CHAPTER VI: COOPERATIVE FRAMEWORKS FOR TRANSBOUNDARY WATER ALLOCATION

SUMMARY:

This chapter discusses the cooperative frameworks that form the basis for transboundary water allocation. It highlights the role of the United Nations global water conventions (1992 Water Convention and 1997 Watercourses Convention), regional and multi- or bilateral legal agreements and institutional arrangements that form the foundations to enable cooperative allocation. The aim and function of joint bodies in transboundary water allocation are analysed, and the role and relevance of informal arrangements are addressed. Finally, national law coherence with transboundary arrangements is highlighted as being important for coordination and implementation.

1. Transboundary Water Agreements

a. Framework from the United Nations global water conventions

The United Nations global water conventions can be seen as manifestations of the duty to cooperate and of the principle of good neighbourliness. The Water Convention obliges the parties to conclude bilateral or multilateral agreements and to establish joint bodies for the prevention, control and reduction of transboundary impacts (Art. 9). The Watercourses Convention stipulates that States may enter into, or consider harmonizing, existing watercourse agreements with the basic principles of the Convention and may consider the establishment or joint mechanisms or commissions (Arts. 3, 8).

b. Binational and multilateral agreements

Numerous transboundary water agreements have been established to govern transboundary surface and groundwaters, and to foster cooperation among the riparian States. It is estimated that more than 450 transboundary water agreements have been signed worldwide since 1820. The scope of these agreements covers a wide spectrum of issues, including rules for energy production, irrigation, fishing, and water quantity and quality. Transboundary agreements generally stipulate the common principles and rules for the protection and use of the shared waters by the co-riparian States.[323] They offer many benefits to inter-State relations and to the management of transboundary water resources. These agreements create stability in and provide predictability to the relationships of the riparian States, facilitate monitoring and information exchange, and generally promote cooperative arrangements for the management and allocation of water resources.[324]

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323 Patricia Wouters, "International law – Facilitating transboundary water cooperation", TEC Background Papers, No. 17 (Stockholm, Global Water Partnership, 2013).

324 See, for example, Jacob D. Petersen-Perlman, Jennifer C. Veilleux and Aaron T. Wolf, "International water conflict and cooperation: challenges and opportunities", *Water International*, vol. 42, No. 2 (January 2017), p. 1–16; Susanne Schmeier and Birgit Vogel, "Ensuring long-term cooperation over transboundary water resources through joint river basin management", in *Riverine Ecosystem Management: Science for Governing Towards a Sustainable Future*, Stefan Schmutz and Johan Sendzimir, eds., Aquatic Ecology Series, vol. 8. (Cham, Switzerland, Springer International, 2018); Stephen C. McCaffrey, "The need for flexibility in freshwater treaty regimes", *Natural Resources Forum*, vol. 27, No. 2 (May 2003), p. 156–162.

CASE STUDY 23: **Southern African Development Community Revised Protocol and subsidiary instruments for developing transboundary water allocation arrangements**

The Revised Protocol on Shared Watercourses in the Southern African Development Community (SADC Revised Protocol) was signed in 2000 and is an example of a regional multilateral agreement for transboundary water cooperation. The SADC Revised Protocol does not explicitly mention allocation, yet it establishes institutional frameworks for the Protocol's implementation, which includes SADC secretariat water sector organs whose functions include developing subsidiary regional water instruments and policies among SADC State parties (Art. 5). The SADC secretariat subsidiary instruments for transboundary water cooperation include "the Regional Water Policy, adopted in 2005; the Regional Water Strategy adopted in 2006 and Regional Strategic Action Plan on Integrated Water Resources and Development Management, which was first approved by SADC Summit in August 1998 to run in five-year phases".[325] Notably, both the Regional Water Policy and the Regional Water Strategy feature numerous mentions of water allocation, particularly equitable and sustainable/reasonable allocation,[326] for implementing the region's water resources development and management.[327]

2. Water allocation in transboundary water agreements

Transboundary water agreements may include specific arrangements for allocating water among the parties. These may appear, inter alia, as treaty provisions on elements such as priorities of uses and guidance regarding equitable and reasonable utilization within the basin in question, or as more specific decisions or guidance on the concrete realization of water allocation such as designated volumetric quotas. It is important to note that there are also numerous agreements which do not address the issue of allocation at all. Often this is simply because allocation is not the main water use challenge in the basin. Transboundary water agreements can promote effective cooperation and facilitate joint water management among riparian States, even without addressing allocation of the shared waters.

Transboundary water agreements are generally based on basin-level cooperation. This means that the territorial scope of the cooperation covers the whole basin. Activities by one riparian State affect the opportunities for the use and the protection of the basin and its resources by others. Similarly, treating the basin as one unit, including surface water and groundwater, may prevent harm to some riparian States and distribute benefits more equally among all of them.[328] Under bilateral and regional water treaties, different types of legal and policy arrangements on water allocation can be agreed. These may include specific protocols and other legal arrangements between and among the parties, and policy instruments such as flood management and water allocation plans. These instruments may also be developed in the absence of formal State-to-State agreements. Basin-level cooperation may be realized by a variety of actors through a variety of instruments and timelines.

325 See "SADC water sector", available at www.sadc.int/sadc-secretariat/directorates/office-deputy-executive-secretary-regional-integration/infrastructure-services/sadc-water-sector/.

326 See, for example, SADC, *Regional Water Strategy* (2006), 4.1(b) Strategy: Promote equitable and sustainable allocation of water resources between competing and conflicting demands; SADC, *Regional Water Policy* (2005), 9.f.(iv) River Basin Approach: Water resources allocation and utilisation will be based on equitable and reasonable mechanisms through negotiations between watercourse States.

327 See SADC, *Regional Water Policy* (2005); SADC, *Regional Water Strategy* (2006).

328 N. Kliot, D. Schmueli and U. Shamir, "Institutions for management of transboundary water resources: their nature, characteristics and shortcomings", *Water Policy*, vol. 3, No. 3 (2001), p. 252.

CASE STUDY 24: **Transboundary water allocation incorporated in the peace treaty between Israel and Jordan**

The water arrangements between Jordan and Israel are part of the Treaty of Peace that was concluded between them in 1994. They are a good example of practical and sensible solutions for the most beneficial use of limited water resources in one of the most arid regions in the world. The water arrangements between the two countries are also part of an ongoing trust-building process following the conclusion of the Treaty of Peace and are implemented at a technical level by a Joint Water Committee that meets regularly.

The Treaty of Peace prescribes the respective water use allocations from the Yarmouk and Jordan Rivers, where these form the boundary between Jordan and Israel and further provides for the use by Israel of wells situated on the Jordanian side of the border in Wadi Araba, south of the Dead Sea.

Pursuant to Annex II of the Treaty of Peace, the waters of the Yarmouk River are for the use of Jordan subject to a priority right of Israel to pump an annual quantity of 25 million m^3 (12 million m^3 in summer and 13 million m^3 in winter). To facilitate the above, a diversion weir was constructed on the Yarmouk near the entry to the King Abdallah Canal (KAC) in Jordan. The diversion weir directs the Yarmouk waters to the entrance tunnel of the KAC while allowing Israel's share to flow downstream in the natural riverbed of the Yarmouk, from where Israel pumps its allocation. In addition, Jordan may allow (concede) Israel to pump up to 20 million m^3 from the Yarmouk during the winter, which water is returned to Jordan from the Jordan River during the summer, a de facto storage arrangement whereby Israel stores water for the benefit of Jordan.

Israel may continue its pre-Treaty use of the Jordan River waters along their common border and Jordan may use an equivalent amount provided such use will not harm the quantity or quality of the above Israeli uses. In addition, during the winter period, Jordan is entitled to store for its use a minimum average of 20 million m^3 of the floods in the Jordan River. Annex II also provides that Jordan is entitled to an annual quantity of 10 million m^3 of water from the planned desalination of about 20 million m^3 of saline springs that are diverted to the Jordan River. Therefore, until the desalination facilities are operational, Israel supplies Jordan with 10 million m^3 of Jordan River water during the winter period.

Jordan and Israel further agreed to cooperate in finding sources for the supply to Jordan of an additional 50 million m^3/yr of water of drinkable standards. Regrettably, such sources have not been found. Since 1997, Israel has transferred to Jordan 25 million m^3 annually. In order to transfer the waters from Israel to Jordan, such as the above-mentioned 10 million m^3, the concession and the 25 million m^3, a pipeline was constructed between the Bet Zera reservoir in Israel and the KAC in Jordan.

It was also agreed that excess floods in either the Yarmouk or the Jordan Rivers that are not usable in accordance with the above allocations and which will otherwise be wasted might be utilized by either side.

Along their southern border, Israel has the right to continue drawing water from certain wells on the Jordanian side of the Araba Valley and to replace those wells that fail.

a. Global trends in water allocation agreements

This section presents an overview of research into the global trends in the types of allocation mechanisms found in international freshwater agreements. The International Freshwater Treaties Database (IFTD) contains 599 agreements on international transboundary waters.[329] Using a methodology described in general terms below in relation to the research outcomes from McCracken and others[330] (see Annex for a more detailed summary of the methodology, its aims and rationale), the Database has coded these agreements in relation to specific criteria regarding allocation. As of 2017, 180 (30 per cent) of these international freshwater agreements contain a mention of at least one allocation mechanism for surface and/or groundwater. Nine agreements have at least one mechanism for both surface and groundwater.

The 180 agreements that mention one or more allocation mechanisms were further analysed using a method cataloguing and analysing allocation mechanisms in international water agreements that identifies two components of an allocation mechanism. The explanatory clause identifies how water is physically divided, while the context clause identifies why water is allocated or its purpose (see Annex). As demonstrated in Figure 4 (Chapter 1), there has been an increase in the number of agreements that include a mechanism for allocation over the past century and a half, with peaks in the 1950s and the 1990s. Since the 1970s, there has been a small but steady increase in the number of agreements with provisions for allocating groundwater, either in conjunction with surface water or solely focusing on groundwater.

Agreements that contain a particular explanatory clause on both surface and groundwater allocation mechanisms are examined in Table 6. An allocation mechanism can fulfil multiple categories; for example, a treaty might specify a set volume of water that changes depending on the month. This explanatory clause would be categorized as both "fixed quantity" and "variable according to time of the year". As shown in Table 6, nearly all the allocation mechanisms address surface water, with the most common explanatory clause being "fixed quantity". In more recently signed agreements, there is an increase in the diversity of explanatory clauses with mechanisms including provisions based on "variable by water availability", "percentage of flow", "consultation and/or prior approval", "fixed quantities" and "RBO (river basin organization), commission, and/or committee". This recent trend in the diversification of the type of explanatory clauses could aid in increasing the adaptive capacity and flexibility of allocation mechanisms, making water allocation more resilient in the face of uncertainties in water availability brought on by climate change.[331]

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329 Oregon State University, College of Earth, Ocean, and Atmospheric Sciences and Program in Water Conflict Management and Transformation, "International Freshwater Treaties Database".

330 McCracken and others, "Typology of Transboundary Water Allocation" (forthcoming).

331 Shlomi Dinar and others, "Climate change, conflict, and cooperation: global analysis of the effectiveness of international river treaties in addressing water variability", *Political Geography*, vol. 45 (March 2015), p. 55–66 ; Aaron T. Wolfe, Shira B. Yoffe and Mark Giordano, "International waters: identifying basins at risk", *Water Policy*, vol. 5, No. 1 (February 2003), p. 29–60; Aaron T. Wolf, Kerstin Stahl and Marcia Macomber, "Conflict and cooperation within international river basins: the importance of institutional capacity", Water Resources Update 125, Carbondale, Illinois, Universities Council on Water Resources, 2003; Olivia Odom and Aaron T. Wolf, "Institutional resilience and climate variability in international water treaties: the Jordan River Basin as 'proof-of-concept'", *Hydrological Sciences Journal*, vol. 56, No. 4 (2011). See, generally, Anoulak Kittikhoun and Susanne Schmeier, eds., *River Basin Organizations in Water Diplomacy* (Abingdon, United Kingdom, Routledge, 2020).

TABLE 6

Frequency of explanatory clauses in surface and groundwater allocation mechanisms in international water agreements

Explanatory Clause	No. of Agreements with a Surface Water Explanatory Clause (% of 175)	No. of Agreements with Groundwater Explanatory Clause (% of 14)	Total
Number of treaties with at least one allocation mechanism	175 (29.2% of 599)	14 (2.3% of 599)	180
Fixed quantity	47 (26.9%)	2 (14.3%)	49
Fixed quantity to a subset of riparians	17 (9.7%)	0	17
Percentage of flow	17 (9.7%)	0	17
Equal division	24 (13.7%)	0	24
Variable by water availability	30 (17.1%)	1 (7.1%)	31
Variable according to time of the year	15 (8.6%)	0	15
Water loans	13 (7.4%)	0	13
Allocation of entire or partial rivers/ aquifers	15 (8.6%)	1 (7.1%)	16
Prioritization of uses	10 (5.7%)	1 (7.1%)	11
Allocation of time	1 (0.06%)	0	1
Benefits sharing	2 (1.1%)	0	2
Historical or existing uses	13 (7.4%)	0	13
Equitable use	13 (7.4%)	0	13
Sustainable use	6 (3.4%)	4 (28.6%)	9
Consultation and/or prior approval	15 (8.5%)	3 (21.4%)	19
RBO, commission, and/or committee	23 (13.1%)	1 (7.1%)	22
Cap, limit, or no allocation allowed	28 (16.0%)	7 (50.0%)	33
Market based	0	0	0
Unclear	30 (17.1%)	4 (28.6%)	34
Pumping rates	N/A	0	0
Water table impact	N/A	0	0
Spring outflow	N/A	0	0
Aquifer	N/A	1 (7.1%)	1

Source: M. McCracken and others, "Typology of Transboundary Water Allocation: a look at global trends in international freshwater agreements" (forthcoming).

Note: Percentages are based on the number of agreements that contain the explanatory clause of the mechanism listed in the first column. For surface water allocation mechanisms, this percentage would be calculated based on a total of 175 agreements, while groundwater allocation mechanism percentages would be calculated using a total of 14 agreements. The percentages do not add to 100 per cent as the agreements are counted multiple times when they contain more than one explanatory clause. The second component is the context clause—or the purpose for allocation.

Table 7 shows the trends in the number of agreements that contain a particular context clause for allocation mechanisms. Slightly more than half of the agreements with an allocation mechanism have an "undefined" purpose. The most commonly defined purposes for allocation are "agriculture/irrigation", "hydropower" and "domestic use". Allocations for environmental purposes, such as to maintain in-stream flow or water quality, are found in less than 20 per cent of agreements with surface and groundwater allocation mechanisms. However, it is important to note that these have become more common in recent years, 75 per cent of the agreements with these types of context clauses having been signed since 1980.

TABLE 7

Breakdown of allocation context clauses

Context Clause	% of Agreements with an Allocation Mechanism (n=180)
Minimum flow: not specified/undefined purpose	5.56%
Minimum flow: navigation	1.11%
Minimum flow: environmental needs	5.00%
Minimum flow: hydropower	2.78%
Minimum flow: tourism/recreation	0.56%
Environmental/in-stream flow	6.67%
Aesthetic/tourism/recreation	1.11%
Intrinsic/cultural/spiritual	0.56%
Hydropower	20.00%
Agriculture/irrigation	22.22%
Navigation	3.33%
Support of fish habitat and stocks/fishing rights	1.67%
Domestic uses	18.89%
Border/territory maintenance	0.00%
Water quality, such as a specific volume for dilution purposes	5.00%
Undefined purpose	56.67%
Other	6.67%

Source: M. McCracken and others, "Typology of Transboundary Water Allocation: a look at global trends in international freshwater agreements" (forthcoming).

Note: Percentages are based on the number of agreements that contain the explanatory clause of the mechanism listed in the first column. For surface water allocation mechanisms, this percentage would be calculated based on a total of 175 agreements, while groundwater allocation mechanism percentages would be calculated using a total of 14 agreements. The percentages do not add to 100 per cent as the agreements are counted multiple times when they contain more than one explanatory clause. The second component is the context clause—or the purpose for allocation.

b. Hydropower

As noted above, one of the predominant purposes for allocation is hydropower (20 per cent of agreements with an allocation mechanism). Yet, rather than allocating the water itself, States often allocate the benefits from hydropower (see Chapter III, subsection 3b, and Chapter IV, subsection 2c for a discussion of hydropower as an example of a shared benefit and how the method used categorizes these benefits). Table 8 presents

a breakdown of how frequently the different mechanisms for hydropower benefits division are included in transboundary water agreements.

TABLE 8

Frequency of different mechanisms for hydropower benefits division

Hydropower Benefits Division	No. of Agreements with a Mechanism for Hydropower Benefits Division
Fixed quantities of power	9 (33.3%)
Variable quantities of power	0
Percentage of assessed value of electricity generated	3 (11.1%)
Percentage of power generated	10 (37.0%)
Fixed value of electricity	2 (7.4%)
Consultations	1 (3.7%)
Other	2 (7.74%)
Total	**27**

Source: M. McCracken and others, "Typology of Transboundary Water Allocation: a look at global trends in international freshwater agreements" (forthcoming).

Hydropower benefits are most frequently allocated by a percentage of the power generated. For example, a 1987 agreement between Syria and Jordan on the construction of the Wahdah dam and power-generating station allocates 75 per cent of the generated power to Syria and 25 per cent to Jordan. Similar to water, hydropower can also be allocated as a "fixed quantity" or through "consultations". While "market-based mechanisms" are not used to allocate water resources between countries, hydropower benefits allocations via "market-based mechanisms" occur in five agreements overall. These "market-based mechanisms" included allocations through the "fixed value of the electricity produced" (two agreements) and as "a percentage of the assessed value of electricity generated" (three agreements). For example, Argentina and Uruguay agreed to allocate the electricity generated in the Salto Grande area of the Uruguay River through a cost-price mechanism. This difference between the use of "market-based mechanisms" for water compared to electricity may be due to the fact that it is easier to assign a price to electricity produced via hydropower than to water.[332]

CASE STUDY 25: **Developing an adaptable allocation treaty regime via a multi-phased project for Lesotho and South Africa**

The Lesotho Highlands Water Project (LHWP) is a regional water resources management scheme and partnership between the Governments of Lesotho and the Republic of South Africa. The LHWP is "a multi-phased project to provide water to the Gauteng region of South Africa and to generate hydro-electricity for Lesotho. It was established by the 1986 Treaty signed by the governments of the Kingdom of Lesotho and the Republic of South Africa. The project entails harnessing the waters of the Senqu/Orange River in the Lesotho highlands through the construction of a series of dams for the mutual

332 Ariel Dinar, Mark W. Rosegrant and Ruth Meinzen-Dick, "Water allocation mechanisms: principles and examples", Policy Research Working Paper, No. 1779 (Washington, D.C., World Bank, 1997).

benefit of the two countries. Phase I of the project was completed in 2003 and inaugurated in 2004, and Phase II is currently underway."[333]

Based on the relative water abundance in Lesotho and enormous projected water demands in South Africa, initial feasibility studies were conducted in the 1950s and 1960s into diverting large quantities of water. Negotiation and further feasibility studies took place in the late 1970s and 1980s. Ultimately, both countries agreed in 1986 to proceed with the LHWP. Its stated purpose is "to enhance the use of the water of the Senqu/Orange River by storing, regulating, diverting and controlling the flow of the Senqu/Orange River and its affluents in order to effect the delivery of specified quantities of water to the Designated Outlet Point in the Republic of South Africa and by utilizing such delivery system to generate hydro-electric power in the Kingdom of Lesotho".[334] Under the Project, the region of Gauteng in South Africa was guaranteed to receive quantities of vital water and Lesotho would have hydropower infrastructure built to generate crucial electricity supply while also receiving royalties from the water transfer. Additional skills transfer and capacity-building to enable Lesotho to manage and maintain the infrastructure within the country and the development of future LHWP phases was also a key consideration.[335]

The legal basis for the LHWP and its sequential phases are established under the Treaty on the Lesotho Highlands Water Project between the Government of the Kingdom of Lesotho and the Government of the Republic of South Africa, which was signed into law on 24 October 1986. It codifies the rights and obligations of each of the State parties, including: the water quantities to be delivered; cost-sharing provisions; scope and calculation of the payments for water delivered; and principles for financing, constructing, operating and maintaining the system.[336] Notably, the Treaty committed the two countries to Phase I of the LHWP, noting that Phase I would be completed in two subphases (IA and IB), while providing for the potential construction of additional Phases, II–IV. The Treaty also establishes national and binational institutions to support the Project's development, including the Lesotho Highlands Water Commission (known as the Joint Permanent Technical Commission prior to 1999) which comprises representatives of both Governments. The Commission is responsible for overall monitoring and advisory functions of the Project and serves as a conflict resolution mechanism between the two State parties.[337]

Under the Treaty terms, different costs are borne by the two countries. South Africa funds all aspects of the water transfer component of the Project, including infrastructure construction, operation and maintenance, as well as any social and environmental mitigation measures, and all costs will be met regardless of the Project's performance. Lesotho funds the hydropower component of the Project, including infrastructure construction, operation and maintenance and all associated environmental and social costs. Both countries are separately liable for any ancillary developments within their respective countries. The parties also agreed to take all reasonable measures during implementation, operation and maintenance of the Project to ensure protection of the existing quality of the environment and to give due regard to maintaining the welfare of persons and communities immediately affected by the Project.[338]

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333 See www.lhda.org.ls/lhdaweb/.

334 Treaty on the Lesotho Highlands Water Project between the Government of the Kingdom of Lesotho and the Government of the Republic of South Africa, 1986, Art. 4(1).

335 International Water Power and Dam Construction, "The second phase", 12 November 2018.

336 Winston H. Yu, "Benefit sharing in international rivers: Findings from the Senegal River Basin, the Columbia River Basin, and the Lesotho Highlands Water Project", Africa Region Water Resources Unit Working Paper 1, Report No. 46456 (n.p., World Bank, Africa Region Sustainable Development Department, 2008).

337 Treaty on the Lesotho Highlands Water Project, 1986, Art. 16.

338 Ibid., Art. 15.

Two specific elements of the Project should be highlighted for transboundary water allocation: flexible minimum annual water quantity to be delivered to South Africa; and cost-benefit analysis for royalties paid to Lesotho for delivering water. The Treaty commits Lesotho to deliver an initial 38 m^3/s of water, rather than the full 70 m^3/s that was estimated to be achieved after development of all phases of the Project. However, after implementation of subphase IA, South Africa would be guaranteed an increasing minimum annual water quantity from 1995 to 2020, and after 2020 as listed in Annexure II, subject to adjustment based on certain conditions should there be a shortfall or surplus.[339] Regarding royalty payments, under Article 12 of the Treaty, South Africa undertakes to share with Lesotho royalty payments based on the net benefit (56 per cent for Lesotho and 44 per cent for South Africa) of the Project. Notable here is that "the royalties were not for the water explicitly, as the water would flow into the Republic of South Africa regardless, but rather the cost savings for undertaking LHWP".[340] This is because two alternative projects were considered to deliver South Africa a fixed amount of water, one based within South Africa and the other the LHWP. The LHWP was analysed as being more cost effective and thus the royalties represent this net benefit differential.

The LHWP provides lessons in the importance of an integrated approach to negotiating not only water allocation but water within a broader "basket" of resources.[341] In this regard, "South Africa receives cost-effective water for its continued growth, while Lesotho receives revenue and hydropower for its own development. The 1986 Treaty spells out an elaborate arrangement of technical, economic, and political intricacy. The elaborate technical and financial arrangements that led to construction of the LHWP provide a good example of the possible gains of an integrative arrangement including a diverse 'basket' of benefits. It is testimony to the resilience of these arrangements that no significant changes were made despite the dramatic political shifts in South Africa at the end of the 1980s until 1990".[342]

The LHWP Treaty exemplifies the importance of providing for possible renegotiation of allocation project terms over time. The Treaty only committed the parties to Phase I of the Project. "The hydropower and development components were undertaken by Lesotho, which received international aid from a variety of donor agencies, particularly the World Bank. Phase IA of the LHWP was completed in 1998, at a cost of USD2.4 billion. Phase IB of the project was completed in early 2004, as a cost of approximately USD1.5 billion."[343] The Phase II Agreement was subsequently signed in 2011 and ratified in mid-2013, whereby its implementation is currently in progress. Envisaged as a multi-phased project, the phases described in the Treaty may be modified by agreement between the two countries. This novel approach to the development of the LHWP has allowed the project planners to adapt and renegotiate allocation plans over time. In the absence of such a provision, the additional phases of the Project might have been implemented without adequate consideration of their feasibility.[344] In particular, changes in the projection of water demand in South Africa and climate change impacts on water supply in Lesotho, along with concerns over negative social and environmental impacts of the Project, have led to negotiations on the future phases.[345]

339 Ibid., Art 7(2).

340 Yu (2008).

341 Aaron T. Wolf and Joshua T. Newton, "Case study transboundary dispute resolution: The Lesotho Highlands Water Project" (n.p., n.d.), p. 4.

342 Ibid., p. 3–4.

343 Wolf and Newton (n.d.).

344 Ibid.

345 Ibid.

c. Groundwater

The methodology used as part of this research also allows for a distinction between allocation mechanisms for surface and groundwater. This distinction is important, as, historically, the focus of allocation mechanisms has been on sharing surface water. The same trends in surface water allocation mechanisms manifest in the smaller number of documents that allocate groundwater. Until recently, only one agreement available for the analysis included a groundwater allocation mechanism—the 1905 Constitution of the Joint Authority for the Study and Development of the Nubian Sandstone Aquifer Waters—although this allocation mechanism was vague and unclear. No other available agreements addressed groundwater allocations until the 1970s, when the agreement on the Genevese aquifer was concluded (see Case Study 26). Following this decade, new groundwater allocation mechanisms appear, albeit only in small counts, with a maximum of four agreements containing groundwater allocation in the 2010s. "Cap, limit, or no allocation allowed" was the most commonly used explanatory clause for groundwater allocations overall, particularly in the 2000s and 2010s. "Minimum flow: environmental needs", "environmental/in-stream flow", "agriculture/irrigation" and "domestic uses" were the only context clauses in these groundwater allocating agreements, with water most commonly allocated for an "undefined" or "domestic" purpose.

While groundwater resources are starting to receive more attention, the frequency of "undefined" allocation mechanisms shows that this focus remains limited and may still be underdeveloped for groundwater. One example of this is the 1992 agreement between Egypt and Libya attempting to manage their shared Nubian Sandstone Aquifer. In this agreement, a Joint Authority is in charge of this resource and its allocation; however, both the specific explanatory and context clauses for structuring the allocation mechanism are "unclear" and "undefined", respectively.

CASE STUDY 26: **Genevese Aquifer Agreement, 1978: capping groundwater abstraction and managing aquifer recharge**

A collaborative effort between Swiss and French authorities to establish and fund a joint water management system based on the Genevese aquifer was initially triggered when overpumping lowered the groundwater level in the 1960s and 1970s. After the option of simply reducing withdrawal, a decision was taken to set up an artificial aquifer recharge plant, which has been operated since 1980 by the Swiss canton of Geneva, replenishing the aquifer with water from the Arve River, the aquifer's main natural recharge source. A committee is mandated to propose the yearly management programme of the Genevese aquifer, taking into account the needs of all the users, and to formulate proposals for protection of the resource. Pumping is limited to a certain volume to obtain a satisfactory average groundwater level. The French authorities and communities undertook to ensure that total abstraction by users on their territory would not exceed 5 million m^3 per year. In 2008, the Agreement was replaced by a new one (see Case Study 33).

Several overarching conclusions can be drawn from the analysis done on the almost 600 treaties coded for allocation mechanisms within the IFTD. First, there is a generally positive trend, with some fluctuations, in the number of agreements that are including allocation mechanisms for surface and groundwater. This is beneficial as they are likely contributing to the institutional capacity governing these shared resources, as well as potentially adding to the adaptive capacity that will help in overcoming uncertainties due to climate change. Second, there has been a change in the type of mechanisms that States include in their agreements, moving towards indirect and principle-based explanatory clauses and away from direct mechanisms. Third, there is an increasing trend in the number of groundwater-specific allocation mechanisms since the 1970s; however, more work is needed to develop groundwater-specific mechanisms that consider the unique characteristics of international transboundary groundwater. Fourth, most allocation mechanisms do not define a purpose for their allocation (context clause). For those that do, "agriculture/irrigation", "hydropower"

and "domestic use" are the most common; however, since the 1970s, "environmental needs" and "water quality" are becoming more common.

3. Joint Bodies and Cooperation Arrangements

a. Tasks of joint bodies

Joint bodies are an essential part of the governance structures of transboundary basins, interacting with the different actors, norms and measures that form the governing regime. The specific themes of the work of joint bodies are contained in the underlying transboundary water agreements or other arrangements that set out the operation of the bodies. The orientation, underlying principles and relevant issues addressed by joint bodies may be shaped by the characteristics of the parties and of the shared basin, as well as by the more general operating environment of the institution.[346] Joint bodies have an important role to play in transboundary water allocation processes and outcomes.

CASE STUDY 27: **Dniester River Basin: a joint body preventing and resolving disputes**

In the Soviet period in the 1980s, a decision was made to construct the Dniester Hydropower Hub to, inter alia, enhance flood protection and increase water availability during low-water periods for Moldova and Odessa City and oblast in Ukraine. In 2012, a treaty between Moldova and Ukraine was signed on cooperation in the field of protection and sustainable development of the Dniester River Basin. The Dniester Commission has been created, which is currently finalizing the operational rules of the Dniester Hydropower Hub to establish schemes for water allocation under different water availability conditions. The Commission serves also as a platform to study disputes arising from the use and protection of water and other natural resources and ecosystems of the Basin and seek a settlement.

The Water Convention defines a "joint body" as any bilateral or multilateral commission or other appropriate institutional arrangements for cooperation between the riparian parties. Article 9(2) of the Convention specifies a non-exhaustive list of the basic functions (10 categories) to be entrusted to the joint bodies to perform, several of which can be relevant to water allocation:

a. Collecting, compiling and evaluating data to identify pollution sources that generate a cross-border impact;
b. Developing joint monitoring programmes on the quality and quantity of the resource;
c. Developing inventories and exchange of information on pollution sources that generate a cross-border impact;
d. Establishing emission limits for wastewater and evaluating the effectiveness of control programmes;
e. Jointly defining quality criteria and objectives and the proposed measures to maintain and, if necessary, improve water quality;
f. Developing joint action plans to reduce polluting loads from accidental pollution and diffuse pollution;
g. Establishing alert procedures;
h. Providing a forum for information exchange on existing and planned uses of the resource and related facilities, which generate a cross-border impact;

346 See, for example, UNECE, *Principles for Effective Joint Bodies for Transboundary Water Cooperation under the Convention on the Protection and Use of Transboundary Watercourses and International Lakes* (New York and Geneva, United Nations, 2018).

i. Promoting cooperation and information exchange on best available technologies and fostering cooperation in scientific research programmes;

j. Participating in the environmental impact assessment of transboundary waters, in accordance with the relevant international rules.

CASE STUDY 28: **River basin authority charter and technical body to advise ongoing allocations for the Senegal River**

In the Senegal River Basin, many activities, uses and environments (agriculture, fishing, drinking water, production of hydroelectricity, river transport, environment, etc.) need the regular and permanent availability of water resources for their development and protection. The water resources allocation is used to meet the various demands of these often antagonistic socioeconomic and environmental sectors, in order to allow the Organization for the Development of the Senegal River (OMVS) Member States to better manage the distribution of water among sectors of activity and uses, depending on the demands and availability of water resources.

In 2002, aware of the need to take into account not only the needs, demanding activities and uses, but also the impacts and consequences resulting from the use of water resources on their available and usable volume and on their quantity and quality necessary for each type of use, the OMVS Member States developed the Senegal River Basin Water Charter. It sets the conditions and specifies the terms of water use to which all the Member States must adhere.

"The Charter embodies all key emerging principles on equity, IWRM and on the need to protect the environment. For example, there are provisions on water allocations in the Charters that require [sic] the dams in the basins to be managed so as to guarantee what we could consider an 'environmental flow' whenever the annual hydro-climatic condition[s] permit. For example, the Charter requires the Manantali Dam to generate releases to create an annual flood to respond to needs of recession agricultural [sic] and of the ecology of the floodplain".[347]

Based on the 2002 Water Charter, "an innovative body within the OMVS organisational set-up" is the Permanent Commission for Water (Commission Permanente des Eaux (CPE)). CPE is an advisory body composed of representatives of Member States (generally senior governmental experts), which is "in charge of defining the principles and modalities of water allocation between the various sectors".[348] The CPE constitutes a space for dialogue, consultation and exchange on the distribution of water among the different demanding sectors, according to the objectives to be achieved and the volume of water available. The CPE meets five times a year to discuss the distribution of water. The OMVS High Commission provides its secretariat.

The decision-making and problem-solving mechanism for water allocation measures takes place at the level of expert meetings, ministers' councils and/or heads of state and government conferences. Decisions are adopted by consensus and not by vote, at meetings organized by the OMVS. The resolution of a problem is submitted to the Ministers' Council when experts do not agree. Likewise, if ministers do not agree, they transfer the debate to the level of Heads of State who, in general, always agree on a political solution.

347 Madiodio Niasse, "Integrated management of the Senegal River", SHARE Toolkit Case Studies (n.p., IUCN Water Programme, n.d.).

348 Ibid.

b. Joint bodies and transboundary water allocation

Joint bodies have an important role in water allocation in a transboundary context as they provide a forum and institutional framework for negotiating and planning water allocations within a shared basin. Joint bodies are permanent institutions with equal representation of the parties and are established to promote cooperation and coordination among the riparian States. Joint bodies should be neutral actors, safeguarding the interests of the shared basin and the riparian States as a whole, not of any individual basin State. In addition, joint bodies often form centres of information for monitoring and assessing transboundary water allocation. In practice, many joint bodies have water quantity issues included in their mandate.[349] That mandate, however, may refer to a number of different things and specific cooperative actions vary in this regard. Joint bodies may, for example, be engaged in the management of flows, floods and droughts, navigation and hydropower generation, as well as specific economic sectors, the overall sustainability of water uses and the implementation of international water law principles.[350]

Examples of joint body tasks that may be relevant to transboundary water allocation include the following:

- In recent years, one of the key tasks of the Permanent Okavango River Basin Water Commission (OKACOM) has been to manage flows by developing environmental flow requirements, especially with a view to protecting the Okavango Delta;
- The Tripartite Permanent Technical Committee on the Incomati and Maputo Rivers has been tasked to alleviate problems stemming from drought and floods;
- Both the Mekong River Commission (MRC) and the Zambezi Water Commission (ZAMCOM) have mechanisms in place to assess planned measures with regard to the no-significant-harm rule;
- Some joint bodies are mandated, among other things, to regulate flow in order to ensure minimum flows for navigation (e.g. the Commission Internationale du Bassins Congo–Oubangui–Sangha (CICOS) and the Finnish–Russian Commission on the Utilization of Frontier Waters);
- To achieve the objectives of the Albufeira Convention between Portugal and Spain, including compliance with the flow regime agreed under the Convention and, in the case of potential drought situations, implementing measures that are considered necessary to minimize their effects, two bilateral bodies of equal composition were established to carry out the functions of management and control of compliance, namely, the Conference of the Parties and the Commission for the Application and Development of the Convention (CADC);
- The Orange–Senqu River Commission (ORASECOM) is tasked to deal with water quantity concerning the sustainable water use by all countries involved; recently, this has included the management of the development of a transfer scheme extension from Lesotho and South Africa to Botswana.

Examples of specific transboundary water allocation mandates in joint bodies include the following:

- The International Water and Boundary Commission between the United States and Mexico is in charge of distributing water between the two countries and regulating the waters of the Rio Grande and other shared rivers, which is done through regular intergovernmental meetings and minutes of those that become binding on both parties;
- The Joint Water Committee between Israel and Jordan is tasked to work on water allocation and sharing between the parties;

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349 Of the 121 joint bodies captured in the Transboundary Freshwater Dispute Database (TFDD), 38 feature water quantity in their functional scope.

350 Susanne Schmeier, *Governing International Watercourses: River Basin Organizations and the Sustainable Governance of Internationally Shared Rivers and Lakes* (Abingdon, United Kingdom, Routledge, 2013); Oregon State University, College of Earth, Ocean, and Atmospheric Sciences and Program in Water Conflict Management and Transformation, "International River Basin Organisation (RBO) Database".

- The Chu–Talas Commission between Kazakhstan and Kyrgyzstan is mandated to work on "water allocation among States", among other issues.

CASE STUDY 29: **Important role of a joint body in transboundary water allocation in the Amu Darya River Basin**[351]

The Amu Darya River Basin extends into the area of five States: Afghanistan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The majority of water is used for irrigated agriculture and hydropower production.

Water is allocated among Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan according to the 1992 Almaty Agreement on Cooperation in the Field of Joint Management on Utilization and Protection of Water Resources from Interstate Sources, essentially validating continuation of the Soviet-era water allocation regime. Estimated water use by Afghanistan is deducted from water available for allocation. The Agreement established the Interstate Commission for Water Coordination of Central Asia (ICWC).

Functioning under the broader regional structure, the International Fund for saving the Aral Sea (IFAS), the tasks of the ICWC are to determine, approve, implement and monitor annual and seasonal water allocation along the Amu Darya River. The ICWC plays a prominent role in ensuring peace and stability in water allocation, even during extremely high- and extremely low-water years. It also provides a forum for information exchange, building capacity, elaborating new agreements, conducting research and joint projects, and facilitating mutual learning among the riparian States. The ICWC has indeed demonstrated good results in annual and seasonal water allocation planning to adjust to variability and extremes.

However, Afghanistan is not a party to the ICWC and Kyrgyzstan suspended its participation in 2016, claiming lack of reform. For the ICWC to deliver further, legal and institutional frameworks in the Basin need to be improved, in order also to better respond to changes in the countries' water use priorities and hydrological conditions due to climate change. Additionally, comprehensive assessment of future demands and its impacts has to overtake the current water allocation that is driven primarily by current needs.

Concerning transboundary water allocation, where joint bodies are operational, they can be mandated to advise/be the technical advisor/provide guidance to Member States with regard to water allocation. Implementation of agreed measures rests with riparian States. Only a few joint bodies globally are specifically mandated to perform water allocation. Their concrete role in water allocation varies considerably, from providing technical advice to providing concrete allocation proposals. Also, the success of joint bodies in water allocation varies.[352] Many joint bodies that have been tasked with water allocation have found it challenging to deal with water allocation over time. Nonetheless, empirical evidence demonstrates that those basins that have joint bodies in place do better in addressing contested issues around water quantity because they have a platform for regular exchange.

351 For a comprehensive overview on water allocation practices in Central Asia and neighbouring countries, see IWAC, *The Allocation of Water Resources in a Transboundary Context to Strengthen Water Cooperation between Eurasian Countries* (Nur-Sultan, Kazakhstan, 2021).

352 Schmeier (2013); Oregon State University, "International River Basin Organisation (RBO) Database".

4. Adaptive Capacity of Water Allocation Arrangements

a. Climate and development outlook

Transboundary water resources are under multiple growing pressures, as detailed in Chapters I and II. Thus, many transboundary water allocation arrangements are subject to stress due to the changing circumstances. Water allocation schemes may no longer reasonably be based on a stationary setting with fixed rules and permanent quotas of water. The adaptive capacity of transboundary water agreements and other arrangements for water allocation has become increasingly important. The current types and rates of change facing transboundary basins may not have been envisaged when past transboundary water treaties and their related joint governing bodies were originally created, especially in relation to preserving the integrity of freshwater ecosystems.

CASE STUDY 30: **Adaptive capacity of water allocation arrangements: the Portuguese–Spanish Albufeira Convention**

The 1998 Agreement on Cooperation for the Protection and Sustainable Use of the Waters of the Spanish–Portuguese Hydrographic Basins (Albufeira Convention) conditions the uses of the water in both countries to a flow regime that is accepted by the two parties, having in mind downstream water needs in Portugal and environmental flows. Minimum annual, seasonal and weekly flows have been agreed at the entrance into Portugal (conditioning up to a certain amount of water use in Spain) and to the estuaries (conditioning water uses in Portugal).

In the Guadiana River Basin, the flow regime at the border of the two countries is defined in accordance with the rainfall and water stored in the main reservoirs in the Spanish part of the Basin. The more rainfall and water in the reservoirs, the more substantial the water flows. The two countries agreed in the Convention that the set of hydrometric and pluviometric stations and reservoirs provide data for the flow regime.

The minimum flows regime has been evolving in time. It started with minimum yearly flows (1998); later (2008), a minimum seasonal and weekly flows regime was agreed. In 2020, the two parties were negotiating an update of the minimum flows to address flows that are needed in the Lower Guadiana River and minimum daily flows. Modifications to the minimum flows are needed also, to adapt to the impacts of climate change.

b. Adaptive management

Flexibility of water allocation arrangements

In terms of specific measures within agreements and arrangements, historically, water allocation has been approached in terms of fixed volumes or quantities.[353] Of the 180 treaties with allocation mechanism(s) in the IFTD, just over 35 per cent of agreements with surface water allocation mechanisms and just under 15 per cent of agreements with groundwater allocation mechanisms designate a "fixed quantity" of water to at least one party to the agreement, under the categorization applied.[354] However, there is an increase in the number of allocation mechanisms that can contribute to adaptive management, such as those that address variability. For example, just under 20 per cent of the surface-water-allocating agreements include a provision for allocating water based on the variability in flow, such as using a mechanism that establishes allocation based on the percentage of flow or temporal variability. One example is an agreement in which

353 Shlomi Dinar and others (2015).

354 See Oregon State University, "International Freshwater Treaties Database".

South Africa and Eswatini allocated different amounts of water from the Komati River Basin during periods of high flow and periods of low flow, with additional shares set aside to compensate for water lost through evaporation.

At a broader, systems scale, the application of adaptive management in transboundary water allocation requires institutional and normative flexibility. Water allocation arrangements should be able to respond and adapt to changes and manage uncertainty. Transboundary water agreements and their governing bodies should be responsive to new information and different kinds of uncertainties. At the same time, they must be capable of reflecting the vulnerabilities, capacities, needs and priorities of the State parties and of the river basin ecosystems. This flexibility of transboundary water allocation arrangements needs to be carefully balanced with the needs of stability and legal certainty.[355] Transboundary water allocation arrangements can have either a proactive or reactive approach to changing circumstances, or a mix of them. A proactive approach is based on anticipating the changes on the basis of historical data and future projections of water flows, and studies on the expected changes in the relevant circumstances and uses of water. A reactive approach is focused on managing the changes as they come, for example, through emergency response measures.[356] With either of the approaches to adaptivity, the aim is that water allocation satisfies the needs of the riparian States.

Increasing the adaptive capacity of transboundary water allocation typically means the introduction of more complex and flexible arrangements between or among riparian States. The allocations can no longer be simple fixed amounts from year to year, based on an historically agreed scheme and historical uses and patterns. The existing arrangements may be difficult to change, but the introduction of enhanced adaptive capacity into the allocation regime may be necessary. Strengthening of adaptive capacity usually requires significant institutional capacity and, for example, robust water monitoring systems to be implemented. One example of an adaptive management process that supports water allocation in a transboundary context is the Great Lakes–St Lawrence River Adaptive Management (GLAM) Committee created by the International Joint Commission (see Case Study 38).[357]

Adaptive capacity in transboundary water allocation agreements and other arrangements

At present, many transboundary water agreements and allocation arrangements do not include strong mechanisms for addressing changing environmental, climatic, social or economic conditions. Notwithstanding, of the surface water treaties with an allocation mechanism in the IFTD that were analysed, 85 per cent allow for some flexibility to react to changes in the available supply, changing demand or an institutional change.[358] All the treaties with allocation mechanisms for groundwater included a flexible mechanism ("variable by water availability", "sustainable use", "consultation and/or prior approval"). However, not all allocation mechanisms are equivalent in increasing the adaptive capacity.

Using a methodology for categorizing allocation mechanisms (see Annex), we can further identify different components of allocation mechanisms that are not as flexible as others (please note that specific categories of allocation in the text are signified by inverted commas). The methodology identifies the following components of allocation mechanisms as having some flexibility: "variable by water availability", "variable according to time of the year", "equitable use, sustainable use", "equal division", "percentage of flow", "consultation and/or prior approval" and "water loans". Some mechanisms allow for greater flexibility than others. The degree of flexibility and the increase in the adaptive capacity it provides depends on the context of the basin or aquifer, including the physical and political characteristics of the resource. An example of this

355 T. Honkonen, "Water security and climate change: the need for adaptive governance", *Potchefstroom Electronic Law Review*, vol. 20, No. 1 (2017), p. 1–26.

356 See, for example, Lea Berrang-Ford, James D. Ford and Jaclyn Paterson, "Are we adapting to climate change?", *Global Environmental Change*, vol. 21, No. 1 (February 2011), p. 25–33.

357 Detailed information is available at www.ijc.org/en/glam.

358 McCracken and others, "Typology of Transboundary Water Allocation" (forthcoming).

differing degree of flexibility according to the categorization would be "fixed quantities" vs. "percentage of flow". Allocating water by a "percentage of flow" allows water divisions to vary according to the seasonal or annual variability in the river's total flow rate while still maintaining a proportional division. Allocating water through "fixed quantities", on the other hand, does not account for variability in flow, such as droughts, since it still mandates a set volume of water. The flexibility of a "fixed quantity" allocation mechanism can be increased by including other components, such as "variable by water availability" or "variable according to time of the year". With climate change, as well as increases in water demand, it is crucial for States to consider the degree of flexibility of allocation mechanisms to increase both their institutional and adaptive capacities.

Under international law, the United Nations global water conventions do not directly address the adaptive capacity of transboundary water management. However, soft law tools under the Water Convention, such as the *Guidance on Water and Adaptation to Climate Change*,[359] adopted by the Meeting of the Parties and published in 2009, can provide step-by-step advice on how to adapt to climate change, with a special focus on transboundary basins. A collection of lessons learned and good practices on climate change adaptation in transboundary basins was subsequently developed in the period 2013–2015 to complement the *Guidance* document, and supports practical implementation.[360] Related issues are also covered under the principles of equitable and reasonable utilization and the no-harm rule, as well as by provisions on monitoring and joint bodies.[361] Broader systems-scale approaches can provide effective methods to enhance the adaptive capacity of transboundary water allocation arrangements. Such measures can include: monitoring and communication; information-gathering and management; financial and technical support; planned measures for emergency situations and droughts and floods; and amendment and review of the provisions of agreements in accordance with the agreed procedures and relevant principles of international law.[362]

CASE STUDY 31: **The Amu Darya River Basin: short- and long-term adaptability in water allocation**

The Amu Darya River Basin extends into the area of five States: Afghanistan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The majority of water is used for irrigated agriculture and hydropower production.

Water is allocated among Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan according to the 1992 Almaty Agreement on Cooperation in the Field of Joint Management on Utilization and Protection of Water Resources from Interstate Sources. The Agreement established the Interstate Commission for Water Coordination of Central Asia (ICWC).

In the Soviet period, a framework for water allocation was set in "The Revised Schemes for Integrated Use and Conservation of Water Resources in the Amudarya" (1987). The Schemes' allocation planning focused on irrigated agriculture expansion, the development of infrastructure and possible inter-basin transfer.

In the period of independence, the Soviet principles of water allocation were retained but the basin planning process changed. The ICWC has demonstrated good results in annual and seasonal water

359 UNECE, *Guidance on Water and Adaptation to Climate Change* (2009).

360 UNECE and INBO (2015).

361 According to the Water Convention, for example, "[t]he Riparian Parties shall, at regular intervals, carry out joint or coordinated assessments of the conditions of transboundary waters and the effectiveness of measures taken for the prevention, control and reduction of transboundary impact" (Art. 11.3). The Watercourses Convention includes climatic and hydrologic conditions as factors to be considered in the assessment of equitable and reasonable utilization (Art. 6).

362 See, for example, UNECE, *Guidance on Water and Adaptation to Climate Change* (2009); Heather Cooley and Peter H. Gleick, "Climate-proofing transboundary water agreements", *Hydrological Sciences Journal*, vol. 56, No. 4 (2011), p. 711–718; Sanchez and Roberts, eds. (2014); UNECE and INBO (2015).

allocation planning to adjust to variability and extremes. But the achievements in medium- and long-term basin planning are less encouraging. Over recent decades, water allocation has been driven primarily by current needs, rather than a comprehensive assessment of future demands and its impacts.

In the future, given the increasing water demand and diminishing water supply due to climate change, more integrated basin allocation planning is required. A framework for water allocation planning should be able to optimize the benefits from the available water supplies, manage demand and meet environmental needs.

Drought and flood management as adaptive allocation

The management of droughts and floods is an essential element of adaptive transboundary water allocation. Prolonged or extreme drought conditions or massive flooding always pose challenges to water allocation. The risks for and actualization of floods and droughts can be directly taken into account in transboundary water allocation arrangements. The arrangements should anticipate changes in hydrological cycles and respond to the increased water stress.

The United Nations global water conventions contain many provisions that are relevant for these purposes. The Watercourses Convention lays down an obligation to prevent and mitigate conditions resulting from, inter alia, drought or flood that may be harmful to other States, also in emergency situations (Arts. 27–28). The Water Convention obliges parties to prevent, control and reduce transboundary impacts (Art. 2) and develop contingency planning (Art. 3.1). The riparian countries have an obligation to inform each other without delay about any critical situation that may have transboundary impact and set up joint communication, warning and alarm systems (Art. 14) with the aim of obtaining and transmitting information. The Guidelines on Sustainable Flood Prevention, issued under the Water Convention in 2000, recommend that joint bodies develop long-term flood prevention and protection strategies and action plans. The Model Provisions on Transboundary Flood Management, adopted in 2006, provide assistance in the development of these strategies and other measures for transboundary river basins and thus provide guidance for allocation initiatives. The European Union Floods Directive (2007) has significance in a transboundary context. According to the Directive, the Member States must coordinate their flood risk management practices in shared river basins, including with non-Member States, and not undertake measures that would increase the flood risk in neighbouring countries. Competent authorities are required to engage in information exchange and coordination in transboundary river basin districts.

CASE STUDY 32: **Allocation of flood control and hydropower benefits through coordinated management of the Columbia River**

The Columbia River flowing between Canada and the United States is prone to flooding and inefficient hydropower generation. A major flood in 1948 gave urgency to the need for coordination of infrastructure development and management. The result is the Columbia River Treaty regime to which Canada and the United States are signatories. The Treaty regime covers construction and operational management of three dams on the main stem in Canada and allocation of benefits from joint management. It also allowed the construction of Libby Dam in the United States. The Treaty regime encapsulates the 1961 Treaty itself, the 1964 Treaty Protocol and associated implementing arrangements for the Treaty that have been developed in the years since.

Over the years, Treaty implementation has been shaped by notes exchanged between the two governments, and through numerous operational and supplemental arrangements between the United States and Canadian implementing entities. This includes arrangements for shaping flow to meet ecosystem objectives in both countries. The Treaty regime's key contribution is how it defined and operationalized the allocation of shared benefits. The agreement focused on the shared benefits

of four large mainstream dams to be managed cooperatively. "Benefits" were primarily conceived of as the economic value of decreased flooding and the increased hydropower generation resulting from management of four infrastructure projects. By estimating the tangible economic benefits of infrastructure for controlling floods and generating hydropower, the parties avoided the pitfalls of trying to allocate quantities of water across the border. It is noteworthy that the preamble of the 1961 Treaty recognized that other benefits would be made possible by securing cooperative measures for hydroelectric power generation and flood control.

What is allocated in the agreement is the economic value of increased flood control and the hydropower benefits generated by coordinated management. The United States paid Canada $64.4 million for the first 60 years of storage of potential floodwaters within Canadian dams—half the value calculated at the time for the damage that would not happen over that period. The two countries also divide equally the value of the additional hydropower generated through coordinated management of the three Canadian dams. Canada received $254 million for the first 30 years of hydropower benefits; its share of hydropower is currently delivered daily for use or resale. For the United States Treaty dam, the countries agreed that the benefits that occurred in either country from the operation of the dam would accrue to that country.

The Treaty required each country to name operating entities for day-to-day operations and established a Permanent Engineering Board to report on Treaty performance. The operating entities are BC Hydro (Canada) and the Administrator of the Bonneville Power Administration and Division Engineer of the Northwestern Division of the United States Army Corps of Engineers. The Treaty sets out goals for coordinated management, but no joint managing body. Thus it is a treaty of coordination rather than integration.

For that contribution, the Treaty deserves its reputation as one of the more creative of its kind. Nonetheless, the decision to focus on two criteria of benefits—flood control and hydropower—can constrain others of increasing import, especially ecosystem health and water quality. Despite the Treaty's primary focus criteria, the operating entities have used its flexibilities to enter operating arrangements to provide ecosystem benefits on both sides of the border. Ongoing challenges are thus more in terms of determining binational focus areas and prioritization than simply being restricted to considerations of hydropower and flood control. Consideration of major changes in values, representation or governance became an object of increased focus around 2010, when each operating entity launched regional processes concerning these issues and the potential for Treaty termination after 2024. Some operational arrangements for mutually beneficial operations to support fish in both countries have been implemented over the years, and non-Treaty entities have filled some of the dialogue/governance gaps.

5. National Water Laws' Coherence with Transboundary Arrangements

a. Implementation of transboundary water allocation arrangements at national level

Implementation of transboundary water allocation arrangements and agreements at national and subnational levels are crucial to their overall effectiveness. Domestic regulation of riparian States must usually be put in place or harmonized to implement the allocation of transboundary water resources agreed in transboundary water treaties. National laws may either support or constrain the implementation of these treaties. The interaction between domestic and international levels of regulation may become evident when national basin plans or thematic plans (e.g. on navigation, flood management or infrastructure development and management) concerning a transboundary basin are prepared. Alignment and coordination at these two levels should be taken into consideration as early as possible in the transboundary allocation planning

process and relevant national water resources legislation should be harmonized where appropriate and to the extent possible. In addition, national bodies that manage a part of a transboundary basin may exist alongside a joint transnational treaty body. The need for coherence between transboundary and national water regulation becomes specifically apparent when different water allocation plans are being prepared and implemented. In addition to the transboundary context (cooperation between countries), these plans may focus on allocating water resources between or among basins or federated States in a country or at a regional level.

It should be in all parties' interest to ensure that no conflicts emerge between the entitlements granted at different governance levels and that the integrity of the allocation system as a whole can be maintained.[363] In concrete terms, this can be achieved through joint efforts to ensure consistency and equity between transboundary and national laws, policies and plans concerning a given basin (which may require revising them) and in the sharing of costs and benefits from the different uses of the shared water resources (e.g. the maintenance costs of jointly used basin infrastructure). Furthermore, institutional and technical capacity of all States' agencies relevant to water management should also be taken into consideration in transboundary water allocation implementation plans.

b. Subnational level

It is noteworthy that federal States, cantons and other subnational entities can sometimes be parties to transboundary water agreements.[364] This stems from the structure of the participating States (the constitution) but it also reflects the general decentralization development in water management.

CASE STUDY 33: **Genevese Aquifer Agreement**

The 2008 agreement on the use, recharge and monitoring of Franco-Swiss Genevese groundwater followed establishment of cross-border legal bases which provided for the French party to allow the creation of operational structures between local authorities and/or local public bodies with legal personality. The Karlsruhe Agreement (1996) makes it possible to delegate the exercise of a mission to one of the communities, and in this case a cross-border agreement among the communities concerned provides for exploitation of artificial groundwater recharge. The signatories were, on the French side, the communes of the greater Annemasse region and the commune of Viry and, on the Swiss side, the State Council of the Republic and the canton of Geneva and the Genevese communes.

The situation may require specific solutions for cooperation: coordination must be ensured between different levels of domestic regulation and action(s) to avoid ambiguities of parties' responsibilities and the varying interests of States and provinces.

CASE STUDY 34: **Agreement between Bosnia and Herzegovina and the Republic of Croatia**

The 2015 Agreement between the Council of Ministers of Bosnia and Herzegovina and the Government of the Republic of Croatia on the rights and obligations of using water from public water supply systems crossed by the State border provides a basis for preparing contracts between municipalities for existing technically unique water supply systems and for the water supply systems that could be built. One of the interested parties must seek the written approval of the bilateral Commission for Water Management

363 Speed and others (2013), p. 42.

364 Gabriel de los Cobos, "The Genevese transboundary aquifer (Switzerland-France): the secret of 40 years of successful management", *Journal of Hydrology: Regional Studies*, vol. 20 (December 2018), p. 116–127

for the contract to enter into force, and such a decision states the maximum quantity of water that can be delivered. For example, Neum in Bosnia and Herzegovina supplies water to some local communities near Dubrovnik in Croatia.