6 European Water Law and Uncertainty

Managing Hydrological Variability in Shared River Basins in the EU

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hydrological variability, transboundary water governance, EU water law, shared river basins, variability management

Abstract
Hydrological variability has been on the rise in the past decades with dramatic consequences for water management on the national and international plane alike. Yet, most legal regimes governing the use and protection of water resources reflect a high degree of rigidity presuming that hydrological conditions prevailing at the time of their conception remain stable indefinitely. The mismatch between rigid legal frameworks and rapidly changing natural conditions are likely to give rise to new types of interstate conflicts in shared river basins (or accentuate existing ones), since historically the adoption of (new) transboundary governance regimes has been very slow and reactive in character. While the EU has been praised worldwide as an exemplary model of co-riparian cooperation, its multi-layered water governance regime also deserves a comprehensive fitness check that, among others, should evaluate its ability to handle the growing uncertainty surrounding underlying hydrological circumstances. This article provides a resilience assessment of European water law from the perspective of the management of hydrological variability.

6.1 Introduction: Hydrological Variability in the Anthropocene

Much of the world's legal institutions governing transboundary water management have evolved in relatively stable hydro-climatic conditions over the past century or so. These regimes therefore reflect a high degree of stationarity, an assumption that the physical parameters of the management of international rivers are sufficiently well-known and are largely predictable. Yet, the arrival of the Anthropocene ('age of man') has brought about new phenomena that are likely to alter the natural hydrological cycle beyond recognition.[1]

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1 Paul C. D. Milly *et al.*, 'Stationarity is Dead: Whiter Water Management?' *Science*, Vol. 319, Issue 5863, 2008, p. 573.

With stationarity declared dead by natural sciences, international water governance frameworks must embark on a fundamental adaptation course so they can continue to fulfil their foundational objective: ensuring the smooth cooperation of states over the utilization and protection of shared water resources. The principal facet of this adaptation challenge is the management of increasing hydrological variability with extreme events beyond historically recorded ranges and frequencies. Variability management is, therefore, an essential token of the resilience of a given governance system as it provides a means for the political and technical masters of transboundary water management to address elements of uncertainty and surprise in an orderly fashion.

This article investigates how the four overlapping regulatory regimes governing co-riparian relations in the EU – *i.e.* EU law, the UNECE framework, basin treaties and bilateral water agreements – address the question of hydrological variability. It does so from an analytical perspective with a view to identifying regulatory lacunae that may amount to major sources of conflict in shared river basins in the EU.

6.2 The Role of Variability Management in Co-Riparian Relations

Fluctuation of flow quantities is an inherent feature of any natural river system, even in temperate basins characterized by modest intra-annual variability. The variation of high and low water levels plays an important regulating role in riverine ecology and in traditional agriculture. Yet, a high degree of natural variability may also be a precursor to transboundary water conflict. Rivers with outstanding hydrological variability display a considerable tendency to trigger or contribute to political tensions among basin states. As Wolf *et al.* conclude

> "extreme events of conflicts were more frequent in marginal climates with highly variable hydrological conditions, while the riparians of rivers with less extreme natural conditions have been more moderate in their conflict/cooperation relationship."[2]

Consequently, managing hydrological variability can be a major challenge in co-riparian relations even at the best of times. Given, however, the impact of climate change on the hydrological cycle and human responses thereto (*e.g.* more irrigation in times of drought) controlling flow variability beyond previously recorded ranges will give rise to new levels of political difficulty all over the world. Not surprisingly, the question features high in

2 Aaron T. Wolf *et al.*, 'Conflict and Cooperation Within International River Basins: The Importance of Institutional Capacity', *Water Resources Update*, Vol. 125, 2003, p. 31.

recent hydro-political analyses. In fact, based on a mathematical modelling of the relationship between water conflicts and treaty configurations Dinar *et al.* actually suggest that legally defined adaptation mechanisms for hydro-variability are one of the few key factors of the resilience of co-riparian relations.[3]

6.3 Variability Management as a Policy and Regulatory Challenge

In the broadest sense of the word, variability management is about dealing with naturally occurring hydrological extremes, including floods, droughts and other specific variations.[4] It must be pointed out, however, that while both floods and droughts can be considered as extreme events, their impacts on co-riparian relations are quite different. Floods are typically short-term phenomena with a(n almost) mechanical knock-on effect on downstream riparians. The downstream motion of water can be predicted fairly precisely by widely available satellite-based technologies. On mid- and downstream areas, where population density tends to be the highest, these allow authorities and citizens to choose the adequate level of protection. Droughts, on the other hand, do not follow precisely calculable patterns and can last several months or years. Severe droughts trigger a variety of response measures by water managers, many of them actually having a dramatic impact on water availability downstream (typically: more irrigation). As a consequence, flood management features among the most 'benign' collective action problems of shared river basins, while natural or man-made water shortages or scarcity tends to be the most powerful driver of transboundary conflict.[5] Either way, variability management is closely linked to water quantity regulation.

The potentially very broad range of measures dealing with hydrological variability in a transboundary context can be clustered as follows:

3 Shlomi Dinar *et al.*, 'Climate Change, Conflict, and Cooperation – Global Analysis of the Resilience of International River Treaties to Increased Water Variability', *Policy Research Working Paper No. 6916*, The World Bank, Washington D.C., 2014, p. 20.

4 Id. p. 8.

5 Suzanne Schmeier, *Governing International Watercourses – River Basin Organizations and the Sustainable Governance of Internationally Shared Rivers and Lakes*, Routledge, London, 2013, p. 68.

i. *short term measures:*
   - flexible water allocation mechanisms (*e.g.* water sharing based on percentages) that require the automatic adjustment of cross-border river flow to changes in water availability;[6]
   - domestic water management measures aimed to minimize the transboundary impacts of hydrological extremes (emergency use of reservoirs to store or release water, stricter irrigation procedures *etc.*);[7]
   - emergency communication and cooperation mechanisms (data collection and sharing, early warning, immediate consultations, mutual assistance among riparian states *etc.*).[8]

ii. *long term measures:*
   - regular review of water allocation and relevant water uses;[9]
   - joint construction and/or operation of water infrastructure to increase water supply or store excess water;[10]
   - joint long-term planning for and management of hydrological extremes (*e.g.* transboundary flood risk mapping);
   - broadened cooperation with regards to issues that go beyond flow variability or the quantitative aspects of water.[11]

6.4 Variability Management in International Water Law: An Overview

Concerns about the natural variability of transboundary river flow are not a new phenomenon in international relations. As Drieschova *et al.* point out as early as 1863 the Netherlands and Belgium made allocation of water resources of the Meuse conditional upon annual variability. Yet, until relatively recently neither water treaties nor academic research have paid sufficient attention to the issue. As a result, general international water law scarcely addresses variability management in any explicit fashion. Thus, the various principles enumerated by of world's most eminent framework instrument: the 1997 UN Watercourses Convention[12] – *i.e.* equitable and reasonable utilization, the obligation not to cause significant harm and the obligation to cooperate – regulate the issue only indi-

6 Alena Drieschova *et al.*, 'Governance Mechanisms to Address Flow Variability in Water Treaties', *Global Environmental Change*, Vol. 18, Issue 2, 2008, p. 290.
7 Lucia De Stefano *et al.*, 'Climate Change and the Institutional Resilience of International River Basins', *Journal of Peace Research*, Vol. 49, Issue 1, 2012, p. 196.
8 Id.
9 Id.
10 Drieschova *et al.* 2008, p. 290.
11 Id. p. 291.
12 Convention on the Law of Non-navigational Uses of International Watercourses, New York, 21 May 1997.

rectly.[13] These principles imply the duty of watercourse states to manage hydrological extremes with due attention to the interests of other riparians. The Convention also calls on watercourse states to prevent and mitigate, individually and/or jointly, 'harmful conditions', *e.g.* floods, droughts or desertification that may have a negative impact on other riparian states.[14] When such conditions amount to an emergency situation, *i.e.* a sudden event actually or potentially causing serious harm to other watercourse states, the state of origin must immediately notify the (potentially affected) other riparians and take all practicable measures to prevent, mitigate or eliminate the harmful effects of the emergency.[15] Such emergency cooperation, however, does not apply to gradually unfolding events such as droughts and desertification.

In a similar fashion, the regional water governance agreement of the Southern African Development Community, the SADC Revised Protocol on Shared Watercourses[16] addresses hydrological variability only marginally, calling on riparian states to act individually and/or jointly to prevent and mitigate harmful conditions resulting from such natural causes as floods, droughts or desertification.[17]

As the scale of treaty area decreases, specific variability management schemes become more frequent. In fact, a meticulous review of 50 relevant basin treaties concluded between 1980 and 2002 by Drieschova *et al.* found that 68% of the water agreements explicitly mention flow variability.[18] *E.g.* the Mekong Cooperation Agreement[19] contains general and specific rules for water quantity management for the monsoonal wet and dry seasons.[20] In "cases of historically severe droughts and/or floods", however, the application of regular allocation rules is suspended.[21] Such exceptionally severe hydrological events are subject to early notification and the mandatory involvement of the Joint Committee of the Mekong River Commission with a view to adopting appropriate remedial action.[22] The Charter of Waters of the Senegal River[23] also foresees such consultation procedures in the event pre-

13 Stephen McCaffrey, 'The UN Convention on the Law of the Non-Navigational Uses of International Watercourses: Prospects and Pitfalls', *in* Salman M. A. Salman & Laurence Boisson de Chazournes (eds.), *International Watercourses – Enhancing Cooperation and Managing Conflict*, World Bank Technical Paper No. 414, Washington D.C., 1998, pp. 18-19.

14 *See* Article 27 of the Convention.

15 Id. Article 28.

16 SADC Revised Protocol on Shared Watercourses, Windhoek, 7 August 2000.

17 Id. Article 3(4)(a).

18 Drieschova *et al.* 2008, p. 287.

19 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin, Chieng Rai, 5 April 1995.

20 Id. Articles 5 and 6.

21 Id. Article 6.

22 Id. Article 10.

23 Charter of Waters of the Senegal River, 28 May 2002.

determined water allocations must be revisited due to floods, other natural disasters or water shortages of natural character.[24]

Apparently, water treaties primarily concerned with water allocation are more likely to contain some kind of mechanisms to handle extreme flow variations. For instance the 1996 Ganges Treaty between India and Bangladesh[25] calls for immediate consultations should the flow at the Farakka Dam at the border fall below a commonly agreed threshold so as "to make adjustments on an emergency basis, in accordance with the principles of equity, fair play and no harm to either party."[26]

6.5 Variability Management in European Water Law

6.5.1 The Structure and Normative Features of European Water Law

Co-riparian relations in the EU are governed by a complicated system of overlapping transnational legal regimes. Such normative characteristic stems from the unique constitutional construction of the EU, under which the management of shared water resources is subjected to four levels of supranational law (hereinafter collectively referred to as European water law): *(i)* EU primary law determines the distribution of powers in the field of water policy between the EU and its Member States. It also establishes horizontal institutional requirements and broad policy environmental objectives that apply across all levels of European water law; *(ii)* international water treaties ratified by the EU: the EU is an active player in the international water policy arena. Any treaty to which the EU accedes becomes automatically binding on EU institutions and Member States, even if some Member States choose not to become a party on their own right; *(iii)* EU secondary law: the bulk of EU water law has been adopted by EU institutions, mostly in the form of directives. Any such secondary legislation must conform to primary EU law as well as to international treaties approved by the EU; *(iv)* multilateral and bilateral water treaties concluded by EU Member States: the daily practice of cross-border water management takes place through basin treaties and bilateral water agreements. These treaties do not only have to comply with all three above layers of EU law, but – under the 'doctrine of harmonious interpretation' – Member States must also interpret them in light of the letter

24 Id. Articles 6 and 7.

25 Treaty between the Government of the Republic of India and the Government of the People's Republic of Bangladesh on sharing of the Ganga/Ganges waters at Farakka, New Delhi, 21 December 1996.

26 Id. Article II.

and spirit of relevant EU norms.[27] It means that Member States cannot conclude agreements to deviate from general EU or specific water law.

6.5.2 EU Water Law and Variability

EU water law addresses several facets of natural hydrological variability. In fact, one of the objectives of the EU's core water legislation, the Water Framework Directive (WFD), is to contribute to mitigating the effects of floods and droughts.[28] Yet, the coverage of these phenomena by the WFD is far from comprehensive, especially in a transboundary context. One major exception however stands out: Floods Directive creates an elaborate system of flood risk mapping and management that pays particular attention to the vulnerabilities of downstream riparian states.[29] Following the above classification, the measures aimed at managing hydrological variability in the EU's existing legal toolbox can be summarized as follows.

As regards short term management of hydrological extremes all that the WFD does is to create a temporary derogation from the obligation to comply with the objectives of good water status, *i.e.* the overarching objective of water management under EU law. These circumstances include in particular "extreme floods and prolonged droughts" or other conditions of natural cause or force majeure that are "exceptional or could not reasonably have been foreseen."[30] If a member state intends to invoke such derogation, it must, ironically, define in advance in the relevant river basin management plan the conditions under which such 'unforeseeable' emergency situation can be declared. It also must specify what measures will have to be taken under such circumstances.[31]

As regards long term adaptation to hydrological variability the WFD goes several steps further. First, it imposed an obligation on Member States to undertake a detailed analysis of the main characteristics of each river basin by 2004 that had to contain an analysis of all relevant water uses, human and natural impacts on river flow and groundwater status, including abstractions.[32] Ever since, Member States have been required to continuously monitor any developments in these factors, including the volume and rate or level of flow.[33]

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27 Pieter Jan Kuijper, 'It Shall Contribute to … the Strict Observance and Development of International Law…', *in* Allan Rossas *et al.* (eds.), *The Court of Justice and the Construction of Europe: Analyses and Perspectives on Sixty Years of Case-law*, TCM Asser Press, The Hague, 2013, p. 601.

28 Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (WFD), Article 1(e).

29 Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (Floods Directive).

30 WFD, Article 4(6).

31 Id. Article 4(6)(b) and (c).

32 Id. Article 5, Annex II.

33 Id. Article 8.

The impacts of natural and man-made fluctuations in stream flow had to be reviewed by 2014 and appropriate adaptation measures had to be included in the revised river basin management plans and program of measures.[34] The coordination framework of the WFD, however, ensures not only the collection and exchange of information among EU Member States on hydrological variability in shared basins. Through the consultation procedures in the context of international river basins it also provides a (limited) opportunity to influence each other's plans and measures to manage existing and emerging hydrological extremes.

Finally, EU law lays down sophisticated transboundary cooperation mechanisms in relation to floods. The above-mentioned Floods Directive sets up a scheme that complements the ecological program of the WFD with regard to flood risk management. The Directive is not concerned with short term emergency cooperation among riparian states. Instead, it obliges Member States to assess, develop and coordinate their flood control activity with a long term and comprehensive focus. Thus, EU governments are required to carry out a preliminary flood risk assessment and, subsequently, to establish flood hazard and flood risk maps.[35] Based on these maps Member States must adopt flood risk management plans that are coordinated at basin or at least sub-basin level.[36] The Directive requires flood risk management plans to address all aspects of flood management from prevention to emergency preparedness. The plans may also contain long term national adaptation measures such as the promotion of sustainable land use practices, improvement of water retention or controlled emergency flooding.[37] Importantly, the Floods Directive prohibits Member States from adopting measures that are liable to significantly increase flood risks upstream or downstream in the same basin, unless it has been specifically agreed upon by the affected riparians.[38] In the case of international river basins Member States must, as a priority, produce a single flood risk management plan or a set of coordinated plans for the entire basin. Should the riparian states concerned fail to deliver joint plan(s), the Floods Directive simply calls on individual Member States to produce their own flood risk management plan. A similar procedure applies *vis-à-vis* basin states outside the EU with the difference, however, that members must only 'endeavor' to arrive at a single plan with fellow co-riparians that are not bound by the Directive.[39]

34 Id. Article 5, Annex VII. *See* also *River Basin Management in a Changing Climate*, CIS Guidance Document No. 24, European Commission, Luxembourg, 2009.
35 Floods Directive, Articles 4-6.
36 Id. Article 7(1).
37 Id. Article 7(3).
38 Id. Article 7(4).
39 Id. Article 8.

6.5.3 The UNECE Water Convention

The UNECE Water Convention[40] – the overarching instrument of pan-European transboundary water cooperation – does not directly address variability management. Nonetheless, it contains a number of obligations that require riparian states to cooperate with respect to hydrological extremes. In addition, during the past two decades the Convention bodies have developed a number of soft law documents that provide guidance on how to manage the various impacts of climate change, the primary driver of increasing hydrological variability in the EU. While the latter instruments are legally non-binding, they are seen to contribute significantly to controlling the hydro-political risks relating to intensifying river flow fluctuations.[41]

The starting point under the Convention is the general obligation to prevent, control and reduce transboundary impact.[42] Transboundary impact is defined as "significant adverse effect […] caused by a human activity". Yet, the progressive reading of the Convention text and two decades of practice confirm that the impacts of naturally occurring hydrological extremes also fall under this obligation. This is because eventually, human acts and omissions contribute to the occurrence, magnitude or the damage potential of these phenomena.[43] Hand in hand with the prevention/mitigation obligation goes the general duty of riparian states to cooperate on a multitude of water management issues. These include the joint monitoring and regular assessment of transboundary impacts (including the quantity of transboundary waters, floods and ice drifts)[44] or the early exchange of information.[45] Also, in their basin treaties and/or bilateral arrangements riparian states have to establish warning and alarm procedures as well as contingency plans that cover hydrological extremes.[46] In case of critical situations parties are under a duty to assist each other following the procedures laid down by the Convention.[47]

In addition to the above general framework, the various Convention bodies have adopted a range of soft law instruments that provide further assistance to basin states as to the short- and long-term management of hydrological variability. First and foremost, the 2009 guidance document on water and climate adaptation is designed to assist states

40 Convention on the Protection and Use of Transboundary Watercourses and Lakes, Helsinki, 17 March 1992.

41 Francesca Bernardini, 'The Normative and Institutional Evolution of the Convention', *in* Attila Tanzi *et al.* (eds.), *The UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes – Its Contribution to International Water Cooperation*, Brill Nijhoff, Leiden, Boston, 2013, pp. 43-44.

42 UNECE Water Convention, Articles 1(2) and 2(1).

43 Alexandros Kolliopoulos, 'The UNECE Model Provisions on Transboundary Flood Management', *in* Tanzi *et al.* (eds.), 2015, p. 369.

44 UNECE Water Convention, Articles 4, 9(2), 11(1) and 13(3).

45 Id. Articles 6 and 13(1).

46 Id. Articles 3(1), 9(2) and 14.

47 Id. Article 15.

in tackling a range of climate change-related water issues in a transboundary context, including flood and drought mitigation and response.[48] Equally important are the UNECE Model Provisions on Transboundary Flood Management,[49] endorsed by the Meeting of the Parties of the Convention in 2006, that provide a concrete legislative text that can be used by riparian states in their specific basin-wide or bilateral arrangements to tackle the challenges of transboundary flood control. The Model Provisions follow a similar logic as the EU's Floods Directive, but, unlike the former, they also cover short term risk assessment and emergency response.[50]

6.5.4 Multilateral Basin Treaties

Despite its primary ecological focus, the Danube Protection Convention[51] contains a number of substantive and procedural provisions that help riparian states address hydrological variability in a systematic and structured fashion. The preamble to the Convention directs specific attention to "the occurrence and threats of adverse effects, in the short and the long term, of changes in conditions of watercourses within the Danube River Basin".[52] It follows that the primary obligation of Danube states is to cooperate in the prevention, control and reduction of transboundary "adverse impacts and changes occurring or likely to be caused."[53] Joint action thus extends not only to man-made transboundary impacts, but must also encompasses the monitoring and evaluation of the natural water cycle and all of its components (precipitation, evaporation, surface and groundwater run-off) in the entire basin.[54] From this general objective flow a number of precisely defined obligations. First, riparian states must monitor, record and assess, jointly and individually, the conditions of the Danube's natural water resources through a number of quantitative parameters, including water balances, flood forecasts or any change in the riverine regime.[55] Second, under the general obligation to prevent, control and reduce transboundary impacts riparian states are obliged to exchange all relevant data, including the operation of existing hydrotechnical constructions (*e.g.* reservoirs, water power plants) and measures aimed at preventing the deterioration of hydrological conditions, erosion, inundations and sediment flow *etc.*[56] Regular exchange of information must be supplemented by coordinated or joint

48 UNECE, *Guidance on Water and Adaptation to Climate Change*, Geneva, 2009. *Also see* Bernardini 2015, p. 44.
49 UNECE, *Model Provisions on Transboundary Flood Management*, ECE/MP.WAT/2006/4.
50 Kolliopoulos 2015, p. 369.
51 Convention on Cooperation for the Protection and Sustainable Use of the Danube, Sofia, 29 June 1994.
52 Id. Recital 2.
53 Id. Article 5(2).
54 Id. Article 1(c)(g).
55 Id. Articles 5(2)(a) and 9(1).
56 Id. Articles 3(2) and 12.

communication, warning and alarm systems as well as emergency plans to address critical water conditions, including floods and ice-hazards.[57] Should such a critical situation of riverine conditions arise, riparian states must provide mutual assistance upon the request of the affected basin state.[58]

The daughter treaty of the Danube Convention, the Sava Framework Agreement[59] goes even further when it comes to managing hydrological variability. The Agreement specifically refers to droughts and water shortages as critical hazards jeopardizing the integrity of the river's water regime.[60] It therefore calls upon riparian states to establish a coordinated or joint system of "measures, activities and alarms in the Sava River Basin for extraordinary impacts on the water regime, such as […] discharge of artificial accumulations and retentions caused by […] flood, ice, drought, water shortage […]."[61] To that effect, parties even committed themselves to conclude a special protocol "on the protection against flood, excessive groundwater, erosion, ice hazards, drought and water shortages."[62] Out of this ambitious variability management program, however, only a protocol on flood management cooperation was adopted by the riparian states in 2010.[63] This protocol, on the one hand, provides for the coordinated implementation of the EU Floods Directive in the basin (even though half of the riparian states are not EU members).[64] On the other hand, it creates an operative system of flood protection, comprising forecasting, warning and alarm, information exchange as well as the handling of emergency situations and mutual assistance.[65]

The Rhine Protection Convention[66] addresses variability management along similar lines, although in a far less elaborate fashion. The key objectives of the Convention – the maintenance and restoration of the natural functions of the Rhine basin waters, the environmentally sound management of water resources and general flood protection and prevention – imply broad cooperation in flood protection and other hydrological hazards.[67] Thus, riparian states must inform the competent river basin organization, the International Commission for the Protection of the Rhine (ICPR) and other riparian states likely to be affected by imminent flooding.[68] They must also draw up warning and alert plans for the Rhine under the coordination of the ICPR.[69] Rhine basin states also actively cooperate on

57 Id. Article 16.
58 Id. Article 17.
59 Framework Agreement on the Sava River Basin, Kranjska Gora, 3 December 2002.
60 Id. Articles 2(1) and 13.
61 Id. Article 13(1).
62 Id. Article 30(1)(a).
63 Protocol on Flood Protection to the Framework Agreement on the Sava River Basin, Gradiška, 1 June 2010.
64 Id. Articles 3-8.
65 Id. Articles 9-11.
66 Convention on the Protection of the Rhine, Bern, 12 April 1999.
67 Id. Article 3.
68 Id. Article 5(6).
69 Id. Article 8(1)(c).

certain long term variability questions such as extreme low water levels and declining water availability even in the absence of explicit treaty requirements to that effect.[70]

The Meuse Agreement[71] defines the mitigation of the effects of floods and droughts as one of the key objectives of transboundary cooperation.[72] In both cases joint riparian action should extend to the development of preventive measures.[73] To that end, the International Meuse Commission is tasked with developing recommendations on flood prevention and protection, flood management coordination as well as on the mitigation of the effects of droughts.[74] Meuse riparians are also obliged to inform each other of any major hydrological events, including imminent floods.[75]

The 1990 Elbe and the 1996 Oder Conventions make no reference whatsoever to hydrological variability, not even flood protection cooperation. The two basin commissions are, however, tasked with monitoring the general hydrological situation in their respective catchment areas.[76]

While explicit treaty justification to do so remains limited or entire missing, all relevant river basin commissions are extensively engaged in climate change adaptation and flood management. *E.g.* the International Commission for the Protection of the Danube (ICPDR) adopted, in 2012, a climate change strategy which outlines the guiding principles of adaptation and their integration in the ICPDR's activities, especially in implementing the Water Framework Directive and the Floods Directive. Similar strategies have been adopted for the Rhine or in progress for the Sava basin.[77]

6.5.5 Bilateral Water Agreements

The most comprehensive of all bilateral water agreements, the Albufeira Convention[78] between Spain and Portugal addresses hydrological variability in a substantive and sophisticated manner. The Convention expressly defines the prevention, elimination, mitigation or control of the effects of exceptional situations as a key priority of cooperation

70 Heide Jekel, 'Integrated Water Resources Management as a Tool to Prevent or Mitigate Transboundary Impact', *in* Tanzi *et al.* (eds.), 2015, p. 237.
71 Accord international sur la Meuse, Gent, 3 December 2002.
72 Id. Recitals (7) and (8).
73 Id. Article 2(c).
74 Id. Article 4(4)(a) and (b).
75 Id. Article 3(2)(d).
76 Convention on the International Commission for the Protection of the Elbe, Magdeburg, 8 October 1990, Article 2, Convention on the International Commission for the Protection of the Oder, Wroclaw, 11 April 1996, Article 2.
77 Jekel 2015, p. 247.
78 Convention on the Co-operation for the Protection and the Sustainable Use of the Waters of the Luso-Spanish River Basins, Albufeira, 30 November 1998.

between the parties.[79] Consequently, the Convention sets out a robust water allocation regime that caters for natural variations in river flow that also include extreme situations. (Extreme hydrological situations are determined with reference to historic precipitation levels).[80] Should such a situation emerge, parties must inform each other and the joint Commission and exchange all relevant information.[81] The Convention also sets out concrete substantive measures parties must implement in case of floods and droughts. With regards to floods the applicable regime goes further than the usual forecasting-warning-emergency-preparedness provisions most regional or bilateral similar regimes contain. It also gives upper and lower riparian states a right to demand the other party to implement pre-defined (or any other) interventions that are necessary to prevent, control or mitigate the effects of floods.[82] Even more elaborate are the measures relating to droughts and water scarcity. In this context the Convention defines a set of concrete drought management measures to prevent and control the effects of low precipitation and discharge. These relate to water demand control (abstractions for consumption), infrastructure management (impoundment, storage and release), wastewater discharges *etc.*[83] Conditions of exceptional situations – both floods and droughts – are to be defined for every two years and subsequently reviewed. The Convention also calls for the joint study of water scarcity and floods with a view to long term prevention and mitigation.[84]

Several other European bilateral water treaties make some reference to cooperation over flood prevention and protection. Most of these treaty provisions are, however, relatively basic, reinstating the general will or duty of the parties to cooperate and/or referring the subject to the activities of joint commissions.[85] In a limited number of cases bilateral water treaties contain substantive obligations parties must observe in flood protection or other emergency situations. *E.g.* the Hungarian-Ukrainian frontier water treaty[86] requires parties to refrain from permitting any interventions that may raise flood volumes above previously agreed-upon levels. In the spirit of solidarity riparian states are also obliged to provide technical assistance in times of exceptional floods upon demand (the costs of such technical

79 Id. Article 10(1)(f).
80 Id. Annex II to the Additional Protocol.
81 Id. Article 11.
82 Id. Article 18(5).
83 Id. Article 19(2).
84 Id. Articles 18(7) and 19(5).
85 Agreement between Finland and Sweden Concerning Transboundary Rivers, Agreement between Finland and Sweden Concerning Transboundary Rivers, Stockholm, 11 November 2009, Article 2(1)(b); Agreement between the Federal Republic of Germany and the European Economic Community, on the one hand, and the Republic of Austria, on the other, on cooperation on management of water resources in the Danube Basin, Regensburg, 1 December 1987, Articles 2(2)(b) and 6.
86 Convention between the Government of the Republic of Hungary and the Government of Ukraine on water management questions relating to frontier waters, Budapest, 11 November 1997, Articles 9(1) and 9(4).

assistance are to be borne by the beneficiary).[87] As opposed to flood protection the management of droughts rarely features in bilateral water treaties. Exceptions are those bilateral agreements that are primarily concerned with transboundary flow regimes or water allocation anyway. Thus, the 1991 Discharge Rule[88] between upstream Finland and downstream Russia for the Vuoksi river basin calls on riparian states to maintain the flow quantity of the river in a 'normal zone', defined by the Rule with reference to historically prevailing natural flow volumes. Should extreme low water levels appear discharge rates must be changed by Finland with a view to minimizing adverse effects.[89] The 1970 amendment of the 1958 French-Spanish Agreement regarding the Lake Lanoux also takes into account natural flow variations, although it does not specifically address droughts or floods. The allocation regime calls for the increased discharged towards Spain in the summer months "in order to take account of the evaporation from the enlarged surface area of the Lake."[90]

6.6 Evaluation and Conclusions

The four layers of European water law regulate an important aspect of variability management, notably flood prevention and protection at an exemplary level of sophistication. Given the high number of catastrophic inundations most international basins witnessed only during this millennium, the complementary regimes of the EU Floods Directive, the UNECE Model Provisions and the extensive cooperation at basin and bilateral level seem to constitute an adequate regulatory response to the collective action problems posed by excess water levels.

Less positive is the picture when it comes to long term adaptation to hydrological extremes, especially prolonged droughts. Here, the systematic review of the main characteristics of each basin, as foreseen by the Water Framework Directive, ensures that riparian states address changing hydrological conditions on a regular and substantive basis. Also, it allows riparian states to have an impact on the joint river basin management plans and, to a lesser extent, on each other's programs and measures. Yet, neither EU and UNECE law, nor basin treaties call for real adaptation interventions. The various climate change adaptation strategies developed by the river basin organizations only provide general

87 Anikó Raisz & János Ede Szilágyi, 'Cross Border Issues of the Hungarian Water Resources', *Rivista quadrimestrale di diritto dell'ambiente*, Vol. 1, Issue 1, 2017, p. 86.

88 Vuoksi Agreement on Discharge Rule in Lake Saimaa and the Vuoksi River, 1989.

89 Antti Belinskij, 'Cooperation between Finland and the Russian Federation', *in* Tanzi *et al.* (eds.), 2015, p. 315.

90 Exchange of Letters Constituting an Agreement between France and Spain Amending the Arrangement of 12 July 1958 relating to Lake Lanoux, 27 January 1970.

guidance as to future measures and do not address the potential of political risks prolonged droughts are likely to pose in transboundary relations.

Finally, European water law addresses the short-term consequences of prolonged low river flows only marginally. Undoubtedly, the basic principles of transboundary water cooperation (equitable and reasonable utilization and the no-harm rule) together with the various information exchange and notification procedures provide a rudimentary framework to handle such critical situations. These, however, do not amount to any operative guidance to riparian states as to the immediate adaptation measures to be taken, including adjustments in transboundary flow allocation. This shortcoming can, in part, be explained by the fact that hitherto basin-wide extreme droughts have been relatively rare (apart from the Iberian Peninsula), so there was no real need and political will to address the contentious issue of national water use restrictions or the curtailing of transboundary flows. In part, however, the root of the problem lies in the notoriously complacent approach of EU law and decision-makers *vis-à-vis* the question of transboundary water allocation.[91] This regulatory lacuna and political timidity may, in the future, turn out to be a critical hydropolitical risk, if droughts and scarcity continue to intensify in a transboundary context as projected.

91 Gábor Baranyai, 'Transboundary Water Governance in the European Union: The (Unresolved) Allocation Question', *Water Policy*, Vol. 21, Issue 2, 2019, p. 1.