolved through an examination of relevant data. In this way, joint water resources data and information exchange can help mitigate further disputes and prevent broader conflict (Bernauer and Kalbhenn 2010).

Obstacles

- While institutions may help to overcome such information imbalances, it must also be recognized that the exchange of data in water treaty negotiations may be feared to weaken the bargaining position of one or more riparians and therefore undue insistence on it may hinder negotiation on other aspects of treaty development.
- Data or information may be used as a weapon, directing blame at other parties for causing negative conditions in a shared basin (Timmerman 2004).¹⁴
- Close assessment of negotiations in the region might suggest that some riparian states have used the lack of a formal agreement as a reason not to fully share existing data. Even when an agreement is reached, it might be that states intentionally design vague mechanisms related to data exchange. This may occur in order to allow for greater flexibility in the face of resource uncertainty or to serve domestic political purposes (Fischhendler 2008), or may help propel an agreement forward, even without all of the issues being formally resolved (Mitchell and Keilbach 2001).

Chenoweth and Feitelson (2001) conclude that, “data and information exchange in international river basins requires both political agreement and technical proficiency. Such data collection incurs costs, and establishing exchange mechanisms requires transaction costs. These are likely to vary significantly as a function of the relations between the countries, as well as a function of

¹² *Id.*

¹³ *Id.*

¹⁴ According to Timmerman (2005), “water resources management requires negotiating conflicts and differences between different stakeholders with different mind frames. Conflict is in such a situation often a clash of paradigms. People act and rationalize things in a way that does not make sense to others because they are operating with a different set of assumptions, values and beliefs. In resolving such conflicts, those involved need to make their paradigms explicit and see others’ paradigms. For this, facilitation is critical (citing Woodhill 2004).” Timmerman further notes: “One such conflict in trans-boundary river basin management is that especially the upstream countries have a tendency to restrict information exchange, as it is not in their direct interest to give full access to the available information. This is partly related to the power connected to the possession of information. As the lack of information can hinder proper definition of a situation or hamper appropriate action, control over information gives an advantage over those who do not have this information.”

the structure and independence of water institutions within them.”¹⁵ The authors state that joint data collection, data sharing, or exchange is likely only if all parties perceive that benefits will outweigh the costs.

Several factors can affect the perceived costs and benefits. The authors classify these factors into primary and secondary. Primary (or basic) factors are “those aspects relating to a river or groundwater basin, which essentially cannot be changed by internal or external forces and must, therefore, be accepted as forming the basic context of the secondary (or derived factors).” “Secondary factors are issues that the individual countries, or collectively the basin as a whole, have at least limited power to modify. It is these factors that will largely determine whether effective data and information exchange can actually occur.”¹⁶

Table 1: Factors that Affect the Perceived Costs and Benefits of Data Exchange

PRIMARY FACTORS	<ul style="list-style-type: none"> • Compatible Needs • Absence of Legacies of Mistrust • Political Stability • Common Language and Culture • Sufficient Levels of Economic Development • Increasing Water Resources Stress
SECONDARY FACTORS	<ul style="list-style-type: none"> • Perception by Basin Countries that Cooperation is of Mutual Benefit • External Pressure and Funding for Cooperative Initiatives • Comparable Levels of Institutional Capacity • Popular and Political Concern About Water Resources Management • Existence of a Functional Formal or Informal Cooperative Arrangement

¹⁵ Jonathan L. Chenoweth & Eran Feitelson, *Analysis of Factors Influencing Data and Information Exchange in International River Basins: Can Such Exchange be Used to Build Confidence in Cooperative Management?*, 26 *Water International*, 499 (2001).

¹⁶ See *id.* for an in depth discussion of these factors. While some primary and secondary factors are closely related in some river basins, the factors are considered separately where they can operate independently of the other, or where the relative importance of the two factors can be significantly different.

Data and Information Sharing and Exchange and International Law

Global transboundary international waters often have characteristics that make their conservation and management particularly challenging, the most notable of which is the tendency for regional politics to regularly exacerbate the already difficult task of understanding and managing complex natural systems.¹⁷

There are several rules of international law of a general and fundamental nature that govern the conduct of states in relation to international watercourses.¹⁸ The most basic of these are the following:

- States are to use an international watercourse in a way that is “equitable and reasonable” vis-à-vis other states sharing the watercourse.
- States are to take “all appropriate measures” to prevent causing “significant harm” to co-riparian states.
- States are to “consult” with the other international watercourse states and provide prior, “timely notification” about any new use or change in an existing use of an international watercourse that could have significant adverse effects on co-riparian states, along with relevant technical information.¹⁹

Beyond customary international legal obligations lie treaties and other agreements that are negotiated between states in an effort to address particular watercourse management issues, to clarify how customary obligations will be met, and in some cases to jointly develop opportunities that neither state could fully capitalize on if acting independently.²⁰

The 1997 United Nations Convention on Law of the Non-Navigational Uses of International Watercourses²¹ recognizes that the exchange of data and information is a necessary prerequisite for good governance. Article 9 requires basin states to regularly exchange data and information on the condition of the watercourse, in particular that of a hydrological, meteorological, hydrogeological and ecological nature or related to water quality and related forecasts. The 1997 UN Watercourses Convention also allows states to request information that is not currently available while providing compensation to the state procuring the data.²²

¹⁷ Alex Grzybowski, Stephen C. McCaffrey & Richard K. Paisley, *Beyond International Water Law: Successfully Negotiating Mutual Gains Agreements for International Watercourses*, 22 Pac. McGeorge Global Bus & Dev. L.J. 139 (2010), citing James Kraska, *Sustainable Development is Security: the Role of Transboundary River Agreements as Confidence Building Measure (CBM) in South Asia*, 28 Yale Journal of International Law 465. (2003).

(competition over freshwater resources often exacerbates international tension).

¹⁸ See Richard K. Paisley, *International Water Law, Transboundary Water Resources and Development Aid Effectiveness*, 1 Indian Jurid. Review 67 (2004). For background on the law of transboundary waters, see Aaron T. Wolf, Jeffrey A. Natharius, Jeffrey J. Danielson, Brian S. Ward & Jan K. Pender, *International River Basins of the World*, 15 Int'l J. of Water Res. Dev., 387 (1999).); See generally, Stephen McCaffrey, *The Law of International Watercourses* (2nd ed. 2007). Oxford University Press.

¹⁹ Grzybowski et al., *supra* note 17.

²⁰ *Id.*

²¹ United Nations Convention on Law of the Non-navigational Uses of International Watercourses., art. 9, May. 21, 1997, available at http://untreaty.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf.

²² In 1997, the UN Convention on the Non-Navigational Uses of International Water Courses was adopted by the United Nations General Assembly by a vote of 103 for and three against, with 27 abstentions and 33 members absent. It has since become the principal instrument with which states may negotiate and develop water resources along international rivers and through which international law may be applied. Though extremely holistic in content, taking into account the basin wide approach and the precautionary principle, the Convention has yet to be ratified by a sufficient number of countries to enter into force, and the ratification deadline of May 20, 2000 has passed.

The general obligation of international water states to exchange information has been further affirmed in various ministerial declarations of international water conferences and the resolutions of international organizations. These include: the Declaration of the United Nations Conference on the Human Environment (encouraging the collection and exchange of information through joint mechanisms);²³ Dublin Statement of the International Conference on Water and the Environment (recommending information exchange as a means of minimizing conflict over shared resources);²⁴ and the Kyoto Ministerial Declaration of the 3rd World Water Forum (encouraging information exchange as a mechanism to mitigate natural disasters).²⁵

Some resolutions of international organizations further affirming the general obligation to exchange information include the: UNECE Decision on International Cooperation on Shared Water Resources, principle 11 (encouraging members to carry out joint data collection projects);²⁶ Draft Principles of Conduct for the Guidance of States in the Conservation and Harmonious Exploitation of Natural Resources Shared by Two or More States;²⁷ and Co-operation in the Field of the Environment Concerning Natural Resources Shared by Two or More States.²⁸

Numerous international resolutions also include a duty to exchange information on transboundary watercourses. See, for example, the IDI Resolution on the Pollution of Rivers and Lakes and International Law, art. VII (encouraging the exchange of data on pollution and the coordination of programs designed to generate data about the basin);²⁹ the ILA, New York Resolution, art. 3 (recommending that “[c]o-riparian states should make available to the appropriate agencies of the United Nations and to one another hydrological, meteorological and economic information, particularly as to streamflow, quantity and quality of water, rain and snowfall, water tables and underground water movements”);³⁰ and the ILA, Helsinki Rules, art. XXIX,³¹ relating information exchange to the mitigation of water disputes. Article XXIX specifies.³²

²³ Declaration of the United Nations Conference on the Human Environment, June 16, 1972, *available at* <http://www.unep.org/Documents.Multilingual/Default.asp?documentid=97&articleid=1503>.

²⁴ The Dublin Statement on Water and Sustainable Development, Jan. 31, 1992, *available at* <http://www.inpim.org/files/Documents/DublinStatmt.pdf>.

²⁵ *Kyoto Ministerial Declaration of the 3rd World Water Forum, March 23, 2003, available at* http://www.astee.org/communication/cai/fichiers/13_6.pdf.

²⁶ Convention On The Protection And Use Of Transboundary Watercourses And International Lakes, Mar. 17, 1992, *available at* <http://www.unece.org/env/water/pdf/watercon.pdf>.

²⁷ Intergovernmental Working Group of Experts on Natural Resources, U.N. Environment Programme, 6th Sess., Agenda Item 11, U.N. Doc. UNEP/GC.6/17, 1978, adopted by the General Assembly.

²⁸ *Co-operation in the Field of the Environment Concerning Natural Resources Shared by Two or More States*. G.A. Res. 186, at 128, U.N. GAOR, 34th Sess. 1979.

²⁹ IDI, Resolution on the Pollution of Rivers and Lakes and International Law, Sep. 12, 1979, *available at* http://www.idi-iii.org/idiE/resolutionsE/1979_ath_02_en.PDF.

³⁰ Development Law Service, FAO Legal Office, *Sources of International Law, Some General Conventions, Declarations, Resolutions and Decisions adopted by International Organizations, International Non-Governmental Institutions, International and Arbitral Tribunals on International Water Resources*, FAO Legislative Study 65, Rome 1998 at 289 *available at* <ftp://ftp.fao.org/docrep/fao/005/w9549E/w9549e04.pdf>.

³¹ Development Law Service, FAO Legal Office, *Sources of International Law, Some General Conventions, Declarations, Resolutions and Decisions adopted by International Organizations, International Non-Governmental Institutions, International and Arbitral Tribunals on International Water Resources*, FAO Legislative Study 65, Rome 1998 9 at 299 *available at* <ftp://ftp.fao.org/docrep/fao/005/w9549E/w9549e04.pdf>.

³² Development Law Service, FAO Legal Office, *Sources of International Law, Some General Conventions, Declarations, Resolutions and Decisions adopted by International Organizations, International Non-Governmental Institutions, International and Arbitral Tribunals on International Water Resources*, FAO Legislative Study 65, Rome 1998 at 299 *available at* <ftp://ftp.fao.org/docrep/fao/005/w9549E/w9549e04.pdf>.

With a view to preventing disputes from arising between basin states as to their legal rights or other interest, it is recommended that each basin state furnish relevant and reasonably available information to the other basin states concerning the waters of a drainage basin within its territory and its use of, and activities with respect to each waters.

This statement indicates not only the interconnection between the other key legal principles and the principle of information exchange, but also the legal obligation of riparian states to provide data to co-basin states. By enhancing cooperation and trust, the sharing of information eases the way for discussions on particularly contentious matters such as allocation. Established treaty practice has long made it clear that there is an international legal obligation to share and exchange information regarding shared transboundary international waters.³³

Sources of Data and Information Exchange³⁴

In an international waters context, three broad categories of sources of data and information are:

1. National (private): refers to data and information that are generally available in national agencies of riparian states. While certain rules are to be followed to get access to data and information for ‘national’ use, special arrangements may be required to get access by ‘outsiders’.
2. Shared: refers to data and information that has been compiled through the consent and participation of the riparian states and hence is available to all riparian states. The fact that the data and information is ‘shared’ by the states signifies that they are mutually agreed upon by the riparian states.
3. Public domain: data and information in the public domain are usually available to practically everyone. Examples of such data and information include satellite imageries and derived products obtainable from the worldwide web, information released for public ‘consumption’.

Data and information sharing and exchange in an international waters context is usually governed by written agreements which recognize different classes of users as well as the sensitivity of the data and information. In the case of international waters, agreements are usually needed on data and information exchange or sharing to define the terms (or modalities) under which access can be granted and to whom.

A classification of development phases in a freshwater international waters context has been developed by Burton and Molden (2005)³⁵ and is used here to illustrate how in the case of international drainage basins, information and data needs evolve with growing development and, thus, require an increased allocation of resources. According to this classification, international drainage basins can fall in any of three phases: development, utilization and reallocation.³⁶

³³ Stephen C McCaffrey, *The Law of International Watercourses* (2nd ed. 2007). Oxford University Press.

³⁴ The support and encouragement of Dr. Abdulkarim Seid who assisted with this section is gratefully acknowledged.

³⁵ Martin Burton & David Molden, *Making Sound Decisions: Information Needs for Basin Water Management*, in Mark Svendsen (Ed), *Irrigation and River Basin Management: Options for Governance and Institutions* pp. 51 Massachusetts: CABI Publishing. (2005).

³⁶ *Id.*

International drainage basins are said to be in a *development phase* if the amount of naturally occurring water is not a limiting factor for development. In such a situation, growth in demand for water is the prime driving force for the development of infrastructure. In the second phase, the *utilization phase*, a significant proportion of available resources have been committed to use. Governance in such basins shifts more toward effective utilization from available facilities, such as through reuse of drainage water and demand management. With further development of resources as demands grow, a situation can be reached where most of the utilizable water has been committed. This phase is termed '*reallocation*'. The main focus of governance in international drainage basins in this third phase is toward making 'best' use of available water, which may lead to reallocating resources from lower to higher value uses.

The types of data and information needed change as more water and other resources become committed to various uses and the focus of governance moves more toward demand management.³⁷ Table 2 summarizes the main types of data and information usually thought to be required at different levels of development in an international freshwater drainage basin.³⁸

Table 2: Development stages and data and information requirements in an international drainage basin

Data needs	Typical data collected	Developments in information processes
<u>Infancy:</u> Localized use only		
Rudimentary, limited to water levels and extent of flooding	Flood water levels, flooded areas (through experience)	Demarcation (and avoidance) of flooded areas, correlation of flood extend and flood levels
<u>Development:</u> Water allocation is supply focused; Data collected and used by small number of agencies for specific uses and projects		
Availability of water during the year and extent of agricultural land; Main focus is on surface water, though some interest in groundwater for urban and irrigation development; For initial planning for river basin development.	Project-wise collection of river flow and quality data; Climatic data, particularly rain-fall; Land use in riverine plains and extent of agricultural land Topographic surveys; Aerial photography; Land ownership, traditional/existing water rights.	Initial data collection systems established for individual projects; gradually these are linked up and coordinated by the development agency(s); Basin-wide hydrometric stations established to gather base data.

³⁷ *Id.*

³⁸ *Id.*

Utilization: Water allocation is supply-focused; Data related processes and procedures well established

Detailed knowledge of the available water resources, both surface and groundwater, particularly over-year to establish storage patterns for reservoirs and recharge patterns for groundwater; For river basin master planning.	River flow data throughout the basin; Climatic data throughout the basin; Land ownership and traditional/existing water rights; Groundwater level and quality; Some monitoring of pollution levels.	Data collection procedures standardized and co-coordinated; Procedures established for monitoring pollution levels; Procedures established for monitoring groundwater depth and quality; Publication of water resources and climatic data; Development of simple water resources models for river basins
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Re-allocation and restoration: Demand and supply focused; Data related processes and procedures refined and more widely disseminated

<p>To obtain detailed knowledge of the annual and inter-year water resource situation both for supply and demand;</p> <p>To monitor and control water abstraction by users;</p> <p>To make projections of supply and demand;</p> <p>For water resources modelling, using remote sensing and GIS;</p> <p>For scenario analysis;</p> <p>For river basin master planning;</p> <p>To refine and update supply and demand projections, scenario analysis;</p> <p>To formulate rules for allocation of water during droughts / shortages.</p>	<p>River flow and water quality data throughout the basin;</p> <p>Climatic data throughout the basin;</p> <p>Groundwater level and quality;</p> <p>Pollution levels;</p> <p>Water abstraction by all users;</p> <p>Data for prosecution for over-abstraction and/or pollution;</p> <p>Data analysed from perspective of different water users;</p> <p>Water needs for various environmental processes.</p>	<p>Hydrometric network extended and automated for direct transmission to data collection stations;</p> <p>Groundwater monitoring network extended;</p> <p>Pollution monitoring extended;</p> <p>Further computerization of data collection, processing and analysis;</p> <p>Development of sophisticated water resource models for river basins, with refinement to become an operational tool;</p> <p>Remote sensing incorporated into water management and decision making;</p> <p>Publication of water resources supply and demand information;</p> <p>Analysis and presentation of data for a wider range of stakeholders;</p> <p>Scenario analysis to enable participation in decision-making.</p>
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Every international drainage basin is unique and may not lend itself to be strictly classified into any one of these phases. However, the more water and related resources that are committed to use, the less will purely “supply-oriented” measures be adequate to result in efficient utilization. This usually requires more sophisticated tools and detailed information and data than what would be required in relatively undeveloped situations where resource availability has not yet become a constraint or limiting factor for development.

Key Data Requirements for Effective River Basin Management

Burton and Molden (2005) set out some of the key data requirements for river basin management in the following table:

Table 3: Key Data Requirements

<p>Physical Data</p> <ul style="list-style-type: none"> • Latitude/Longitude • Catchment area • River Channel length • River Slopes • Land use types and areas • Land slopes and areas • Soil types and areas • Aquifers (numbers and areas) 	<p>Demographic Data</p> <ul style="list-style-type: none"> • Total population (past, present and future) • Population densities • Population by location (urban/rural) • Population by work type • Attainment levels for education (by age and gender) 	<p>Institutional</p> <ul style="list-style-type: none"> • Development policy • Water policy • Water law • Environmental law • Land tenure • Water rights • Stakeholders - roles and responsibilities
<p>Groundwater Data</p> <ul style="list-style-type: none"> • Groundwater levels • Groundwater quality • Aquifer yields and quality • Estimate annual groundwater recharge 	<p>Agricultural</p> <ul style="list-style-type: none"> • Cultivable area • Irrigable area • Irrigated area • Irrigation water abstractions (surface/groundwater) • Drainage return flows - quantity • Number of landholders • Population dependent on irrigated agriculture • Value of irrigated agricultural production 	<p>Potable and Wastewater</p> <ul style="list-style-type: none"> • Abstraction quantity (surface/groundwater) • Abstraction quality • Return flow - quantity • Return flow - quality • Number of people supplied

<p>Hydrometric Data</p> <ul style="list-style-type: none"> • River discharges • River water levels • River flood peak discharges • River base flows • River sediment load • River water quality • Lake/reservoir water levels • Lake/reservoir volumes • Lake/reservoir water quality • Lake/reservoir surface evaporation and temperature • Volume of water imported/exported to and from basin 	<p>Economic Data</p> <ul style="list-style-type: none"> • National GNP • Regional or basin GNP • Average basin per capita GNP 	<p>Meteorological and Climatic</p> <ul style="list-style-type: none"> • Sunshine/radiation hours • Wind speed • Air temperature • Humidity • Evaporation • Precipitation • Precipitation intensity
<p>Industrial</p> <ul style="list-style-type: none"> • Abstraction quantity (surface/groundwater) • Abstraction quality • Return flow - quantity • Return flow - quality • Number of people employed 	<p>Navigation</p> <ul style="list-style-type: none"> • River water levels • River discharges • River channels and depths 	<p>Hydroelectric Power</p> <ul style="list-style-type: none"> • Generation capacity • Discharge requirements and timing • Maximum discharge requirements and timing • Minimum discharge and timing

Environmental	Recreational	Tourism
<ul style="list-style-type: none"> • Minimum flow requirements • Critical flow periods and demands • Protected areas and water demands • Required water quality standards 	<ul style="list-style-type: none"> • Minimum flow requirements • Critical flow periods and demands • Protected areas and demands • Required water quality standards 	<ul style="list-style-type: none"> • Minimum flow requirements • Critical flow periods and demands • Protected areas and water demands • Required water quality standards

Data and information exchange can develop as an organic process. The process may commence with the exchange of independent data, followed by standardization of data and then joint collection and monitoring (Paisley and Hearn, 2006). Further along the continuum is the exchange of forecasting and water use plans, and eventually there may be common planning. It is hoped that riparian actors ultimately come to agreement on equitable allocation of consumptive use, pollution and dispute resolution mechanisms; they will then have the framework in place for developing resources in one nation at the joint cost and for the joint benefit of several, coordinated administrative structures.³⁹

III. Case Studies

The following 24 case studies provide examples of data and information sharing and exchange in an international waters governance context.⁴⁰

1. Amazon Basin

In the Amazon Basin,⁴¹ Member States of the Amazon Cooperation Treaty Organization (ACTO)⁴² have a duty to “maintain a permanent exchange of information and cooperation among themselves,” as well as with other agencies operating in the Amazon River Basin.⁴³ This

³⁹ Richard K. Paisley & Glen Hearn, *Some Observations From Recent Experiences With the Governance of International Drainage Basins*, in *Proceedings of the Symposium—Precious, Worthless, or Incalculable: The Value and Ethic of Water*, 2, Center for Water Law & Policy and International Center for Arid and Semi-Arid Land Studies, Texas Tech University. Corrêa A., and Eckstein G., eds. (2006).

⁴⁰ See *supra* note 2.

⁴¹ The Amazon River Basin spans an area of 5,870,000 square kilometers, contains nearly one-fifth of the fresh water on the surface of the Earth, and discharges 4.2 million cubic feet of water per second.³ The Amazon River Basin covers area in the territories of the eight Member States.

⁴² The Member States of the Amazon Cooperation Treaty and the ACTO are Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela.

⁴³ Treaty for Amazonian Cooperation (—Amazon Cooperation Treaty), Jul. 3 1978, *available at*

sharing of information is reflected by the multiple memoranda of understanding that ACTO has entered into with other regional or worldwide bodies (such as the Andean Community and the Inter-American Development Bank). The Member States also agreed to exchange information on flora, fauna, and diseases in the Amazonian territory and to make an annual report on the conservation measures adopted.⁴⁴ In addition, the ACTO Bi-Annual Action Plan describes the programs and projects that are underway and is distributed to the Member States to keep them informed of the activities of the Permanent Secretariat. The Action Plan describes the duration of the program or project, estimated costs, and projected sources of funding. The coordinators of active projects must report back to the Permanent Secretariat on established indicators designed to assess the progress towards the achievement of project goals. The Permanent Secretariat will also publish an Annual Report on the progress of the Bi-Annual Action Plan.⁴⁵ The ACTO Strategic Plan, released in October 2004, describes the plans of the Permanent Secretariat from 2004 to 2012 for various projects that are designed to promote sustainable development and to protect the Amazon Basin. The report describes the strategic axes that will be used to guide the ACTO, the programmatic structure of the plan, and operational tools. The Strategic Plan is meant to be used as a planning document that can be modified based on suggestions from the various stakeholders.⁴⁶ Furthermore, in cooperation with the Directorate General for International Cooperation of the Netherlands (DGIS), the German Federal Ministry for Economic Cooperation and Development (BMZ), and the German Organization for Technical Cooperation (GTZ), ACTO established the Amazon Regional Program regarding the sustainable use and conservation of forests and biodiversity in the Amazon Region. The Amazon Regional Program was developed based on the ACTO Strategic Plan and focuses on being a forum for cooperation and communication among the Member States in the areas of forests, biotrade, tourism, indigenous affairs, and institutional strengthening. For example, in terms of forests, the Member States have developed 15 indicators, which correspond to eight criteria, to measure and evaluate the effectiveness of forest management in the Amazon. This evaluation system was implemented by each Member State and involved training programs, information gathering, identifying key stakeholders, and holding regional talks. The Member States are also working toward developing a real-time satellite monitoring system of the forest. In addition, in March 2009, ACTO and the United Nations Environment Programme (with support from the University of the Pacific) released a report entitled “Perspectives on the Environment in the Amazon: Amazon GEO.” The report, which involved the efforts of 150 scientists and researchers, provides a comprehensive review of the economic, ecological, social, political, and geographical status of the Amazon region.⁴⁷

2. Cartagena Convention

In Article 13 of the *Cartagena Convention*,⁴⁸ the Contracting Parties agreed to cooperate, both with each other and with relevant international and regional organizations, in “scientific research,

<http://www.otca.org.br/en/institucional/index.php?id=29>. at XV.

⁴⁴ Amazon Cooperation Treaty, art. VII.

⁴⁵ Amazon Cooperation Treaty Organization Strategic Plan 2004-2012 (—ACTO Strategic Plan), Oct. 2004, at 15, *available at* http://www.otca.org.br/PDF/Strategic_Plan.pdf. at 67.

⁴⁶ ACTO Strategic Plan, at 9-11.

⁴⁷ See Programa Regional Amazônia, *available at* <http://www.otca.org.br/programaregional/> (last viewed on 11 Feb. 2013) (website only available in Spanish and Portuguese).

⁴⁸ Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region – The Final Act of the Conference of the Plenipotentiaries on the Protection and Development of the Marine Environment of the Wider Caribbean Region (—Cartagena Convention), 24 Mar. 1983, *available at* <http://www.cep.unep.org/cartagena-convention/text-of-the-cartagena-convention>; The Caribbean Environment Programme (—CEP)– Cartagena Convention & Protocols, *available at*

monitoring, and the exchange of data and other scientific information relating to the purposes of th[e] Convention.” In addition, Article 17 of the Specially Protected Areas and Wildlife (SPAW) Protocol⁴⁹ calls upon the Contracting Parties to develop “scientific, technical and management-oriented research” on protected areas and threatened or endangered species and their habitats. Contracting Parties are also encouraged to consult with one other and with relevant organizations to identify protected areas and species and to conduct research and monitoring programs to protect them; to assess the effectiveness of measures enacted to implement management and recovery plans; to exchange information and coordinate research and monitoring programs; and to standardize the procedures used for collecting, reporting, archiving, and analyzing scientific and technical information. The Caribbean Regional Coordinating Unit (CAR/RCU) is also intended to serve as a forum for collecting, reviewing, and distributing information on relevant studies, publications, and the results of work conducted under the framework of the Cartagena Convention and its Protocols.⁵⁰ The Caribbean Environment Programme (CEP) manages and/or contributes to numerous databases related to the marine and coastal environment in the Wider Caribbean Region. The SPAW Species Database, which is hosted and maintained by the CEP, contains both taxonomic information and distribution data on protected species of marine and coastal flora and fauna. Other relevant databases include: the Caribbean Marine Protected Area (MPA) (information on protected coastal areas in 34 countries and territories); the Marine Litter Database; the Global Environment Facility Integrating Watershed and Coastal Areas Management in Caribbean Small Island Developing States Project Databases (GEF-IWCAM); INFOTERRA (the UNEP global environmental information exchange network); and UNEP State of the Environment Reports (SOER) (information on the environmental health of countries and regions).⁵¹ The Contracting Parties also agreed to develop information systems and networks to promote the exchange of information and facilitate the implementation of the Land-Based Sources (LBS) Protocol.⁵²

3. International Commission for the Conservation of Atlantic Tunas (ICCAT)

Every two years, ICCAT⁵³ submits a report on its work and findings, which is transmitted by the Executive Secretary to all Contracting Parties of the Commission, the FAO and any government

<http://www.cep.unep.org/cartagena-convention> (last visited on 6 Dec. 2010). The Contracting Parties to the Cartagena Convention and the Oil Spills Protocol are Antigua and Barbuda, Bahamas, Barbados, Belize, Colombia, Costa Rica, Cuba, Dominica, the Dominican Republic, France, Grenada, Guatemala, Guyana, Jamaica, Mexico, the Netherlands, Panama, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, United Kingdom, the United States, and Venezuela.

⁴⁹ The Contracting Parties of the SPAW Protocol are Barbados, Belize, Colombia, Cuba, the Dominican Republic, France, Guyana, the Netherlands, Panama, Saint Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, the United States, and Venezuela.

⁵⁰ See UNEP-Caribbean Regional Coordinating Unit, *available at* <http://www.cep.unep.org/about-cep/unep-car-rcu/unep-caribbean-regional-coordinating-unit>.

⁵¹ See CEP-Databases, *available at* <http://www.cep.unep.org/publications-and-resources/databases> (last viewed on 11 Feb. 2013). Protected species are listed in Annexes I-III to the SPAW Protocol. See SPAW Protocol, art. 11(1); Final Act of the Conference of Plenipotentiaries for the Adoption of the Annexes to the Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region, Annexes I-III, 10-11 June 1991, *available at* <http://www.cep.unep.org/cartagena-convention/spaw-protocol/spaw-final-act-resolution-and-appendix/view>.

⁵² Protocol Concerning Pollution from Land-Based Sources and Activities to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, art. VIII, Oct. 6, 1999, *available at* <http://www.cep.unep.org/cartagena-convention/lbs-protocol/lbs-protocol-english>. The Contracting Parties of the LBS Protocol are Antigua and Barbuda, Bahamas, Belize, France, Guyana, Panama, Saint Lucia, Trinidad and Tobago, and the United States.

⁵³ ICCAT has 48 Contracting Parties: Albania, Algeria, Angola, Barbados, Belize, Brazil, Canada, Cape Verde, China, Côte d’Ivoire, Croatia, Egypt, Equatorial Guinea, European Community, France (St. Pierre & Miquelon), Gabon, Ghana, Guatemala, Guinea, Honduras, Iceland, Japan, South Korea, Libya, Mauritania, Mexico, Morocco, Namibia, Nicaragua, Nigeria, Norway, Panama, Philippines, Russia, Senegal, Sierra Leone, South Africa, St. Tome and Principe, St. Vincent and the Grenadines, Syria,

or international organization invited to send observers to the meeting. The Council, Panels and other subsidiary bodies of ICCAT also adopt reports at the end of each meeting, which are then submitted to the appropriate parent body.⁵⁴ Generally speaking, ICCAT collects two main types of data. Fishery independent data includes research vessel surveys and other studies, such as those conducted with tagging programs.⁵⁵ But, ICCAT generally relies on fishery-dependent data sources, such as logbooks, observer programs, port sampling, factory/market sampling and international trade (import/export) statistics.⁵⁶ ICCAT also maintains a number of statistical databases, which contain data on fleet characterization (number and type of fishing vessels); nominal catch (by species, region, gear, flag); catch and effort (fishing fleet, time, gear and time and area strata); and fish size (size samples and catch-at-size estimates).⁵⁷

4. Rio Grande/Rio Bravo⁵⁸

Data on water flow and reservoir condition are collected and updated daily on the International Boundary and Water Commission (IBWC) website.⁵⁹ The collated stream gauging record and records of waters in storage, rainfall and evaporation stations and of the measurements of the quality of waters are published annually in the Flow of the Rio Grande and Tributaries and Related Data, an IBWC bulletin.⁶⁰ Data on water quality and quantity is also available on IBWC's Geographic Information System.⁶¹

5. Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution

Under Article 4(3)(d) of the Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution⁶², as amended, the Contracting Parties are called upon to promote cooperation among themselves in regards to environmental impact assessment procedures for activities under their jurisdiction that are likely to have a significant adverse effect on the marine environment of other Contracting Parties or other areas beyond their national jurisdiction. This cooperation is to be achieved through notification, exchange of information and consultation. In addition, the Protocols require the Contracting Parties to share specific information relevant to their subject matters.

Trinidad and Tobago, Tunisia, Turkey, United Kingdom (Overseas Territories), United States, Uruguay, Vanuatu and Venezuela.

⁵⁴ ICCAT Rules of Procedure, Rule 15. The reports are available on the ICCAT website. *See e.g.*, ICCAT Biennial Reports, *available at* http://www.iccat.int/en/pubs_biennial.htm (last viewed on 11 Feb. 2013).

⁵⁵ ICCAT Field Manual, at Sec. 1.2. Tunas and billfishes are tagged in order to learn more about their movements, migrations, stock structure, growth, population size, mortality, schooling behavior, and physiology. Tagging is also used to study the effects of fishing patterns on the fish and fisheries. Currently, ICCAT has developed a cooperative tagging program in the Atlantic Ocean and adjacent seas, through which various countries are participating. ICCAT: Tagging, *available at* <http://www.iccat.int/en/Tag-Desc.htm> (last viewed on 11 Feb. 2013).

⁵⁶ ICCAT Field Manual, at Sec. 1.2.

⁵⁷ ICCAT: Access to ICCAT Statistical Databases, *available at* <http://www.iccat.int/en/accesingdb.htm> (last viewed on 11 Feb. 2013); ICCAT Field Manual, at Sec. 1.3.

⁵⁸ The Member States of the IBWC are Mexico and the United States.

⁵⁹ International Boundary & Water Commission – United States Section: Rio Grande Basin Conditions, *available at* http://www.ibwc.gov/Water_Data/Reports/RG_Flow_data.html (last viewed on 11 Feb. 2013).

⁶⁰ *See* IBWC Water Resources, *available at* http://www.ibwc.gov/wad/water_resources.htm (last viewed on 11 Feb. 2013).

⁶¹ International Boundary & Water Commission – United States Section: Geographic Information System (GIS) Program, *available at* http://www.ibwc.gov/GIS_Maps/GIS_Program.html (last viewed on 11 Feb. 2013).

⁶² Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution. *available at* http://www.unep.ch/regionalseas/regions/med/t_barcel.htm. The Contracting Parties of the Barcelona Convention are Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, the European Union (—EU), Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria, Tunisia, and Turkey.

- The Dumping Protocol requires each Contracting Party to report dumping permits issued and the actual dumping that occurs. The Dumping Protocol also provides that each Contracting Party shall, if it considers it appropriate, report suspicions of illegal dumping to other concerned Parties.⁶³
- The Emergency Protocol obliges its Contracting Parties to exchange information, through the Regional Activity Centre (RAC) in Malta, about domestic regulations, responsible authorities, and best practices regarding the prevention of pollution and emergency response. The Emergency Protocol further requires Contracting Parties to warn the nearest coastal state (and other Parties likely to be affected) of incidents that may result in pollution. Contracting Parties must also inform each other of their planned response to a pollution incident.⁶⁴ The Offshore Protocol (which is not yet in force) would require Contracting Parties to ensure that persons on offshore installations follow similar procedures.⁶⁵
- The Hazardous Wastes Protocol requires its Contracting Parties to report to the Secretariat, as soon as possible, information relating to illegal traffic in hazardous waste. Contracting Parties must also share annual statistics on waste generation and transfer.⁶⁶
- The Specially Protected Areas and Biodiversity Protocol calls upon Contracting Parties to regularly exchange information about the characteristics of protected areas and species and to communicate, at the earliest opportunity, information on any situation that might endanger protected ecosystems.⁶⁷
- The Integrated Coastal Zone Management Protocol (which is not yet in force) would require Contracting Parties to assess and report the status of coastal erosion and to share information about major natural disasters.⁶⁸

Under Article 13 of the Barcelona Convention, as amended, the Contracting Parties undertake “as far as possible to cooperate...in the fields of science and technology and to exchange data as well as other scientific information for the purpose of this Convention” and further agree to cooperate in the development and sharing of clean production technology. The Protocols elaborate the required cooperation in their respective domains. For example, according to Article 7(f) of the Emergency Protocol, the Contracting Parties are obligated to share information about “new ways in which pollution of the sea by oil and hazardous and noxious substances may be avoided, new measures for combating pollution, new developments in the technology of

⁶³ The Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft or Incineration at Sea (Dumping Protocol), arts. 12, 14. February 12, 1978 (not yet in force) *available at* http://www.sviva.gov.il/subjectsEnv/InternationalRelations/Marine_coast/BarcelonaConvention/Documents/ShipsAircraftConvention.pdf.

⁶⁴ The Protocol Concerning Co-operation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency (Emergency Protocol), arts. 7, 9, 10. Feb. 16, 1976, *available at* <http://www.unep.ch/regionalseas/main/med/medemer.html>.

⁶⁵ Protocol for the Protection of the Mediterranean Sea Against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil (Offshore Protocol), art. 17; *see also* Offshore Protocol, art. 16 (requiring application of the Emergency Protocol). Oct. 14, 1994, *available at* http://www.sviva.gov.il/subjectsEnv/InternationalRelations/Marine_coast/BarcelonaConvention/Documents/mul38165.pdf

⁶⁶ Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and Their Disposal (Hazardous Waste Protocol), arts. 8(2), 9(6). Oct. 1, 1996, *available at* <http://www.unep.ch/regionalseas/main/med/medhaz.html>.

⁶⁷ The Protocol Concerning Specialty Protected Areas and Biological Diversity in the Mediterranean (Specially Protected Areas and Biodiversity Protocol), art. 21(1)-(2), Jun. 10, 1995, *available at* <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:322:0003:0017:EN:PDF>.

⁶⁸ Protocol on Integrated Coastal Zone Management (ICZM Protocol), arts. 23(4), 24(2). Jan. 21, 2008, *available at* <http://ec.europa.eu/world/agreements/downloadFile.do?fullText=yes&treatyTransId=12967>.

conducting monitoring and the development of research programmes.” Article 9 of the Land-Based Sources Protocol requires cooperation in “research on inputs, pathways and effects of pollutants and on the development of new methods for their treatment, reduction or elimination, as well as the development of clean production processes to this effect.” Under Article 20 of the Specially Protected Areas and Biodiversity Protocol, the Contracting Parties are called upon to coordinate, to the extent possible, their research and monitoring of protected areas and species. Article 8 of the Hazardous Wastes Protocol mandates cooperation in the development and implementation of clean production methods. Furthermore, Article 22 of the Offshore Protocol and Article 25(2) of the Integrated Coastal Zone Management Protocol (which are not yet in force) call for the cooperation in the research of new technology and emergency procedures and in the research on integrated coastal zone management, respectively. The Marine Pollution Assessment and Control (MED POL) and RACs participate in research coordination, information generation, and information sharing. The Protocols expressly provide that progress and lessons learned in implementation will be shared at regular meetings of their respective Contracting Parties.⁶⁹ The Contracting Parties have also begun to coordinate national library resources related to marine science.⁷⁰

In 1996, the Contracting Parties and the EU commissioned the development of a data coordinating structure, which led to the Euro Mediterranean (Water) Information System (EMWIS).⁷¹ The decision-making and operational structure of EMWIS is independent of the Barcelona Convention structure, but its objectives include developing national water information systems and efforts to transfer know-how in the water sector.⁷² Article 4 of the Barcelona Convention, as amended, also establishes principles to harmonize domestic environmental policies, including the precautionary principle,⁷³ the “polluter pays” principle,⁷⁴ and a technology-based approach considerate of sustainable development needs.⁷⁵ To facilitate such harmonization, Article 14(2) of the Barcelona Convention, as amended, suggests that the Secretariat may assist Contracting Parties in drafting environmental legislation that is in compliance with the Barcelona Convention and its Protocols. The Protocols generally establish or call for the development of baseline measures to be implemented in national regulations, but

⁶⁹ See Dumping Protocol, art. 14(2); Emergency Protocol, art. 18(2); Land-Based Sources Protocol, arts. 13, 14(2); Specially Protected Areas and Biodiversity Protocol, art. 26(2); Offshore Protocol, art. 25; Hazardous Wastes Protocol, art. 11; *cf.* Integrated Coastal Zone Management Protocol, art. 33 (requiring Parties at regular meetings “to consider the efficiency of the measures adopted”).

⁷⁰ See European Association of Aquatic Science Libraries and Information Centres (EURASLIC); Mediterranean Special Interest Group: Report of the First Workshop/Meeting of the Mediterranean Marine and Aquatic Science Libraries and Information Centres Network, Marine Science Institute of Andalusia (CSIC), Cadiz Spain, 17-18 Nov. 2008, *available at* http://195.97.36.231/dbases/MedLibs/Final_Report_Cadiz.pdf.

⁷¹ The Euro-Mediterranean Conference on Water Management held in Marseilles (containing decisions adopted by the Ministers and Heads of delegation), 25-26 Nov. 1996, *available at* http://www.ufm-water.net/download/DCL_Marseille1996_en.pdf; Euro Mediterranean (Water) Information System on know-how in the water sector – HANDY GUIDE, 16 May 2000, at 2, *available at* http://www.emwis.org/overview/fol226852/handy_guide.pdf (last viewed 11 Feb. 2013).

⁷² See EMWIS: Decision-Making level, *available at* <http://www.semide.net/overview/fol226852/fol1720468> (last viewed on 11 Feb. 2013); EMWIS: Operational level, *available at* <http://www.emwis.org/overview/fol226852/fol335117> (last viewed on 11 Feb. 2013); EMWIS: Orientations, 22 Aug. 2006, *available at* <http://www.semide.net/overview/fol350157/doc064667> (last viewed on 11 Feb. 2013).

⁷³ See, e.g., 16th Meeting Report, Annex I, Marrakesh Declaration, at 3; Dumping Protocol, Annex III, para. B(9); Emergency Protocol, Preamble; Hazardous Wastes Protocol, art. 8(3); Specially Protected Areas and Biodiversity Protocol, Preamble. See also 16th Meeting Report, Annex III, Five-Year Programme of Work 2010-2014, Appendix 1, at 4.

⁷⁴ See, e.g., Offshore Protocol, art. 27; 15th Meeting Report, Annex V, Decision IG 17/4 (and Appendix): Guidelines for the Determination of Liability and Compensation for Damage Resulting from Pollution of the Marine Environment in the Mediterranean Sea Area (“Decision IG 17/4”), at 136, para. 9.

⁷⁵ See, e.g., Emergency Protocol, Preamble; Land-Based Sources Protocol, arts. 7(2)-(3), and Annex IV; Offshore Protocol, art. 3.

do not require absolute harmonization of law.⁷⁶ The Barcelona Convention and certain Protocols promote harmonization by requiring technical assistance to developing countries.⁷⁷

6. Caspian Sea

The Tehran Convention contains a number of articles dealing specifically with the exchange of information among the Member States,⁷⁸ cooperation on environmental policies and harmonization of national laws.⁷⁹ The Member States are directed to harmonize their national laws and to work together in order to develop specific rules and standards designed to protect the environment of the Caspian Sea, including to jointly develop an action plan to help implement the objectives of the Tehran Convention. The Member States are called upon to: (a) collect and exchange data concerning the sources of pollution in the Caspian Sea; (b) develop programs to monitor water quality and quantity; (c) develop contingency plans for pollution emergencies; (d) implement emission and discharge limits; (e) establish water quality objectives and criteria; and (f) develop harmonized programs to reduce pollution loads from municipal and industrial points, as well as from diffuse sources.⁸⁰ The Member States are also to cooperate on research and development concerning techniques for the prevention, control and reduction of pollution in the Caspian Sea. The information gathered, and any resulting reports, are exchanged among the Member States through the Secretariat. The Member States, in conjunction with the Secretariat, are to endeavor provide public access to this information and to the action plans developed by the Member States.⁸¹

7. Danube River Basin

The Contracting Parties to the Danube River Protection Convention (DRPC)⁸² are required to report to the International Commission for the Protection of the Danube River (ICPDR) on issues necessary for the ICPDR to comply with its tasks. Reports involve a variety of data and information, including on other bilateral or multilateral agreements affecting the Danube, information on Contracting Parties' laws and regulations concerning the protection and water management of the river, communication concerning the domestic implementation of ICPDR decisions, designation of competent institutions for cooperation in the framework, and communication on planned activities likely to cause trans-boundary impacts.⁸³ Similarly, as

⁷⁶ See, e.g., Dumping Protocol, arts. 11, 13; Land-Based Sources Protocol, arts. 6, 7 and Annex II; Offshore Protocol, arts. 10, 23(2); Specially Protected Areas and Biodiversity Protocol, arts. 16, 27; Emergency Protocol, art. 20; Integrated Coastal Zone Management Protocol, arts. 4(3), 8(2)(a).

⁷⁷ See Barcelona Convention, as amended, art. 13(3); Land-Based Sources Protocol, art. 10; Specially Protected Areas and Biodiversity Protocol, art. 22; Offshore Protocol, art. 24; Hazardous Waste Protocol, art. 10; see also Emergency Protocol, art. 13(4); Integrated Coastal Zone Management Protocol, art. 26.

⁷⁸ The Caspian littoral states, all of whom have signed and ratified the Tehran Convention, are: Azerbaijan, the Islamic Republic of Iran, Kazakhstan, the Russian Federation and Turkmenistan.

⁷⁹ See generally Framework Convention for the Protection of the Marine Environment of the Caspian Sea (—Tehran Convention), Nov. 4, 2003, available at <http://ekh.unep.org/?q=node/2452> arts. 18-21.

⁸⁰ Tehran Convention, art. 18.

⁸¹ Tehran Convention, arts. 20, 21.

⁸² The DRPC and ICPDR Contracting Parties are Austria, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, Germany, Hungary, Moldova, Montenegro, Romania, Serbia, the Slovak Republic, Slovenia, and Ukraine. The EU is also a Contracting Party of the DRPC and ICPDR. In addition, countries in the catchment area of the Danube River Basin that cooperate with the ICPDR under the EU Water Framework Directive include Albania, Italy, Macedonia, Poland, and Switzerland.

⁸³ Convention on Cooperation for the Protection and Sustainable Use of the Danube River (—DRPCI), 29 June 1994, available at <http://www.icpdr.org/icpdr-files/6787>. Navigation on the Danube River is governed by the separate Danube Commission

required by the ICPDR, the Contracting Parties are required to share with the other Contracting Parties any “reasonably available data” relating to: (a) the environmental conditions within the catchment area of the Danube River Basin; (b) the experience gained from the application of best techniques and results of research; (c) emission and monitoring data; (d) measures taken and planned to address trans-boundary impacts; (e) regulations for the discharge of waste water; and (f) accidents that involve substances hazardous to water. Additionally, the Contracting Parties are also required to exchange information on regulations to harmonize emission limits. Moreover, provision is made to enable a Contracting Party to request data not available from another Contracting Party, on the condition that the requesting Contracting Party agrees to pay reasonable charges for collecting and processing such data or information. The objectives of the DRPC are also promoted by the facilitating the exchange of “best available techniques” via promotion and commercial exchange, technical assistance, and joint training programs.⁸⁴ In addition, the DRPC requires that the Contracting Parties make available all information concerning the state or quality of the river environment “to any natural or legal person, with payment of reasonable charges, in response to any reasonable request.”⁸⁵ At the same time, the DRPC includes provisions for the protection of certain information and data, including personal data, industrial and commercial secrets and information affecting public or national security.⁸⁶ The DRPC also establishes obligations for coordinated or joint communication, warning and alarm systems and obligations to consult on “ways and means of harmonizing domestic communication, warning and alarm systems and emergency plans.”⁸⁷ In this regard, Contracting Parties must supply competent authorities or points of contact for emergency events, including accidental pollution or critical water conditions such as floods and ice-hazards. Competent authorities identifying increases in hazardous substances or floods or forecasts of ice-hazards are obligated to inform downstream states along the Danube River.⁸⁸

Overall, information sharing, exchange, and harmonization have been primary objectives of the ICPDR from its inception. In particular, the establishment of uniform standards for data collection and exchange has been a prime focus of the Contracting Parties since the beginning of the Danube Pollution Reduction Programme in 1992. There are also joint data collection and survey efforts and a technical body—the Information Management and Geographical Information System Expert Group—which is charged with maintaining the overall data information system.⁸⁹

established by the Convention Regarding the Regime of Navigation on the Danube, 18 Aug. 1948, *available at* http://www.danubecommission.org/index.php/en_US/convention art. 10.

⁸⁴ DRPC, art. 12(1)-(4).

⁸⁵ DRPC, art. 14(1).

⁸⁶ DRPC, arts. 12(5)-(6), 13, 14(3).

⁸⁷ DRPC, art. 16(1).

⁸⁸ DRPC, art. 16(2)-(4).

⁸⁹ Terms of Reference of the ad hoc Information Management and Geographical Information System Expert Group (ad hoc IM+GIS EG) of the ICPDR, Dec. 11, 2006, at sec. 2, *available at* <http://www.icpdr.org/icpdr-files/9237> (“The overall objective of the ad hoc IM+GIS EG is to support ICPDR activities related to the operation and further development of the ICPDR information system. It comprises control over the development, implementation, testing and maintenance of a common Danube River Basin Geographical Information System (DRB GIS).”). The Member States are France (the Community of the Annemassienne Region, the Community of the Genevois Rural Districts, and the Rural District of Viry) and Switzerland (the Republic and Canton of Geneva).

8. Franco-Swiss Genevese Aquifer

The Genevese Aquifer Management Commission maintains an inventory of all waterworks and equipment, which is available to both Member States.⁹⁰ Additionally, the volume of water extracted is to be recorded periodically and provided to the members of the Commission. The Commission also maintains a record of water level variations of the aquifer, which is available to the parties on demand.⁹¹ Each user or group of users of the aquifer also informs the Commission of their estimated volume of extractions from the aquifer at the beginning of each year and their actual usage at the end of the year.⁹²

9. The Rhine

Under Article 5(1) of the Convention for the Protection of the Rhine⁹³, the Contracting Parties⁹⁴ agreed to cooperate and inform one another of actions taken in their territory to protect the Rhine. In addition, under Article 5(2), the Contracting Parties have also committed to implementing international monitoring programs and studies of the Rhine ecosystem in their territories and to inform the International Commission for the Protection of the Rhine (ICPR)⁹⁵ of the results of those studies and programs. The ICPR relies on the data collection and monitoring efforts of the Contracting Parties. For example, the Warning and Alarm Plan allows the ICPR to gather information on water pollution levels collected by monitoring stations along the river, with more than 100 substances monitored. In addition, the Rhine 2020 program contains numerous targets designed to improve the health and ecological balance of the Rhine, and which call upon the Contracting Parties to work in collaboration in order to meet the stated goals of the program. In addition, as required by the European Water Framework Directive, an Internationally Coordinated Management Plan for the International River Basin District of the Rhine (Part A) was released in December 2009. The report contains a discussion, as it pertains to the Rhine, of: (a) human activities and stresses; (b) a register of protection areas; (c) surveillance networks and results of surveillance programs; (d) environmental objectives and adjustments; (e) economic analysis; (f) summary of the program of measures; (g) a list of the program and management plans; (h) as well as other relevant items. There are also coordinated reports for the areas of operation in the Rhine international river basin district (the Alpenrhein/Bodensee, High Rhine, Upper Rhine, Neckar, Main, Middle Rhine, Mosel/Saar, Niederrhein, and the Delta Rhine), as well as national management plans for Switzerland,

⁹⁰ Convention relative à la protection, à l'utilisation, à la réalimentation et au suivi de la nappe souterraine franco-suisse du Genevois (—Franco-Swiss Genevese Aquifer Convention), Dec. 18 2007, *available at* http://www.unece.org/fileadmin/DAM/env/water/meetings/legal_board/2010/annexes_groundwater_paper/2008Franco-Swiss-Aquifer-English.pdf (unofficial translation), art. 4.

⁹¹ Franco-Swiss Genevese Aquifer Convention, arts. 6.2, 7.2.

⁹² Franco-Swiss Genevese Aquifer Convention, arts. 9.1, 10.3.

⁹³ The Convention on the Protection of the Rhine, April 12, 1999, *available at* http://www.iksr.org/fileadmin/user_upload/Dokumente_en/convention_on_the_protection_of_the_rhine.pdf.

⁹⁴ The Member States are France (the Community of the Annemassienne Region, the Community of the Genevois Rural Districts, and the Rural District of Viry) and Switzerland (the Republic and Canton of Geneva).

⁹⁵ International Commission for the Protection of the Rhine, *available at* <http://www.iksr.org/index.php?id=58&L=3&cHash=455fdab52c>.

Liechtenstein, Austria, France, Germany (broken down by different regions in the country), Luxembourg, Belgium, and the Netherlands.⁹⁶

10. Abidjan Convention

Under Article 22 of the Abidjan Convention⁹⁷, the Contracting Parties⁹⁸ should transmit to the UNEP reports on the measures they adopted in implementing the Convention and its Protocol(s). In addition, each Contracting Party should also provide the UNEP, according to Articles 12 and 3 respectively, with information concerning pollution emergencies and any additional agreements entered into concerning the protection of the marine and coastal environment in the Convention area. The UNEP, as the Secretariat, will send these reports to the other Contracting Parties, as required by Article 16 of the Abidjan Convention. And according to Article 13, the Contracting Parties should develop procedures to share information regarding their environmental assessments of potentially harmful activity. Furthermore, as the Contracting Parties are meant to cooperate, according to Article 14 of the Abidjan Convention, in the fields of scientific research and development, monitoring, and assessments of pollution in the Convention area, the Contracting Parties should exchange with each other relevant data and other scientific information related to the Abidjan Convention and its Protocol(s). In addition, under Article 5 of the Protocol, each Contracting Party is also obligated to provide the Secretariat and the other Contracting Parties with information on its National Focal Point; its relevant laws, regulations, and other legal instruments; and its national marine emergency contingency plans. And as part of the revitalization program, the stakeholders requested that each National Focal Point provide the Secretariat with reports on its national coastal and marine environment and on the status of its implementation of the relevant Abidjan Convention work programs.⁹⁹ As part of the effort to revitalize the Abidjan Convention, one of the strategies is focused on enhancing the sharing among the Contracting Parties of reliable and up-to-date information, especially if the information could lead to a better understanding among the Contracting Parties of the benefits of the Abidjan Convention. The Abidjan Convention stakeholders recommended that the Contracting Parties adopt a specific information and data sharing policy to cover issues related to the sustainable development of the coastal and marine environment in the Convention area.¹⁰⁰ In addition, under the revitalization plan, the Contracting Parties asked the Secretariat to create a database and web-based information sharing system that would allow the Contracting Parties, as

⁹⁶ ICPR – Management Plan, *available at* <http://www.iksr.org/index.php?id=171&L=3> (last visited 11 Feb. 2013). The Internationally Coordinated Management Plan for the Rhine, *available at* http://www.iksr.org/fileadmin/user_upload/Dokumente_en/Inventory_Parts/bwp_endversion-en_komplett.pdf.

⁹⁷ Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region, March 23, 1981, *available at* http://abidjanconvention.org/index.php?option=com_content&view=article&id=46&Itemid=103.

⁹⁸ The Contracting Parties that have ratified the Abidjan Convention are Benin, Cameroon, the Republic of the Congo, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Liberia, Nigeria, Senegal, Sierra Leone, South Africa and Togo. Angola, Cape Verde, the Democratic Republic of the Congo, Equatorial Guinea, Guinea-Bissau, Mauritania, Namibia, and Sao Tome and Principe are located in the Abidjan Convention area, but have not yet ratified the Convention. As part of a revitalization program for the Abidjan Convention, one of the focuses is on persuading these countries (through high-level delegation visits and support from the Secretariat) to ratify and accede to the Abidjan Convention.⁶¹¹ Relevant institutions are also allowed to accede to the Abidjan Convention.

⁹⁹ Abidjan Convention Report Stakeholders Meeting Held on 1-3 April 2008, Dakar, Senegal (2008 Stakeholders Report), at 13, *available at* http://www.abidjanconvention.depiweb.org/download/cat_view/1-abidjan-convention/3-abidjan-convention-reports.html?limit=5&limitstart=0&order=name&dir=ASC (last visited on 11, Feb. 2013).

¹⁰⁰ 2008 Stakeholders Report, at 14-15.

well as other stakeholders, to access information on the value and benefits of the Abidjan Convention.¹⁰¹

11. Lake Tanganyika

Article 19 directs the Contracting States of The Convention on the Sustainable Management of Lake Taganyika¹⁰² to provide the public with “adequate information... concerning the state of the Lake Basin, planned development activities, measures taken or planned to be taken to prevent, control and reduce adverse impacts, and the effectiveness of those measures.” For that purpose, the Contracting States are obligated to make information available concerning: water and environmental quality objectives; compliance with permits; notifications concerning proposed activities likely to have trans-boundary adverse impacts; and environmental impact assessment reports concerning such activities. Article 20 addresses information exchange between the Contracting States, directing them to exchange data and information concerning sustainable management of the Lake Basin and the implementation of the Convention. Contracting States are also directed to employ “best efforts” to provide data or information that is requested, but not readily available.¹⁰³ The Convention additionally obligates the Contracting States to report periodically to the Authority on certain measures relevant to the environmental management of the Lake Basin and the implementation of the Convention.¹⁰⁴ Article 21 specifies that the Convention shall not affect the established rights or obligations of Contracting States to protect personal information, intellectual property, and confidential information. It also directs the Contracting States to respect the confidentiality of confidential information they receive.

12. Lake Victoria Basin Commission and Lake Victoria Fisheries Organization

Lake Victoria Basin Commission (LVBC)

Article 24 of the LVBC Protocol discusses the exchange of data and information, mandating that the Member States¹⁰⁵, on a regular basis, “exchange readily available and relevant data and information on existing measures on the condition of the natural resources of the Basin.” If one Member State receives a request from another Member State for information that is not readily available, that Member State is obligated to use its best efforts to fulfil the request, but may condition its compliance upon receiving payment from the requesting Member State to cover the reasonable costs of collecting and processing the relevant data. The Member States are also charged with facilitating collaboration in research and on the exchange of data, reports and information among stakeholders within the Member States. However, the exchange of information or data does not extend to information that is protected under the laws of the

¹⁰¹ 2008 Extraordinary Meeting Report, at 21, *available* at http://www.abidjanconvention.depiweb.org/download/cat_view/1-abidjan-convention/3-abidjan-convention-reports.html?limit=5&limitstart=0&order=name&dir=ASC (last visited on 11, Feb. 2013).

¹⁰² The Contracting States of the Convention are Burundi, the Democratic Republic of Congo (the DRC), Tanzania, and Zambia. In November 2007, the DRC became the last of the Contracting States to ratify the Convention.

¹⁰³ The Convention on the Sustainable Management of Lake Taganyika Convention, Jun. 12, 2003 art. 20(2), *available* at <http://lta.iwlearn.org/documents/the-convention-on-the-sustainable-management-of-lake-tanganyika-eng.pdf>

¹⁰⁴ The Convention on the Sustainable Management of Lake Taganyika Convention, art. 22.

¹⁰⁵ The original Member States (Partner States) of both the LVBC and the LVFO are Kenya, Uganda and Tanzania. As Rwanda and Burundi acceded to the EAC in 2007, they are being integrated as members into the LVBC and the LVFO.

Member States or any international treaty to which a Member State is a party.¹⁰⁶ Additionally, one of the functions of the LVBC Secretariat is to establish a regional database and to promote the sharing of information and the development of information systems and data exchange.¹⁰⁷

In terms of harmonization, Article 6(2) of the LVBC Protocol requires the Member States to take steps to harmonize their laws and policies through the institutional framework established under the LVBC Protocol. Accordingly, one of the functions of the LVBC listed under Article 33(3) is to harmonize the policies, laws, regulations and standards of all of the Member States. More specifically, Article 14 requires the Member States to harmonize their laws and regulations in order to conform to the guidelines formulated by the LVBC regarding environmental audits for operators of facilities within the Member States that are likely to have a significant impact on the environment; Article 16(2) requires the Member States to “adopt standardized equipment and methods of monitoring natural phenomena;” Article 25(1) requires the Member States to harmonize their water quality standards; and Article 29 calls for the harmonization of infrastructure and services within the Member States.

Lake Victoria Fisheries Organization (LVFO)

Article II(2) of the LVFO Convention calls for the harmonization of national measures in order to promote the sustainable utilization of the living resources of Lake Victoria. However, the LVFO Convention specifies that it does not infringe upon each Member State’s sovereign powers regarding any of the areas covered by the LVFO Convention, and that each Member State remains free to adopt national laws that are more stringent or extensive than those required to fulfill its obligations to the LVFO.¹⁰⁸ Under Article XIII of the LVFO Convention, the Member State agreed to implement the decisions of the LVFO’s governing bodies, in accordance with their respective constitution and national legal framework. The Member States also agreed to adopt laws and regulations prohibiting the introduction of non-indigenous species into Lake Victoria, other than in accordance with a decision by the Council of Ministers.

In terms of data sharing, each Member State is to provide the LVFO with access to “laws, regulations and all documents, data and reports pertaining to fish landings, stock assessments, living resources of Lake Victoria or any other matter which is the subject of resource management and utilization, and research” in furtherance of the objectives of the LVFO Convention.¹⁰⁹ Additionally, each Member State must transmit to the LVFO an annual statement of the measures it has taken to implement the decisions of the Council of Ministers.¹¹⁰ Article XIV of the LVFO Convention requires the Member States, when a research program has been authorized by the LVFO, to grant access to the research teams to their national territories and territorial waters.

¹⁰⁶ Protocol for Sustainable Development of Lake Victoria Basin (LVBC Protocol), Nov. 29, 2003, art. 24, *available at* http://www.internationalwaterlaw.org/documents/regionaldocs/Lake_Victoria_Basin_2003.pdf

¹⁰⁷ LVBC Protocol, art. 42(c).

¹⁰⁸ Convention for the Establishment of the Lake Victoria Fisheries Organization (LVFO Convention), May. 24, 1996, art. XIII(4), *available at* <http://wipo.int/wipolex/en/details.jsp?id=12506>.

¹⁰⁹ LVFO Convention, art. XIII(5).

¹¹⁰ LVFO Convention, art. XIII(8).

13. Niger Basin

The Convention charges the Niger Basin Authority (NBA) with harmonizing and coordinating national policies to develop the resources of the Niger Basin, and requires it to maintain permanent contact with the Member States¹¹¹ to inform them of development plans in the Basin. In turn, the Member States undertake to inform the Executive Secretary of proposed projects in the Basin and agree not to undertake projects on portions of the Niger River in their jurisdiction that are likely to pollute the waters or adversely affect the biological characteristics of the flora or fauna.¹¹² Outside the Convention framework, the NBA has established “national focal structures,” or teams in each country, including a point of contact and various experts, to liaise and ensure proper communication between the Executive Secretariat and national governments.¹¹³ The Water Charter of the Niger Basin provides for the exchange of information and obligates parties to consult and negotiate (if necessary) on the possible effects of planned measures. Member States are obligated to notify other Basin States (through the Executive Secretariat) prior to implementing measures that may have “significant adverse effects” on such states. The Executive Secretariat then refers the notification to the Permanent Technical Committee for an opinion. Notifying States must allow the Executive Secretariat a three-month period to review and evaluate the planned measures (such period may be extended), and during this period must provide requested data and information and refrain from implementing the planned measures. In the event a Notified State or the Executive Secretariat considers that the proposed measures are likely to have a significant harmful impact, the parties are to enter into consultations and negotiations.¹¹⁴

14. Nubian Sandstone Aquifer System

Data is consolidated in the Nubian Aquifer Regional Information System (“NARIS”)—which has the following functions: (a) stores and documents different data relating to the NSAS; (b) processes, analyzes and displays the data; (c) prepares input parameters for different models of the Aquifer and provides comparisons of the results; and (d) provides a link among the Member States¹¹⁵ to exchange information.¹¹⁶ Additionally, the Member States have agreed to share information on yearly extractions, representative electrical conductivity measures, and water level measurements.¹¹⁷

¹¹¹ The Niger Basin Authority (—NBA) Member States include the following riparian states of the Niger River: Niger, Benin, Chad, Guinea, Côte d’Ivoire, Mali, Nigeria, Cameroon and Burkina Faso.

¹¹² Convention Creating the Niger Basin Authority, Nov. 21, 1980, art. 4, available at <http://ancetogo.org/resources/freshwater%20-%20niger.pdf>.

¹¹³ Peter Pieck, *West Africa Sets an Example, Development and Cooperation*, 36:252 (2009) available at <http://www.dandc.eu/en/article/international-management-river-niger>

¹¹⁴ The Water Charter of the Niger Basin, Jun. 14, 2012 arts. 19-20, 22, available at <http://www.inbo-news.org/inbo/information-and-publications/article/the-water-charter-of-the-niger>

¹¹⁵ The Member States of the Joint Authority are Egypt, Libya, Sudan (since 1996), and Chad (since 1999).

¹¹⁶ Agreement #1, Terms of Reference For the Monitoring and Exchange of Groundwater Information of the Nubian Sandstone Aquifer System, October 5, 2000, available at <http://www.ecolex.org/server2.php/libcat/docs/TRE/Multilateral/En/int39094E.pdf>.

¹¹⁷ Agreement #2, Terms of Reference for Monitoring and Data Sharing, October 5, 2000, available at <http://faolex.fao.org/docs/pdf/int39095E.pdf>.

15. North Western Sahara Aquifer System (NWSAS)

The original UNEP project called for the establishment of a “consultation mechanism” for the NWSAS in order to ensure that, at the conclusion of GEF project funding, there would be continued management of the shared water resources. This led to the creation of an Observatory for the Aquifer-Basin, which is shared by the three Member States.¹¹⁸ The Observatory for the Aquifer-Basin is responsible for technical and scientific issues related to the management of the shared waters, information exchange and consultation, and joint elaboration of simulation models. The Observatory of the Aquifer-Basin is also charged with a number of additional tasks, including data collection and the publication of relevant documents that synthesize data analysis on the exploitation of water resources and its implications.

16. Okavango River System

The Permanent Okavango River Basin Water Commission (OKACOM) is authorized to appoint consultants to assist in gathering and processing information concerning any matter on which it is tasked with advising the Member States.¹¹⁹ A Member State may request that OKACOM provide such advice in the form of a written report signed by the leaders of each Member State’s delegation. Each Member State’s delegation is then responsible for submitting such reports to its respective government.¹²⁰ During OKACOM’s 16th Meeting, held in Gaborone, Botswana from 24-27 May 2010, OKACOM adopted a protocol to share information related to the Okavango River Basin.¹²¹ This new protocol, the OKACOM Protocol on Hydrological Data Sharing for the Okavango River Basin (“Protocol”), is intended to help the three Member States better prepare themselves for extreme climatic events, such as floods and droughts.¹²² The Protocol provides that the OBSC is the entity responsible for the implementation of the Protocol. But, under the Protocol, each Member State shall be responsible for the installation and the operation and maintenance of hydrometeorological stations in its territory.¹²³ The specific types of data required to be monitored pursuant to the Protocol include water levels, water discharge, water quality, sediment transport and meteorological data.¹²⁴ More specifically, the Protocol also provides that the Member States shall share, on a daily basis, water level data collected from key hydrometric stations at the following sites: (a) in Angola, Menongue on the Cuebe, Mucundi on the Cubango and Cuito Cuanavale on the Cuito; (b) in Namibia, Rundu and Andara on the Okavango; and (c) in Botswana, Mohembo on the Okavango.¹²⁵ The Member States are also required to share, on a quarterly basis, discharge data from all stations, calculated using rating curves from the previous hydrological year. Water quality data is also to be shared on a

¹¹⁸ The Member States are Algeria, Tunisia, and Libya.

¹¹⁹ The Member States are Angola, Botswana, and Namibia.

¹²⁰ Agreement Between 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 (OKACOM) September 15, 1994, art. 5, *available at* <http://epsmo.iwlearn.org/about/background/agreement-between-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-okacom/view>.

¹²¹ See OKACOM Protocol on Hydrological Data Sharing for the Okavango River Basin (“OKACOM Protocol”), May 26, 2010, *available at* http://www.icp-confluence-sadc.org/sites/default/files/OKACOM_Hydrological_Data_Sharing_Protocol_English_C.pdf.

¹²² OKACOM – News: 16th OKACOM Meeting, *available at* <http://www.okacom.org/okacom-news/news/16th-okacom-meeting> (last viewed on 11 Feb. 2013).

¹²³ OKACOM Protocol, arts. II, III, IV.

¹²⁴ OKACOM Protocol, art. V.

¹²⁵ OKACOM Protocol, art. VI.

quarterly basis, and on an *ad hoc* basis as requested by the Member States.¹²⁶ The Protocol specifies that the following parameters should be considered during an analysis of water quality: electrical conductivity, total dissolved solids, dissolved oxygen, pH, phosphates; nitrates, fecal coliforms (in inhabited zones), total hardness, temperature, turbidity, total suspended solids, and chlorophyll a. The Protocol requires that the sampling and analytical methods used to measure water quality be standardized among the Member States.¹²⁷ With respect to sediment transport data, the Protocol mandates that such data be shared on an annual basis among the Member States. The Protocol also requires that meteorological data, including rainfall, evaporation and temperature data, be shared on an *ad hoc* basis.¹²⁸ At the end of each hydrological year (defined in the Protocol as the period commencing each October 1 and ending each September 30), the Member States are given three months to prepare an annual hydrological report for such year, and the report is then distributed by OKASEC (The Secretariat).¹²⁹ The Protocol also requires that early warning information with respect to important environmental indicators be shared among the Member States. OKACOM's Hydrological Task Force is required to provide OKASEC with "the best available information on floods, droughts and pollution magnitudes at different time and space scales." OKASEC is then required to channel such information to "decision making bodies and other public actors" in the Member States.¹³⁰

17. Southern African Development Community (SADC)

To achieve the objectives of the SADC Treaty, the SADC Treaty encourages, *inter alia*, the harmonization of political and socioeconomic policies of the Member States¹³¹ and the promotion of the coordination and harmonization of the international relations of the Member States.¹³² Furthermore, the Member States have agreed to cooperate in numerous areas, including in regards to natural resources and the environment.¹³³ The objectives of the Watercourses Protocol include promoting the harmonization and monitoring of relevant legislation and policies concerning shared watercourses, as well as encouraging information exchange regarding shared watercourses management.¹³⁴ The Watercourses Protocol also obligates the Member States to undertake to harmonize their water uses in the shared watercourses and to observe the objectives of regional integration and harmonization of their socioeconomic policies. In addition, the Member States agreed to verify that all necessary interventions in the shared watercourses are consistent with the sustainable development of all of the Watercourse States. For planned measures that may have a significant adverse impact upon other Watercourse States, the relevant Member States must engage in consultations (and, if necessary, negotiations on the possible effects of the planned measures on the shared watercourse) and exchange certain technical data and information, including the results of any environmental impact assessment. In terms of data exchange, the Member States committed to

¹²⁶ OKACOM Protocol, arts. VII, VIII.

¹²⁷ OKACOM Protocol, arts. IX, XII.

¹²⁸ OKACOM Protocol, arts. X, XIII.

¹²⁹ OKACOM Protocol, arts. I, XV.

¹³⁰ OKACOM Protocol, art. XIV.

¹³¹ The SADC Member States are Angola, Botswana, the Democratic Republic of the Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.

¹³² Treaty of the Southern African Development Community (SADC Treaty), Aug. 14, 2001, art. 5(2), *available at* http://www.iss.co.za/Af/RegOrg/unity_to_union/pdfs/sadc/8SADC_Treaty.pdf.

¹³³ SADC Treaty, art. 21.

¹³⁴ Protocol on Shared Watercourse Systems in the Southern African Development Community (SADC) Region (Watercourses Protocol), arts. 2, 4(2)(b)(ii), *available at* http://www.sadc.int/files/2913/5292/8368/Revised_Protocol_Shared_Watercourses.pdf

exchanging available information and data concerning the hydrological, hydro-geological, water quality, meteorological and environmental condition of the shared watercourses in the SADC region.¹³⁵ Furthermore, the Shared Watercourse Institutions are obligated to provide, on a regular basis or as required by the Water Sector Co-coordinating Unit, all of the information needed to assess the progress on implementing the Watercourses Protocol.¹³⁶ Under the Protocol of Fisheries, the Member States agreed to exchange information needed to achieve the Protocol's objective of responsible and sustainable use of the aquatic resources and the aquatic ecosystems in the SADC region, as well as to cooperate in the exchange of information on the state of shared resources, levels of fishing effort, measures undertaken to monitor and control the exploitation of shared resources, any plans for new or expanded exploitation, and relevant research activities. Two or more Member States may collaborate to create mechanisms for cooperation and information sharing regarding shared resources. The Member States are also called upon to promote effective communication strategies with stakeholders in order to encourage the participative management of the aquatic resources and to publicize certain information, including the rationale and criteria behind decisions regarding total allowable catches, allocation of quotas, permits, licensing, and other rights to use the living aquatic resources.¹³⁷ In addition, Member States are called upon to harmonize their legislation concerning the management of shared resources. The Member States have also agreed to make illegal fishing and related activities by nationals an offense under their national laws and to establish region-wide comparable levels of penalties for illegal fishing by both non-SADC flag vessels and SADC flag vessels.¹³⁸ In 2005, the Governing Council decided to create a database of scientific organizations and individual scientists who work on fisheries, aquaculture, and other related activities in the region. The database is intended to promote the sharing of information between relevant organizations and scientists and individuals in the region. Currently, the database is limited to the Member States and their populations, but the goal is to eventually expand the database to a wider audience.¹³⁹ In addition, the Governing Council has approved activities regarding capacity building related to fisheries data collection methodologies and stock assessment.¹⁴⁰

18. Bay of Bengal

In 1995, the FAO developed a global Code of Conduct for Responsible Fisheries. Under the old FAO Bay of Bengal Program and continuing under the Bay of Bengal Programme-Inter-Governmental Organisation (BOBP-IGO), the Code of Conduct was translated into the languages of Bay of Bengal basin countries (Bengali, Dhivehi, Sinhalese, Thai, Oriva, Tamil, Telugu, Gujarati, Hindi and Marathi) in order to better engage the fishing community in the region. The BOBP-IGO is continuing this effort to translate the Code of Conduct and its Technical Guidelines into additional regional languages. The BOBP-IGO also intends to promote the Code of Conduct and its Technical Guidelines through workshops, seminars, and regional training courses in Member States¹⁴¹, as well as distributing booklets directly to local

¹³⁵ Watercourses Protocol, arts. 3(1), 3(6), 4(1).

¹³⁶ Watercourses Protocol, art. 5(3)(c).

¹³⁷ SADC Protocol on Fisheries, arts. 3, 7(3)-(4), 18, *available at* http://www.nda.agric.za/daDev/fisheries/03_areasofwork/Aquaculture/AquaDocumentation/SADC_ProtocolFisheries.pdf

¹³⁸ SADC Protocol on Fisheries, arts. 8(1), 8(2), 8(4)(b).

¹³⁹ BOBP-IGO: Database, *available at* <http://bobpigo.org/database.html> (last viewed on 11 Feb. 2013).

¹⁴⁰ 2010 Governing Council Report, at 13, *available at* <http://bobpigo.org/bobp-reports.html>.

¹⁴¹ The Member States of the Bay of Bengal Inter-Governmental Organization on coastal fisheries (—BOBP-IGO) are Bangladesh, India, the Maldives, and Sri Lanka. There have also been discussions for other countries in the Bay of Bengal region (such as Myanmar, Thailand, and Indonesia) to join the BOBP-IGO.

fisherman.¹⁴² The regional training courses consist of theoretical sessions, field visits and interactions regarding the Code of Conduct and are targeted at mid-level and junior level fisheries officials in the Member States.¹⁴³ In addition, documents from the FAO's erstwhile Bay of Bengal Program are available online.¹⁴⁴

19. Partnerships in Environmental Management for the Seas of East Asia (“PEMSEA”)

One of the objectives of the Sustainable Development Strategy for the Seas of East Asia (“SDS-SEA”)¹⁴⁵ is to mobilize governments, civil society and the private sector to use innovative communication methods.¹⁴⁶ To achieve this aim and to enhance the dissemination of data related to coastal and marine environmental and resource management, the SDS-SEA encourages the use of local, national and regional networks to distribute information, the creation of online resource centers, the establishment of a news monitoring and quick response systems, and the establishment of partnerships with international agencies in order to strengthen technical skills related to information sharing.¹⁴⁷ In addition, the Partnership Operating Arrangements call upon the Partners to “[s]trengthen communication and dialogue with each other regarding activities affecting the implementation of the SDS-SEA,” and indicate that the Partners have the right “[t]o participate in PEMSEA’s knowledge sharing network.”¹⁴⁸ Additionally, the International Conference of the EAS Congress serves as a forum to “[f]acilitat[e] knowledge exchange, advocacy and multi-stakeholder participation, through sessions, workshops, side events and exhibitions, etc.”¹⁴⁹

¹⁴² BOBP-IGO: Programs, available at http://bobpigo.org/html_site/programs.htm (last viewed on 11 Feb. 2013).

¹⁴³ BOBP-IGO: News & Events, available at http://bobpigo.org/html_site/news_events.htm (last viewed on 11 Feb. 2013).

¹⁴⁴ FAO Fisheries and Agriculture Department: BOBP – Bay of Bengal Programme, available at http://www.fao.org/fishery/rfb/bobp_igo/en (last viewed on 11 Jan. 2013).

¹⁴⁵ Sustainable Development Strategy for the Seas of East Asia (—SDS-SEA), 12 Dec. 2003, at 26-32, 34, 37, 93- 100, available at <http://pemsea.org/pdf-documents/sds-sea/SDSSEA-Full.pdf>.

¹⁴⁶ The PEMSEA Partner States who signed the Putrajaya Declaration are: Brunei Darussalam, Cambodia, China, the Democratic People’s Republic of Korea, Indonesia, Japan, Malaysia, the Philippines, the Republic of Korea, Singapore, Thailand, and Vietnam. The signatories of the Haikou Agreement are: Cambodia, China, the Democratic People’s Republic of Korea, Indonesia, Japan, Laos, the Philippines, the Republic of Korea, Singapore, Timor-Leste, and Vietnam. The Manila Declaration was signed by Cambodia, China, the Democratic People’s Republic of Korea, Indonesia, Japan, Laos, the Philippines, the Republic of Korea, Singapore, Timor-Leste, and Vietnam. In addition to the Partner States, PEMSEA includes non-state Partners. These non-state partners include the Association of Southeast Asian Nations Centre for Biodiversity, the Coastal Management Center, Conservation International Philippines, the International Environmental Management of Enclosed Coastal Seas Center, the International Ocean Institute, the Intergovernmental Oceanographic Commission Sub- Commission for the Western Pacific, the International Union for the Conservation of Nature Asia Regional Office, the Korea Environment Institute, the Korea Maritime Institute, the Korea Ocean Research and Development Institute, the Northwest Pacific Action Plan, the Ocean Policy and Research Foundation, Oil Spill Response, the Plymouth Marine Laboratory, the PEMSEA Network of Local Governments for Sustainable Coastal Development, the Swedish Environmental Secretariat for Asia, the United Nations Development Programme (—UNDP)/Global Environment Facility (—GEFI) Small Grants Programme, the United Nations Environment Programme (—UNEP)/Global Programme of Action, and the UNDP/GEF Yellow Sea Large Marine Ecosystem Project.

¹⁴⁷ SDS-SEA, at 91.

¹⁴⁸ Partnership Operating Arrangements for the Implementation of the Sustainable Development Strategy for the Seas of East Asia, par. 9(c), 10(e), available at <http://www.pemsea.org/pdf-documents/pemsea-documents/partnrship-operatng-arrngments.pdf>.

¹⁴⁹ Partnership Operating Arrangements, the Implementation of the Sustainable Development Strategy for the Seas of East Asia par. 22(b).

20. South China Seas

UNCLOS¹⁵⁰ obligates Member States¹⁵¹ to cooperate directly and through competent international organizations to exchange information and data acquired about pollution of the marine environment. In addition, under the Declaration on the Conduct of the Parties in the South China Sea, the Parties agreed to share data on a voluntary basis. However, such data sharing is to begin “pending the peaceful settlement of territorial and jurisdictional disputes.”¹⁵² The ASEAN Declaration on the South China Sea simply states that the Parties shall resolve to explore the possibilities of cooperation in the South China Sea. It does, however, urge the Parties to apply the principles contained in the Treaty of Amity and Cooperation in Southeast Asia as the basis for establishing a code of international conduct over the South China Sea.¹⁵³ The Treaty of Amity and Cooperation in Southeast Asia states that the Contracting Parties shall “strive to achieve the closest cooperation on the widest scale and shall seek to provide assistance to one another in the form of training and research facilities in the social, cultural, technical, scientific and administrative fields.”¹⁵⁴ The Treaty further states that the Contracting Parties shall “maintain regular contacts and consultations with one another on international and regional matters with a view to coordinating their views actions and policies.”¹⁵⁵

21. Western and Central Pacific Fisheries Commission (WCPFC)

Each Commission Member, Cooperating Non-Member and Participating Territory (CCM) must submit an annual report containing certain statistical, biological and other data as required.¹⁵⁶ Part 1 of the Annual Report, which is submitted to the SC, includes information for each CCM on: (a) fisheries information; (b) background (e.g., historical description of national fisheries) (c) flag state reporting that details the activities of national fleets, listed by gear types, in the Convention Area (including trends in each fishery related to changes in fishing patterns, fleet operations, target species, and size composition); (d) coastal state reporting that details activities by foreign and domestic fleets in waters under national jurisdiction (including trends in each fishery related to changes in fishing patterns, fleet operations, target species, and size

¹⁵⁰ United Nations Convention on the Law of the Sea (UNCLOS) Dec. 10, 1982, art. 200, *available at* http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm.

¹⁵¹ The UNCLOS Member States that border the South China Sea are: Brunei, Indonesia, Malaysia, Myanmar, Laos, China, Philippines, Thailand, Vietnam, and Singapore. Cambodia and Thailand have signed UNCLOS, but have not yet ratified the Treaty. The Parties to the Declaration on the Conduct of the Parties in the South China Sea are Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, and China. The Parties to the ASEAN Declaration on the South China Sea are Brunei, Indonesia, Malaysia, Philippines, Singapore, and Thailand. The Contracting Parties of the Treaty of Amity and Cooperation in Southeast Asia, as amended, which border the South China Sea are: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, and China.

¹⁵² 2002 Declaration of the Conduct of Parties in the South China Sea (ASEAN Declaration), Nov. 4, 2002, *available at* <http://cil.nus.edu.sg/2002/2002-declaration-on-the-conduct-of-parties-in-the-south-china-sea-signed-on-4-november-2002-in-phnom-penh-cambodia-by-the-foreign-ministers/>.

¹⁵³ ASEAN Declaration, Declaration 4.

¹⁵⁴ Treaty of Amity and Cooperation in Southeast Asia (Treaty of Amity), Feb. 26, 1976, art. 8. *available at* <http://www.official-documents.gov.uk/document/cm84/8472/8472.pdf>.

¹⁵⁵ Treaty of Amity, art. 9.

¹⁵⁶ *See* Convention on the Conservation and Management of High Migratory Fish Stocks in the Western and Central Pacific Ocean, art. 24 (8)-(10); WCPFC Quarterly Reports – First Quarter 2010, April 9, 2010, *available at* <http://www.wcpfc.int/key-documents/convention-text>. The Contracting Parties are Australia, China, Canada, the Cook Islands, the European Community, the Federated States of Micronesia, Fiji, France, Japan, Kiribati, South Korea, the Republic of the Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, the Solomon Islands, Chinese Taipei (as a fishing entity), Tonga, Tuvalu, the United States, and Vanuatu. In addition, American Samoa, the Commonwealth of the Northern Mariana Islands, French Polynesia, Guam, New Caledonia, Tokelau, and Wallis and Fatuna are Participating Territories. Belize, Indonesia, Senegal, Mexico, El Salvador, Ecuador, and Vietnam are Cooperating Non-Members (—CNMs).

composition); (e) socioeconomic factors; (f) disposal of catch (such as fresh or frozen) and market destination (export or import); (g) onshore developments (such as processing plants or support facilities); (h) prospects of the fishery (such as long-term viability and if the fisheries are expanding or contracting); (i) the status of tuna fishery data collection systems (including information on log sheet data collection and verification, the observer program, the port sampling program, and unloading and transshipment); and (j) research activities focused on both target and non-target species. For the fisheries information, each CCM is required to provide data for its national fleet in the Convention Area, including information on, among other requirements: annual catch and effort estimates, number of vessels, annual distribution of target species catch and effort, and estimated annual coverage of operational catch/effort, port sampling and observer data. This information must be broken down by gear type (such as longline, purse seine, pole-and-line, troll, handline, ringnet, and driftnet).¹⁵⁷ In Part 2 of the Annual Report, which is submitted to the TCC, the CCMs report on their implementation of the CMMs, as well as monitoring and inspection activities, surveillance activities, investigations and prosecution activity, and other relevant information. Monitoring and inspection activities includes the vessel monitoring system, transshipments inspections, at-sea inspections, port inspections, observer monitoring, monitoring of trade and domestic distribution of highly migratory fish species, inspections of domestic-only vessels, and high seas boarding and inspection of flag vessels.¹⁵⁸ Part 1 Reports are posted on the WCPFC website, but Part 2 Reports are classified as confidential and only available to other CCMs.¹⁵⁹ Under Article 24, each CCM must produce a Record of Fishing Vessels that are entitled to fly its flag and are authorized to fish, beyond the areas of national jurisdiction, in the Convention Area and submit it to the Commission.¹⁶⁰ The Commission has established a Vessel Monitoring System (“VMS”) that requires each vessel that fishes in certain parts of the high seas in the Convention Area (south of 20°N and above 20°N, east of 175°E) to use near real-time satellite position-fixing transmitters (i.e., a mobile transceiver unit/automatic location communicator (“MTU/ALC”)) in order to track the positions and movements of fishing vessels. If a vessel is initially fishing in the covered area but then moves north of 20°N and west of 175°E, it still needs to keep its MTU/ALC activated. Generally, vessels report their position to the Commission automatically. Automated alerts have also been established to alert the Commission when vessels enter or exit the high seas of the Convention Area. If a vessel is fishing in waters under the national jurisdiction of another member of the Commission (besides its flag state), it must comply with the requirements of that coastal state in regards to the use of near real-time satellite position-fixing transmitters. The Commission enacted security measures to protect access to the data. The flag states are obligated to ensure that their fishing vessels comply with the VMS requirements. The FFA also has a VMS program, and fishing vessels on the high seas have the option of reporting data to the Commission through the FFA’s VMS. In addition, any CCM can request that the waters under its national jurisdiction be included in the Commission’s VMS (with New Zealand being the first country to sign up for this option).¹⁶¹ The WCPFC has entered into a Data Exchange Agreements

¹⁵⁷ WCPFC Annual Report to the Commission – Part 1: Information on Fisheries, Research and Statistics, Aug. 22, 2008, available at <http://www.wcpfc.int/node/604>; Convention, art. 23.

¹⁵⁸ Western and Central Pacific Fisheries Commission - Revised Template for the Annual Report (Part 2), Dec. 2009, available at <http://www.wcpfc.int/doc/commission-08/revised-template-annual-report-part-2>; Convention, art. 23.

¹⁵⁹ Summary of Annual Reports (Part 1 and 2) to the Commission, 16 Nov. 2009, available at <http://www.wcpfc.int/doc/wcpfc6-2009ip03/summary-annual-reports-part-1-and-2-commission>.

¹⁶⁰ WCPFC Intranet: RFV Vessels, available at <http://intra.wcpfc.int/Lists/Vessels/Stats.aspx> (last viewed on 3 Nov. 2010).

¹⁶¹ Commission Vessel Monitoring System, CMM 2007-02, Dec. 2007, available at <http://www.wcpfc.int/doc/cmm-2007-02/commission-vessel-monitoring-system>; Commission VMS Standard Operating Procedures (SOPs), 19 Feb. 2010, available at <http://www.wcpfc.int/doc/commission-vms-standard-operating-procedures>; Convention, art. 24 (8)-(10); WCPFC Quarterly Reports – First Quarter 2010, 9 Apr. 2010, available at <http://www.wcpfc.int/doc/wcpfc-2010-qtr-01/1st-quarter-2010>.

with the SPC in regards to aggregated catch and effort data and with the IATTC in regarding to operational-level tuna fisheries data (such as catch and effort, observer, unloading, transshipment and port inspection data), aggregated catch and effort data, and other relevant monitoring, control, surveillance, inspection and enforcement data.¹⁶² The Commission has also adopted rules governing the protection and dissemination of data that is compiled by the WCPFC.¹⁶³

22. The Mekong¹⁶⁴

The Mekong River originates high on the Tibetan Plateau, and makes its way through six countries: China (Tibet), Myanmar (Burma), Laos, Thailand, Cambodia, and Vietnam, before reaching the South China Sea.¹⁶⁵ At 4,800 kilometres (2,976 miles), the Mekong River usually ranks twelfth in the world in terms of length, and eighth in terms of average annual runoff. The flow in the Mekong varies with the tropical monsoon climate. The flows begin to increase at the onset of the wet season in May, peaking in August or September, and decreasing rapidly until December. The flows recede slowly during the annual dry period from December to their lowest levels in April. An enormous volume of water flows through the Mekong Basin in the wet season resulting in extensive flooding. The floodwaters support a productive and diverse freshwater ecosystem, but also result in loss of human life and damage to crops and structures. During the dry season, a dramatic reduction of flow leads to water shortages for domestic and agricultural use, and limiting navigation. The coastal plain of the delta constantly suffers from an intrusion of seawater.

The Mekong Basin's water resources have the ability to support economic growth through irrigation, hydropower, navigation, water supply and tourism. Equitable sharing of the water resources and sustainable development of the natural resources in the Basin becomes most critical during the dry season. Laos relies heavily on river transport, and the reduction of dry

¹⁶² Data Exchange Agreement Between the Western and Central Pacific Fisheries Commission and The Secretariat of the Pacific Community, 27 Aug. 2009, available at <http://www.wcpfc.int/doc/wcpfc-spc-ofp-data-exchange-agreement>; Memorandum of Cooperation on the Exchange and Release of Data between the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and the Inter-American Tropical Tuna Commission, 11 Dec. 2009, available at <http://www.wcpfc.int/node/2684>.

¹⁶³ Rules and Procedures for the Protection, Access to, and Dissemination of Data Compiled by the Commission, Dec. 2007, available at <http://www.wcpfc.int/doc/data-02/rules-and-procedures-protection-access-and-dissemination-data-compiled-commission-revise>.

¹⁶⁴ Mekong Physical Characteristics: 795,000 sq. km in area. River length 4,200 km. Basin Annual internal per capita water resources of basin countries ranges from 1,845 cubic meters in Thailand to 50,392 cubic meters in Laos (World Resources Institute, 2000). Basin climate is predominately tropical with significant seasonal rainfall. Socio-Political Characteristics: Basin shared by Cambodia, China, Laos, Myanmar, Thailand, and Vietnam. Low or medium levels of development in basin countries (United Nations Development Programme, 2000). Agriculture, particularly subsistence agriculture, the dominant economic activity in the basin. Major conflict and upheaval over much of the last 50 years occurred in the basin although recent comparative stability has been re-established. Historical Development Cooperation first began in the late 1950s between Cambodia, Laos, South Vietnam, and Thailand, with initial efforts concentrated on data collection and exchange (Schaaf and Fifield, 1963). Cooperative committee with a narrow focus was established between these four countries in 1957. Mekong River Commission (MRC) established in 1995 between Cambodia, Laos, Thailand, and Vietnam to replace earlier committee (Mekong River Commission, 1995).

¹⁶⁵ The Member States to the 1995 Agreement are Thailand, Laos, Cambodia, and Vietnam (the four countries in the Lower Mekong Basin). However, China and Myanmar, whose territories comprise the Upper Mekong Basin, have not signed the 1995 Agreement. In 1996, China and Myanmar became official —dialogue partners. As such, they may dispatch representatives to Joint Committee and Council meetings, where they may participate in discussions.¹⁰⁹³ In the 2010 Hua Hin Declaration, the Member States expressed hope that China and Myanmar would join the MRC in the near future.¹⁰⁹⁴ Indeed, the 1995 Agreement contemplates the accession of China and Myanmar, stating that —[a]ny other riparian State, accepting the rights and obligations under this Agreement, may become a party with the consent of the parties.

season flows could adversely affect navigation. Cambodia has the long-term potential for increasing its irrigated agriculture. Over the decades, Vietnam and Thailand have developed extensive irrigation systems that currently face dry season water constraints. Vietnam makes use of dry season flows for seawater repulsion and for irrigation. Thailand has recently been studying options for diverting water from the Mekong, and for inter-basin diversion from Thai tributaries to the Mekong. Hydropower development in the Mekong Basin has also been gaining momentum in China and Laos. Currently, there are only 500 MW of installed capacity in the Lower Mekong and 1500 MW along the Chinese portion of the River. China is constructing several hydropower projects on the Mekong River. Laos has plans to construct a number of medium sized hydropower projects on Lao tributaries to the Mekong. Both China and Laos would like to export power to Thailand. Options for creating a regional power grid are under study.

Key to reaching an overall framework agreement in 1995 was the need to find acceptable language that provided both a sense of good faith and cooperation, and the assurances that no party would be disadvantaged under its provisions in light of the doctrine of sovereign equality. Efforts to promote sustainable water management in the Mekong River Basin and protection for the environment, aquatic life and the ecological balance of the basin subsequently received a major boost in the form of an \$11 million influx of funding from the Global Environment Facility. The Water Utilization Project (WUP) funded by the grant supported the MRC in developing an integrated and comprehensive Basin hydrologic modelling package, and a functional and integrated knowledge base on water and related resources, and using these tools to establish “Rules,” one of five major goals. The first Rule developed using an “interest based” negotiation approach were the “Procedures for Data and Information Exchange and Sharing” dated 01 November 2001. The approach taken was essentially to establish a framework agreement and a committee and then leave implementation to the committee.

23. The Columbia

The Columbia River is one of a number of key international watercourses shared by Canada and the United States where Canada is generally the upstream watercourse state and the US is generally the downstream watercourse state. Stretching 1952 kilometres, the Columbia River is the fourth largest river in North America and the Columbia River basin covers 640 000 square kilometres of territory in Canada and the United States. In recognition of the importance of cooperating with regard to their many shared water resources, Canada and the United States concluded an agreement in 1909, known as the *Boundary Waters Treaty*, which, among other things, established an entity called the International Joint Commission (‘IJC’) to govern their relations. The subsequent *Columbia River Treaty*¹⁶⁶ between Canada and the United States explicitly recognized that the construction and operation of three treaty projects in Canada would increase both the useable energy and dependable capacity of power plants in the US, as well as provide irrigation and flood control benefits in the United States, all of which would not be possible at the same cost without the three treaty projects in Canada. In return for building the three *Columbia River Treaty* projects in Canada, the Treaty specifically entitled Canada to a lump sum payment for various downstream (flood control) benefits, as well as one half of the

¹⁶⁶ Treaty Relating to Cooperative Development of the Water Resources of the Columbia River Basin (Columbia River Treaty), U.S.-Can., Jan. 17, 1961, 15 U.S.T. 1555, 542 U.N.T.S. 244, available at <http://www.ccrh.org/comm/river/docs/cotreaty.htm>.

additional power generated by power plants in the United States that resulted from storage across the border in Canada.

Much of the data sharing under the Columbia River Treaty is performed by the Permanent Engineering Board.¹⁶⁷ The Columbia River Treaty established the Permanent Engineering Board, consisting of four members—two appointed by the United States and two appointed by Canada. The Permanent Engineering Board is tasked with the following duties:

- Assemble records of the flows of the Columbia River and the Kootenay River at the Canada-United States boundary;
- Report to the United States and Canada whenever there is substantial deviation from the hydroelectric and flood control operating plans and, if appropriate, include in the report recommendations for remedial action and compensatory adjustments;
- Assist in reconciling differences concerning technical or operational matters that may arise between the United States and Canadian Entities;
- Make periodic inspections and require reports from the United States and Canadian Entities in order to ensure that the objectives of the Columbia River Treaty are being met;
- Make reports, at least once a year, to the United States and Canada of the results being achieved under the Columbia River Treaty and make special reports concerning any matter which it considers should be brought to the countries' attention; and
- Investigate and report with respect to any other matter that comes within the scope of the Columbia River Treaty, at the request of either the United States or Canada.¹⁶⁸

The Permanent Engineering Board must comply with directions relating to its administration and procedures that are agreed upon by the United States and Canada.

The key subsidiary agreement to the Treaty governing data and information and exchange is entitled: “Terms of Reference for the Columbia River Treaty Hydrometeorological Committee” is dated 20 May 1968.¹⁶⁹ The approach taken was essentially to establish a framework agreement and a committee and then leave implementation to the committee.

24. Africa

Africa in particular is a region of international drainage basins. With the exception of island states, every African country has territory in at least one transboundary river basin, and transboundary river basins cover 62% of Africa's total land area.¹⁷⁰

¹⁶⁷ Columbia River Treaty, art. XV.

¹⁶⁸ See U.S. Army Corps of Engineers Columbia Basin Water Management, *Permanent Engineering Board, Columbia River Treaty* as found at http://www.nwd-wc.usace.army.mil/PB/PEB_08/peb.htm.

¹⁶⁹ See Appendix B Terms of Reference for the CRTHMC available at http://www.nwd-wc.usace.army.mil/PB/PEB_08/docs/Entity/01HydroMetAnnRep.pdf. See Columbia River Treaty Hydrometeorological Committee, 2001 Annual Report (2002), available at http://www.nwd-wc.usace.army.mil/PB/PEB_08/docs/Entity/01HydroMetAnnRep.pdf.

¹⁷⁰ Malte Grossman, Cooperation on Africa's International Waterbodies: Information Needs and the Role of Information Sharing, In W. Scheumann & S. Neubert (Eds.), *Transboundary Water Management in Africa: Challenges for Development Cooperation*, 173 (2006), Bonn, Germany: German Development Institute; and Jonathan Lautze & Mark Giordano, *Trans-boundary Water*

A number of possible lessons learned from recent African experience in the realm of data and information sharing and exchange include:

1. Responsibilities for data collection and analysis for transboundary water resources management in Africa are typically divided up among different levels of government. As a result, a division of labour between the member countries responsible for collecting and analyzing data in their own territories and an international commission responsible for setting standards and responsible for coordinated basin wide analysis, probably offers the best prospects of success.
2. The methods used to collect data in different African countries do not always appear to be in line with international standards and this often means that the information derived from these data cannot be directly compared with data from neighbouring countries.
3. In supporting transboundary water resources management in Africa, the transaction costs involved in information transmission should be carefully considered. The widespread “what we need is more data” paradigm must give way to efforts to specify the information required to make management decisions.
4. Synergies with other information-generating initiatives should be sought. Close coordination with other national or international initiatives is a good way to make optimal use of synergies. Targeted co-financing of relevant programs is a good way to harness synergy potentials.
5. There is an important lesson to be learned regarding the play of tensions between various requirements concerning the level of public accessibility of information for IWRM. The principles of best IWRM practices are grounded on transparent mechanisms for the allocation, protection, and basic supply of scarce water resources and these mechanisms are best ensured by clear-cut institutional arrangements designed to set the stage for planning and management at the lowest possible level and with the participation of all stakeholders. Participation requires public accessibility of information. Publication of information may prove beneficial to the political and civil society discourse on possible riparian cooperation. On the other hand trans-boundary water resources management is for the most part a governmental task with political accountability. If riparian states withhold information for strategic reasons, creation of a shared information base (i.e. one that is not public but accessible only to the parties) may constitute an important trust-building measure for initiating trans-boundary negotiations.
6. Any successful information and decision support system should probably be perceived as “owned” by the riparian countries concerned.
7. It is essential to ensure that both the database and the methods used for calculation of data and information for IWRM are transparent and inspire confidence. This requires that all riparian states concerned are involved “at eye level” in the specification and development of the models. There should also be consensus on assumptions, methods, and technical descriptions, and these must be accessible to all users and decision-makers.

Law in Africa: Development, Nature and Geography 45 Nat. Resources J. 1053, (2005). The former article explores the instruments that basin organizations in Africa have assumed to facilitate the transmission of information. The former article concludes with lessons to be drawn for development cooperation. The latter article focuses more on documenting and analyzing a large body of transboundary water agreements relating to Africa with a view towards providing guidance for future institutional development.

8. It is essential to ensure that the set of instruments used to collect data and information will be maintained and developed over the long term. This means that due consideration must be given to the institutional, financial, and technical aspects.

IV. Examples of International Agreements/Arrangements on Data and Information Exchange

Table 4 below summarizes examples of international agreements and/or arrangements on data and/or information sharing in selected international waters situations.

Region/River Basin and/or Countries	Procedure/Agreement for Data/Information Sharing	Remarks
<p>Orange-Senqu River Commission</p> <p>Countries:</p> <p>Botswana, Lesotho, Namibia, and South Africa</p>	<p>An Orange-Senqu agreement that provides for the development of a database and a provisional integrated water resources management plan has been signed by the countries.</p>	<p>Data sharing and joint hydrological analyses are conducted regularly among the countries; the data collected by South Africa are regularly shared with its neighbours.</p> <p>Namibia provides runoff data and information on present and anticipated water demand.</p> <p>Lesotho also provides runoff and precipitation data. South Africa has funded measuring weirs in Lesotho to calibrate the data.</p> <p>This information sharing has led to a high level of conformity in assessments of the region's water yield</p>

<p>Nubian Sandstone Aquifer System</p> <p>Countries: Chad, Egypt, Libya, and Sudan</p>	<p>Agreement on Monitoring and Exchange of Groundwater Information of the Nubian Sandstone Aquifer System</p> <p>Signed 3 – 4 October 2000</p>	<p>According to the agreement, member states share information through the Nubian Aquifer Regional Information System (NARIS). The agreements includes the information to be shared:</p> <p>Annual extractions, specifying the geographical location and number of wells and springs</p> <p>Annual electrical conductivity measurements, followed by chemical analysis if drastic changes in salinity are observed</p> <p>Water level measurements taken twice a year</p> <p>The information compiled in the NARIS is used to run aquifer development scenarios using the aquifer model developed for the NSAS.</p> <p>The data are stored on a server operated by the Centre for Environment and Development for the Arab Region and Europe (CEDARE) in Egypt.</p>
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Region/River Basin and/or Countries	Procedure/Agreement for Data/Information Sharing	Remarks
<p>Senegal River (Organization for the Development of the Senegal River, OMVS)</p> <p>Countries: Mali, Senegal, Guinea, Mauritania</p>	<p>Agreements have been concluded between relevant (national) organizations and the OMVS with a view to defining the role and the responsibilities of the individual organizations involved (collection, processing, and storage of data) and the OMVS (preparation, dissemination, and exchange of information).</p>	<p>The OMVS is an example for cooperation with a strong international competence center in charge of organizing cooperation with national authorities.</p> <p>The OMVS is responsible for the operational regulation of jointly run infrastructure, and as such it also operates hydrological measuring networks.</p>
<p>The Mekong</p> <p>Countries: Lao PDR, Thailand, Vietnam, Cambodia; China PR and Myanmar (Burma) are not members</p>	<p>Sharing and exchange of data/information subject to the provisions of the ‘Procedures for Data and Information exchange and sharing’”</p>	<p>Agreement defines types of data/information</p> <p>The Mekong River Commission (MRC) secretariat is designated as the custodian of the data/information (creates and maintains the MRC-Information System</p> <p>MRC Joint Committee oversees the effective implementation of the agreement.</p>
<p>Columbia River</p> <p>Countries: Canada and USA</p>	<p>A subsidiary agreement to the Columbia River Treaty governs data/information exchange. The agreement is entitled: “Terms of Reference for the Columbia River Treaty Hydrometeorological Committee”; dated 20 May 1968.</p>	<p>Scope covers, among others, exchange of available hydrometeorological data/information; recommend establishment of additional gauging stations.</p>

V. Conclusions: An idealized Model Data and Information Sharing and Exchange Agreement for International Waters

This paper has critically identified and reviewed one aspect of good governance in the international waters context: data and information sharing and exchange.

The following eight points identify the possible scope and content of an idealized model data and information sharing and exchange agreement for international waters.

1. Types of data and information: Transboundary water resources management usually requires interventions to integrate socio-economic, environmental and technical/engineering issues and, hence, requires broader types of data including data and information spanning a potentially wide spectrum of thematic categories.
2. Custodianship of Data/Information: The data/information that are being compiled from various sources for the planning/implementation of various current and possible future projects/programs should be systematically archived and made available for use by countries in their cooperative management. This may require a central database of ‘mutually agreed’ data/information, which is maintained and managed by an appropriately mandated institution, which becomes the custodian of the database.
3. Access to ‘third parties’: An important question to be addressed by any agreement regarding data and information sharing and exchange refers to provision of access to potential users other than governments of the riparian states entering into the agreement. Should the agreement limit its scope to governing exchange and sharing of data and information among the riparian states only? Or should it also deal with the question under what circumstances and modalities access to data/information be granted to ‘third parties’, which may include academic/research institutions, NGOs, UN agencies, private institutions?
4. Finance and costs: What are the circumstances under which data and information should be paid for, and by whom? A good starting point could be whereby exchange of readily available data would proceed at no cost to the requesting riparian state. The challenge here is that it may be difficult to reach consensus on what is meant by the term “readily available.” Depending upon whether ‘third’ party access is provided for, the agreement should probably also have provisions on how access is granted to such ‘outside’ users.
5. Data standards and compliance: This refers to the various standards that are potentially relevant in handling data/information sets included in the agreement. While the agreement may not deal with specific details of what standards are to be used, it should probably clarify how these standards are to be set, and who shall be responsible for quality assurance of the data/information, for standardizing data formats and similar issues.
6. Implementation arrangements: While the issue of managing and maintaining the ‘mutually agreed’ data and information is largely addressed under ‘custodianship’, discussed above, the agreement needs to address the issue of how the agreement is to be implemented. Important relevant issues most likely include monitoring, verification, compliance, finance and dispute resolution.
7. Adaptivity: How can the agreement be “adaptive” with regard to emerging technologies?

8. Sustainability: How can “sustainability,” including financial sustainability of the agreement, be ensured? What is the fuel that will keep it running and maintain the parties’ interests in continuing to implement it, and indeed modify and enhance it? This needs to be achieved by ensuring that the agreement adequately addresses the fundamental incentives of the parties.

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