Chapter 4:
Prevention of Transboundary Harm from Biotechnology Under Customary International Law

The preceding chapter has shown that the existing international instruments may be insufficient to effectively prevent adverse transboundary effects of LMOs. For this reason, existing universal rules of customary international law may be particularly relevant in determining the rights and obligations of states in the prevention of transboundary harm.

As defined in Article 38(1) of the Statute of the *International Court of Justice* (ICJ),[1] rules of custom require a general practice of states carried by a corresponding conviction that their conduct is legally required.[2] The most fundamental obligation in international environmental law, and one of the cornerstones of modern international law generally, is the obligation of states to ensure that activities within their territory do not cause harm to the territory of other states (A.).

After assessing the material and spatial scope of this obligation (B.), the present chapter analyses the doctrine of due diligence, which is the standard of conduct in the fulfilment of this obligation (C.). Besides, the preventive obligation also entails more specific procedural obligations that must be observed by states (D.). Yet, identifying breaches of the obligation to prevent transboundary harm, which would entail the international responsibility of the source state, is prone to difficulties (E.).

A. The Legal Foundation of the Obligation to Prevent Transboundary Harm

The obligation not to cause significant transboundary environmental interference has its roots in the principle that the territorial sovereignty of states finds its limits where its exercise adversely affects the territorial sovereignty

1 Statute of the International Court of Justice (18 April 1946), 33 UNTS 993.

2 Cf. ICJ, North Sea Continental Shelf (Federal Republic of Germany v. Denmark; Federal Republic of Germany v. Netherlands), Judgment of 20 February 1969, ICJ Rep. 3, para. 77.

and integrity of other states.[3] This principle is, in turn, based on the even more fundamental principle of *sic utere tuo ut alienum non laedas*, which dictates that one shall use his own property so as not to harm that of another.[4] Although the obligation not to cause transboundary harm had been recognized in scholarly literature much earlier,[5] the first prominent expression of this principle was made by the arbitral tribunal in the *Trail Smelter* case, which concluded in 1939 that

> *'under the principles of international law […] no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.'*[6]

Subsequently, the obligation not to cause transboundary harm was recognized and endorsed by the international community in numerous multilateral treaties and *soft law* declarations. While the Trail Smelter principle was still phrased in a prohibitive manner ('no State has the right'), the emphasis later shifted towards a positive obligation of states to proactively ensure that activities under their jurisdiction do not cause harm to other states.[7] This resulted in the so-called 'principle of prevention', which was first recognized on the universal level in Principle 21 of the *Stockholm Declaration* of 1972:

> *'States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause*

3 Cf. ICJ, Corfu Channel Case (United Kingdom v. Albania), Merits Judgment of 09 April 1949, ICJ Rep. 4, 22, noting that a state must not 'knowingly allow its territory to be used for acts contrary to the rights of other States'.

4 See *Leslie-Anne Duvic-Paoli*, The Prevention Principle in International Environmental Law (2018), 16–21.

5 Cf. *Lassa F. L. Oppenheim*, International Law: A Treatise (2nd ed. 1912), § 127, arguing that: 'A State, in spite of its territorial supremacy, is not allowed to alter the natural conditions of its own territory to the disadvantage of the natural conditions of the territory of a neighbouring State.'

6 Trail Smelter Case (United States v. Canada), Decision of 11 March 1941, III RIAA 1938, 1965; see *John E. Read*, The Trail Smelter Dispute, 1 (1963) Canadian YBIL 213.

7 See *Duvic-Paoli* (n. 4), 27–46.

damage to the environment of other States or of areas beyond the limits of national jurisdiction.'[8]

The parallel recognition of the states' sovereignty over their own resources on the one hand, and their obligation not to cause transboundary harm on the other, was subsequently reaffirmed in the *Rio Declarations* of 1992[9] and 2012.[10] It was also incorporated into a number of multilateral agreements on the environment,[11] including the *Convention on Biological Diversity*[12] and the *United Nations Convention on the Law of the Sea*.[13] Both conventions are virtually universally ratified.[14]

The obligation to prevent transboundary harm has also been recognized in international jurisprudence.[15] The ICJ first recognized the principle in

8 Declaration of the United Nations Conference on the Human Environment (16 June 1972), UN Doc. A/Conf.48/14/Rev.1 (hereinafter 'Stockholm Declaration 1972'), Principle 21.

9 Rio Declaration on Environment and Development (14 June 1992), UN Doc. A/CONF.151/26/Rev.1 (Vol. I) (hereinafter 'Rio Declaration 1992'), Principle 2.

10 The Future We Want: Outcome Document of the United Nations Conference on Sustainable Development (22 June 2012), UN Doc. A/RES/66/288, Annex, paras. 14, 15, 227.

11 For an analysis of preventive obligations in treaty law, organized by types of risk, see *Duvic-Paoli* (n. 4), 66–76. For reiterations of the principle of prevention in regional treaties, see *Philippe Sands* et al., Principles of International Environmental Law (4th ed. 2018), 209.

12 Cf. Convention on Biological Diversity (05 June 1992; effective 29 December 1993), 1760 UNTS 79 (hereinafter 'CBD'), Article 3.

13 Cf. United Nations Convention on the Law of the Sea (10 December 1982; effective 16 November 1994), 1833 UNTS 3 (hereinafter 'UNCLOS'), Article 194(2). On the jurisprudence of ITLOS on environmental matters, see *Jiang Xiaoyi/Zhang Jianwei*, Marine Environment and the International Tribunal for the Law of the Sea: Twenty Years' Practices and Prospects, 5 (2017) China Legal Science 84.

14 The only notable exception is the United States, which has not ratified either of the conventions (it has signed the CBD in 1993 but not ratified it since, and has neither signed nor acceded to the UNCLOS). However, the obligation not to cause significant transboundary harm is recognized in other environmental agreements to which the United States are a party, such as the United Nations Convention to Combat Desertification (14 October 1994; effective 26 December 1996), 1954 UNTS 3 (hereinafter 'UNCCD'), the Vienna Convention for the Protection of the Ozone Layer (22 March 1985; effective 22 September 1988), 2513 UNTS 293, and the United Nations Framework Convention on Climate Change (09 May 1992; effective 21 March 1994), 1771 UNTS 107 (hereinafter 'UNFCCC').

15 For an overview of relevant international case-law, see *Phoebe N. Okowa*, Responsibility for Environmental Damage, in: Malgosia A. Fitzmaurice/David Ong/

its advisory opinion on the *Legality of the Threat or Use of Nuclear Weapons* of 1996, in which it concluded that:

> *'The existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment.'*[16]

Since then, the Court has reiterated the principle of prevention in several cases, including the case concerning the *Gabčíkovo-Nagymaros Project*,[17] the *Pulp Mills* case,[18] and the *Certain Activities* case between Nicaragua and Costa Rica.[19] It is, therefore, safe to conclude that the obligation of states to prevent transboundary environmental harm is well established in both international treaties and customary international law, and forms one of the cornerstones of international environmental law.[20]

The *International Law Commission* (ILC),[21] which has been considering the issue of transboundary environmental harm since 1978, adopted *Draft*

Panos Merkouris (eds.), Research Handbook on International Environmental Law (2010) 303, 305–312; *Duvic-Paoli* (n. 4), 137–166.

16 ICJ, Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion of 08 July 1996, ICJ Rep. 226, para. 29.

17 ICJ, Gabčíkovo-Nagymaros Project (Hungary v. Slovakia), Judgment of 25 September 1997, ICJ Rep. 7, para. 53.

18 ICJ, Pulp Mills on the River Uruguay (Argentina v. Uruguay), Judgment of 20 April 2010, ICJ Rep. 14, para. 193.

19 ICJ, Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) and Construction of a Road in Costa Rica along the San Juan River (Nicaragua v. Costa Rica), Merits Judgment of 16 December 2015, ICJ Rep. 665, para. 118. For an overview of the Court's jurisprudence relating to the environment, see *Alan E. Boyle/Catherine Redgwell*, Birnie, Boyle, and Redgwell's International Law and the Environment (4th ed. 2021), 156–158.

20 *Rebecca M. Bratspies*, State Responsibility for Human-Induced Environmental Disasters, 55 (2012) German YBIL 175, 185; *Sands* et al. (n. 11), 207; *Duvic-Paoli* (n. 4), 174–175.

21 The ILC was established by the UN General Assembly in 1947 in order to promote the codification and progressive development of international law, accordance with Article 13(1)(a) of the UN Charter, cf. UNGA, Resolution 174 (II). Establishment of an International Law Commission (21 November 1947), UN Doc. A/RES/174(II). The ILC prepares draft conventions (commonly referred to as 'draft articles') on subjects which have not yet been regulated by international law or in regard of which the law has not yet been sufficiently developed in state practice, see Statute of the International Law Commission (21 November 1947), UN Doc. A/RES/174(II), last amended by UNGA resolution 36/39 of 18 November 1981, Article 15. The ILC's draft articles are often regarded as codify-

Articles on the Prevention of Transboundary Harm from Hazardous Activities in 2001.[22] The Articles stipulate that states shall take 'appropriate measures to prevent significant transboundary harm or at any event to minimize the risk thereof' from being caused by hazardous activities carried out under their jurisdiction.[23] This pivotal obligation is further specified in a set of detailed rules on both procedural and substantive aspects of prevention. The core of these rules is widely recognized as representing customary international law,[24] although it is questionable whether the Articles in their entirety can be regarded as a codification of custom.[25] As shown subsequently, the precise legal content and the specific duties flowing from the obligation to prevent transboundary harm are still unsettled.[26]

B. Scope of the Obligation to Prevent Transboundary Harm

Before discussing the substantive content of the obligation to prevent transboundary harm, it is necessary to clarify the scope of this obligation. The ILC's Articles on Prevention, which are the 'text of reference' to analyse the scope of the preventive obligation,[27] apply to 'activities not prohibited by international law which involve a risk of causing significant transboundary harm through their physical consequences'.[28]

Thus, the obligation applies to harm (I.) in a transboundary context (II.), provided that such harm is caused through the 'physical consequences' of an activity (III.). The obligation is triggered whenever there is a 'risk of significant transboundary harm', which is a combined threshold incorpo-

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ing the pertinent rules of customary international law, see *Fernando L. Bordin*, Reflections of Customary International Law: The Authority of Codification Conventions and ILC Draft Articles in International Law, 63 (2014) ICLQ 535.

22 ILC, Draft Articles on Prevention of Transboundary Harm from Hazardous Activities, with Commentaries (2001), YBILC 2001, vol. II(2), p. 148 (hereinafter 'ILC, Articles on Prevention').

23 *Ibid.*, Article 3.

24 See *Boyle/Redgwell* (n. 19), 154.

25 Cf. ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge Donoghue, para. 19, warning that 'their role in the assessment of State practice and *opinio juris* must not be overstated'. For a detailed analysis, including of comments by states in the Sixth Committee of UNGA, see *Duvic-Paoli* (n. 4), 101–104.

26 *Bratspies* (n. 20), 185.

27 *Duvic-Paoli* (n. 4), 234.

28 ILC, Articles on Prevention (n. 22), Article 1.

rating both the potential magnitude of harm (IV.) and the probability that harm will occur (V.). In situations where risk cannot be clearly anticipated, it is questionable whether the precautionary principle mandates or even requires preventive action (VI.). Finally, it is assessed whether these criteria capture transboundary risks arising from products of modern biotechnology such as living modified organisms (VII.).

I. Harm

There is no consistent terminology to describe the subject matter of the obligation of prevention.[29] Instead, terms like 'transboundary impacts', 'transboundary pollution', 'transboundary adverse effects', and 'transboundary environmental interference' are often used interchangeably.[30] The ILC has distinguished between 'transboundary harm' and 'transboundary damage', using 'harm' to denote the adverse effects that may ensue from a hazardous activity and 'damage' for those consequences once they have materialized.[31] 'Damage' is also the term which is commonly used in international instruments on environmental liability.[32] But in the context of preventive obligations, the ILC has rather referred to

29 Also see *James Crawford*, Fourth Report on State Responsibility, UN Doc. A/CN.4/517 and Add.1 (2001), para. 30.

30 See, e.g., *René Lefeber*, Transboundary Environmental Interference and the Origin of State Liability (1996), 8–10; *Hanqin Xue*, Transboundary Damage in International Law (2003), 3–10.

31 *Julio Barboza*, The Environment, Risk and Liability in International Law (2011), 10; cf. ILC, Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising Out of Hazardous Activities, with Commentaries (2006), YBILC 2006, vol. II(2), p. 56 (hereinafter 'ILC, Allocation of Loss Principles'), Commentary to Principle 1, para. 11; also see *Joanna Kulesza*, Due Diligence in International Law (2016), 205.

32 See e.g. International Convention on Civil Liability for Oil Pollution Damage (29 November 1969; effective 19 June 1975), 973 UNTS 3, as amended by the Protocol of 27 November 1992 (effective 30 May 1996), 1956 UNTS 255, Article 1(6); Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal (10 December 1999; not yet in force), UNEP/CHW.5/29, p. 88, Article 2(2)(c); ILC, Allocation of Loss Principles (n. 31), Principles 1 and 2(a); Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety (15 October 2010; effective 05 March 2018), UN Doc. UNEP/CBD/BS/COP-MOP/5/17, p. 64 (hereinafter 'Supplementary Protocol'), Article 2(2)(b).

'harm'.[33] Interestingly, the ILC's Articles on Prevention do not provide a comprehensive definition of this term, but merely state that it shall include 'harm caused to persons, property and the environment'.[34] English dictionaries also provide no abstract definition of the term but only refer to synonyms such as *injury*, *loss*, or *damage*.[35] Consequently, the preventive obligation is not limited to 'environmental harm' (a term which involves its own definitional problems[36]), but in principle covers any type of transboundary interference that has adverse or injurious consequences.[37]

II. Transboundary Harm

'Transboundary harm' is commonly understood as harm which is caused by an activity in one state and which materializes in the territory of another state.[38] Contrary to what the term might imply, transboundary harm can occur whether or not the states concerned share a common border.[39] However, the notion of transboundary harm may raise problems when the harm does not originate from a place under the jurisdiction or control of a state (1.), or when harm is caused to an area beyond the limits of national jurisdictions (2.) or to 'global commons' (3.).

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33 See ILC, Articles on Prevention (n. 22), Article 2(b).

34 See. *ibid.*, Commentary to Article 2, para. 8, assuming that this was 'self-explanatory'.

35 Cf. 'harm, n.' in: *James Murray* et al., Oxford English Dictionary, Online Edition, available at: http://www.oed.com/ (last accessed 28 May 2022); *Bryan A. Garner* (ed.), Black's Law Dictionary (11th ed. 2019), 861.

36 The term 'environment' is not defined in the Articles on Prevention, but in the ILC's *Principles on Allocation of Loss*, where the environment is broadly defined as including 'natural resources, both abiotic and biotic, such as air, water soil, fauna and flora, and the interaction between the same factors, and the characteristic aspects on the landscape', cf. ILC, Allocation of Loss Principles (n. 31), Principle 2(b); see *Duvic-Paoli* (n. 4), 180. Also see the introduction to chapter 11.

37 *Ibid.*, 66–67; also see *R. D. Munro/Johan G. Lammers* (eds.), Environmental Protection and Sustainable Development (1987), 38, which define the term 'environmental interference' as 'any impairment of human health, living resources, ecosystems, material property, amenities or other legitimate uses of a natural resource or the environment caused, directly or indirectly, by man through polluting substances, ionizing radiation, noise, explosions, vibrations or other forms of energy, plants, animals, diseases, flooding, sand-drift or other similar means'.

38 Cf. ILC, Articles on Prevention (n. 22), Article 2(c) and (d), and commentary, para. 9; *Lefeber* (n. 30), 10; *Xue* (n. 30), 8–9.

39 ILC, Articles on Prevention (n. 22), Article 2(c).

1. 'Extraterritorial' Transboundary Harm

It is recognized that transboundary harm may also originate from locations outside the territory of a state, provided that the activity is conducted under the 'jurisdiction or control' of that state.[40] The notion 'jurisdiction' refers to all situations in which the state is authorized by international law to exercise governmental authority, such as over ships or aircraft flying its flag.[41]

The notion 'control' has been used to refer to situations in which a state is exercising *de facto* jurisdiction, such as in cases of unlawful intervention, occupation, and unlawful annexation.[42] Hence, the meaning of 'control' in the present context appears to be different from that of the same term under the international law of state responsibility. According to Article 8 of the ILC's *Articles on State Responsibility*,[43] the conduct of a non-state actor 'shall be considered an act of a State' if that person or group is in fact acting under the 'control' of that state. It is recognized that this implies a higher threshold than mere control of a state over its territory and the persons residing therein.[44] Compared to this, the notion of 'jurisdiction or control' in the context of transboundary harm refers not to control over individuals and their activities, but to control over territory in the sense

40 *Ibid.*, Article 2(d) and commentary to Article 1, para. 9. *Vice versa*, transboundary harm may not only affect the territory of another state but also other places under its jurisdiction or control, see ILC, Articles on Prevention (n. 22), Article 2(c) and commentary thereto, para. 9.

41 *Ibid.*, Commentary to Article 1, para. 10; *Lefeber* (n. 30), 11.

42 ILC, Articles on Prevention (n. 22), Commentary to Article 1, para. 12; *Lefeber* (n. 30), 11–12; see *Markus Vordermayer*, The Extraterritorial Application of Multilteral Environmental Agreements, 59 (2018) Harv. Int'l L. J. 59, 65, noting that '[i]n the environmental context, no specific jurisdiction rules have so far emerged; states thus need to resort to the general rules of jurisdiction, notably the territoriality principle, in order to regulate and control, for example, the activities of foreign companies'.

43 ILC, Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries (2001), YBILC 2001, vol. II(2), p. 31 (hereinafter 'ARSIWA').

44 ICJ, Corfu Channel (Merits) (n. 3), 18; cf. ARSIWA (n. 43), Commentary to Article 8, para. 3.

of *de facto jurisdiction*,[45] which does not require that a state is aware of the relevant activities or even has 'effective' control over them.[46]

Nevertheless, there may be situations where a state has 'control' over the conduct of non-state actors even though it does not exercise 'jurisdiction or control' over the place where the conduct is carried out. This could be the case where non-state actors acting under a state's control operate in areas beyond national jurisdiction or – illegally – in the territory of another state, for instance by releasing LMOs.[47] In such situations, it could be argued that the obligation to prevent transboundary harm did not apply because the relevant activities did not occur under the (territorial) 'jurisdiction or control' of the responsible state.[48] However, to avoid fragmentation as well as *lacunae* in responsibility, the notion of 'control' in the context of transboundary harm should be construed as also including all situations within the ambit of Article 8 of the Articles on State Responsibility. Whenever a state exercises 'control' over an activity, regardless of whether by means of territorial control or control over the conduct of individuals,[49] it is required to ensure that the activity does not cause harm to other states.[50]

2. Harm to Areas Beyond National Jurisdiction

The obligation to prevent transboundary harm not only applies to harm caused to other states but also to harm caused to areas beyond the limits of national jurisdiction.[51] This has been recognized in the *Stockholm* and

45 See ILC, Articles on Prevention (n. 22), Commentary to Article 1, paras. 9–12, citing ICJ, Legal Consequences for States of the Continued Presence of South Africa in Namibia, Advisory Opinion of 21 June 1971, ICJ Rep. 16, para. 118.

46 The term 'effective' is often used to qualify the notion of 'control' in the context of attribution, cf. ICJ, Military and Paramilitary Activities in and against Nicaragua (Nicaragua v. United States of America), Merits Judgment of 27 June 1986, ICJ Rep. 14, para. 115; ARSIWA (n. 43), Commentary to Article 8, paras. 4–8.

47 On the conditions for attributing such conduct to a state, see chapter 9, section A.II.2.a)cc).

48 See *Vordermayer* (n. 42), 85–86.

49 See *supra* fn. 46.

50 On the question whether multilateral environmental agreements create extraterritorial obligations even beyond this scope, see *Vordermayer* (n. 42), 87–124.

51 See *ibid.*, 116–118.

Rio Declarations[52] as well as the multilateral treaties governing these areas, namely the high seas and the deep seabed,[53] the Antarctic,[54] and outer space.[55] Article 3 of the CBD also provides that states have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of areas beyond the limits of national control.[56]

Interestingly, the scope of the ILC's Prevention Articles does not cover the prevention of harm to areas beyond national jurisdiction but is expressly limited to damage to the territory of other states (or other places under the latter's jurisdiction or control).[57] This could be explained by the fact that extending the preventive obligation to areas beyond national jurisdiction significantly modifies the rationale of this obligation, as the focus is shifted from avoiding external infringements of national sovereignty towards protecting the environment *per se*.[58] But there is no doubt that the obligation to prevent harm to areas beyond national jurisdiction is now part of customary law.[59] This was also recognized by the ICJ in its *Nuclear Weapons* advisory opinion.[60]

3. Harm to 'Global Commons'

States can also be required to prevent certain forms of environmental harm even when there is no clear impact on specific states or specific areas beyond national jurisdiction. This primarily relates to issues of 'global concern' such as global warming, deforestation, desertification, and the

52 Stockholm Declaration 1972 (n. 8), Principle 21; Rio Declaration 1992 (n. 9), Principle 2.
53 UNCLOS (n. 13), Articles 145 and 192.
54 Protocol on Environmental Protection to the Antarctic Treaty (04 October 1991; effective 14 January 1998), 30 ILM 1455, Article 2.
55 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (27 January 1967; effective 10 October 1967), 610 UNTS 205, Article IX.
56 See chapter 3, section B.II.
57 Cf. ILC, Articles on Prevention (n. 22), Article 2(c).
58 *Duvic-Paoli* (n. 4), 239–240; also see *Barboza* (n. 31), 87, suggesting that the issue of damage to areas beyond the limits of national jurisdiction was left aside by the ILC in order not to further increase the complexity of the work before it.
59 *Xue* (n. 30), 10; *Duvic-Paoli* (n. 4), 239–240; *Sands* et al. (n. 11), 206; *Boyle/Redgwell* (n. 19), 161–162.
60 Cf. ICJ, Nuclear Weapons (n. 16), para. 29.

loss of global biodiversity.[61] These issues are difficult to assess from a legal perspective because they are caused cumulatively by the international community through legitimate exercises of territorial sovereignty by individual states and, for this reason, cannot be easily attributed to any particular state.[62] At the same time, further harm can only be prevented effectively by joint action of all states, as individual states alone are unable to reverse the course of degradation.[63] Moreover, damage to global commons raises questions related to the enforcement of responsibility, especially with regard to the standing to make claims.[64]

Some authors in legal scholarship have distinguished between the responsibility not to cause significant transboundary harm on the one hand and the preventive principle on the other, arguing that the latter required states to prevent environmental harm regardless of whether or not there are transboundary impacts.[65] Indeed, a number of environmental treaties create preventive obligations that are not focused on transboundary effects but on environmental issues which, despite primarily concerning each state party's own environment, ultimately constitute a 'common concern'.[66] It can, therefore, be assumed that states are not only required to prevent transboundary harm but also to prevent harm to values of 'common concern'.[67] However, in its generality, this obligation remains

61 See *Boyle/Redgwell* (n. 19), 143–145.
62 *Xue* (n. 30), 16.
63 *Ibid.*
64 *Ibid.*, 237–250; see chapter 9, section C.I.
65 *Sands* et al. (n. 11), 212; *Alexandre Kiss/Dinah Shelton*, Guide to International Environmental Law (2007), 91; *Boyle/Redgwell* (n. 19), 143.
66 Cf., e.g., the obligation to protect and preserve the marine environment stipulated in Article 192 of UNCLOS (n. 13), which international jurisprudence confirmed to apply 'to all maritime areas' (ITLOS, Request for an Advisory Opinion Submitted by the Sub-regional Fisheries Commission, Advisory Opinion of 02 April 2015, Case No. 21, ITLOS Rep. 4, para. 120). Also see the references in *Boyle/Redgwell* (n. 19), 143; *Duvic-Paoli* (n. 4), 246–247.
67 *Xue* (n. 30), 250; *Duvic-Paoli* (n. 4), 241; *Boyle/Redgwell* (n. 19), 143–145; also see *Roda Verheyen*, Climate Change Damage and International Law (2005), 166–168, specifically addressing the no-harm rule in the context of climate change and arguing that 'neither the decades of ILC debates on the issue of prevention of environmental harm nor international jurisprudence provide evidence that complex instances of environmental change are not be covered by the general duty to prevent harm and minimize the risk thereof'.

difficult to grasp and needs to be operationalized by more specific provisions in multilateral treaties.[68]

The aforementioned conclusions also hold true in the context of the present study. In principle, the CBD does not stipulate an obligation of states to prevent the global long-term loss of biological diversity.[69] But at the same time, the CBD expressly applies to all activities under the jurisdiction of states parties, regardless of where their effects occur.[70] Consequently, the obligation to regulate and control LMOs under Article 8(g) CBD and the obligation to control invasive alien species that threaten ecosystems, habitats and species stipulated in Article 8(h) CBD are not limited to effects that might negatively affect biodiversity in individual states, but potentially also apply to the global impacts of such organisms. The Cartagena Protocol, on the other hand, is limited to regulating the transboundary movements of LMOs (in terms of movements between states) but does not apply to the release of LMOs in areas beyond the limits of national jurisdictions.[71] However, as shown earlier, Article 196(1) UNCLOS requires all states parties to prevent the environmental release of LMOs that may cause significant and harmful changes to the marine environment; this obligation also applies on the high seas beyond national jurisdiction.[72]

III. Harm Caused by 'Physical Consequences'

As shown above, transboundary harm is generally construed as harmful effects which originate in one state and, after being subject to an undelib-

68 See, in particular, *Alexander Zahar*, Methodological Issues in Climate Law, 5 (2015) Climate Law 25.

69 See Article 3 CBD, which merely reiterates the general obligation of states to ensure that their activities do not cause damage to the environment of other states or of areas beyond national jurisdiction. But see *Daniela M. Schmitt*, Staatenverantwortlichkeit für Schäden an der biologischen Vielfalt (2018), 292–296, who argues that, because the conservation of global biodiversity is a 'common concern', the obligation to prevent harm should be read extensively as requiring states to also prevent harm to the biodiversity in their own territory.

70 Cf. Article 4(b) CBD.

71 See chapter 3, section A.I.3.

72 *Detlef Czybulka*, Article 196 UNCLOS, in: Alexander Proelss (ed.), United Nations Convention on the Law of the Sea: A Commentary (2017), MN. 13; see chapter 3, section G.

erate transboundary movement, cause damage in another state.[73] However, it has been controversial which types of effects are covered by this obligation.

During the ILC's deliberation of the topic, one of the major debates was whether the topic should be confined only to environmental harm, or whether it should cover all kinds of transboundary harm including those arising from economic, financial and trade activities, such as the devaluation of a state's currency.[74] The ILC ultimately agreed to limit the scope of the Articles on Prevention to harm caused by the 'physical consequences' of activities, which was meant to rule out harm caused by state policies in monetary, socio-economic or similar fields.[75] At the same time, the ILC agreed that the term 'physical' was to be understood broadly,[76] and that 'physical consequences' could encompass any consequence 'which does or may arise out of the very nature of the activity or situation in question, in response to a natural law'.[77] Consequently, a transboundary spread of LMOs or transboundary adverse effects caused an LMO could be regarded as 'physical consequences' of their release.[78]

Environmental harm may also be caused following the deliberate transfer of hazardous technology or substances into another state. In that case, both the adverse effects and the act ultimately causing these effects take place in the same country, but the actual responsibility nonetheless lies with a foreign actor.[79] As opposed to *transboundary* harm, these situations can be referred to as cases of *transnational* harm:[80]

> *'The "transnational" case is where the activity and the physical damage all occur within one country, but nonetheless there is a transnational involvement, for example, because capital (including technological know-how) has*

73 ILC, Articles on Prevention (n. 22), Article 2(c); see *supra* section B.II.
74 *Xue* (n. 30), 5; *Barboza* (n. 31), 83.
75 ILC, Articles on Prevention (n. 22), Commentary to Article 1, para. 16.
76 Also see 'physical, adj.', in: Oxford English Dictionary (n. 35), sect. III.7.a; Black's Law Dictionary (n. 35), 1386.
77 ILC, Report of the Working Group on International Liability for Injurious Consequences Arising Out of Acts Not Prohibited by International Law, YBILC 1996, vol. II(2), p. 100 (1996), Commentary to Article 1, para. 25.
78 Similar questions are raised in the context of cyber-attacks, see *Beatrice A. Walton*, Duties Owed: Low-Intensity Cyber Attacks and Liability for Transboundary Torts in International Law, 126 (2017) Yale L.J. 1460, 1478–1484.
79 *Xue* (n. 30), 9.
80 See, e.g., *Michael Mason*, The Governance of Transnational Environmental Harm: Addressing New Modes of Accountability/Responsibility, 8 (2008) Global Environmental Politics 8.

> *been exported from another country in order to make possible the activity which has caused environmental damage and, presumably, any profits realized from such exported capital will be returned in one way or another to its country of origin."*[81]

It has been argued that state-centred accountability regimes are unfit to adequately address transnational environmental harm.[82] Developing countries in particular are often unable to adequately regulate externally-generated threats to the well-being of their population, both due to their limited regulatory capabilities as well as the high thresholds international law sets for lawful restrictions on international trade.[83] At the same time, the states of origin of the hazardous techniques or substances are often either unwilling or unable to appropriately control the extraterritorial activities of their nationals.[84] But contrary to what has been suggested by some authors,[85] there is no general responsibility of developed states for injury caused by their nationals in the territory of other (especially developing) states.[86] After all, this would require the exercise of extraterritorial jurisdiction, which could be regarded as an interference with the domestic affairs of the affected states.[87] However, responsibility could be assumed in exceptional cases when the exporting state retains control (in terms of Article 8 ARSIWA) over the hazardous activity in the receiving state.[88]

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81 Hague Conference on Private International Law, Note on the Law Applicable to Civil Liability for Environmental Damage: Preliminary Document No 9 of May 1992, in: Hague Conference on Private International Law (ed.), Proceedings of the Seventeenth Session 10 to 29 May 1993, Tome I (1995) 187, 189.

82 *Mason* (n. 80), 11.

83 See *Lefeber* (n. 30), 12; *Mason* (n. 80), 11; *Boyle/Redgwell* (n. 19), chapter 13.

84 *Lefeber* (n. 30), 12.

85 Cf. *Günther Handl/Robert E. Lutz*, An International Policy Perspective on the Trade of Hazardous Materials and Technologies, 30 (1989) Harv. Int'l L. J. 351, 371; *Francesco Francioni*, Exporting Environmental Hazard Through Multinational Enterprises: Can the State of Origin Be Held Responsible?, in: Francesco Francioni/Tullio Scovazzi (eds.), International Responsibility for Environmental Harm (1991) 275, 289.

86 *Peter-Tobias Stoll*, Transboundary Pollution, in: Fred L. Morrison/Rüdiger Wolfrum (eds.), International, Regional, and National Environmental Law (2000) 169, 175; *Susanne Förster*, Internationale Haftungsregeln für schädliche Folgewirkungen gentechnisch veränderter Organismen (2007), 207–208; *Vordermayer* (n. 42), 118–121.

87 *Lefeber* (n. 30), 12.

88 Cf. ILC, Report of the Commission to the General Assembly on the Work of the Thirty-Fourth Session, UN Doc. A/37/10, YBILC 1982, Vol. II, Pt. 2, p. 86, para. 113, referring to cases of 'substantial control' of the state of origin, which

In the context of biotechnology, comparable transnational situations may arise in cases in which an LMO is deliberately moved into a country and, once released, causes harm there. As shown earlier, it is not an unusual phenomenon that LMOs are developed in countries other than those where they are ultimately released.[89] But even when the import of the LMO – or even its release – occurs without the permission of the affected state and subsequently causes harm, it appears difficult to assume a situation of *transboundary harm*.[90] Instead, such a case could give rise to a violation of the *Advance Informed Agreement* mechanism under the Cartagena Protocol.[91] Moreover, a deliberate release of LMOs into a foreign territory could also give rise to breaches of other norms of international law, such as the prohibition of aggression[92] or the prohibition of the use of biological weapons.[93]

However, as soon as the receiving state has validly consented to the import of a particular LMO, it becomes the sole bearer of the risk.[94] After all, the transboundary movement of hazardous technologies or substances is rather an issue of international trade than a problem of environmental harm.[95] Hence, occurrences of *transnational* harm are generally not covered by the regime on *transboundary* harm in international law.

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seems to be identical to cases of effective control within the meaning of Article 8 ARSIWA. But see ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 113, where the Court concluded that there is no case of transboundary harm when a state causes harm by conducting activities in breach of another state's territorial sovereignty. Also see *supra* section B.II.1.

89 See chapter 3, section A.II.1.g).

90 *Förster* (n. 86), 205–209.

91 Cf. Cartagena Protocol on Biosafety to the Convention on Biological Diversity (29 January 2000; effective 11 September 2003), 2226 UNTS 208 (hereinafter 'Cartagena Protocol'), Article 7(1); see chapter 3, section A.II.1.

92 See *Anikó Raisz*, GMO as a Weapon – a.k.a. a New Form of Aggression?, 2 (2014) Hungarian Yearbook of International Law and European Law 275, 284–285.

93 Cf. Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) And Toxin Weapons and on Their Destruction (10 April 1972; effective 26 March 1975), 1015 UNTS 163, Article I, see *R. Guy Reeves* et al., Agricultural Research, or a New Bioweapon System?, 362 (2018) Science 35, 36.

94 *Förster* (n. 86), 209.

95 *Xue* (n. 30), 9.

IV. The Threshold of 'Significant' Harm

It is generally recognized that international law does not prohibit the causation of transboundary environmental interference under all circumstances. Instead, transboundary impacts are considered to be tolerable and lawful as long as they do not reach a certain threshold.[96]

In contemporary[97] international law, this threshold is usually described as that of 'significant' transboundary harm.[98] The threshold applies in two different ways: *Ex ante*, it is part of the assessment of whether there is a risk that triggers the obligation to prevent harm, whereas *ex post*, it serves to determine whether the damage that has occurred is wrongful.[99] Consequently, the concept is found both in instruments dealing with the prevention of harm[100] and in instruments on responsibility or liability for damage that has actually occurred.[101] However, in both dimensions (*ex ante* and *ex post*) it is difficult to define in general terms when the threshold of 'significant' harm or risk thereof is reached. According to the ILC,

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96 ILC, Articles on Prevention (n. 22), Commentary to Article 2, para. 5; *Lucas Bergkamp*, Liability and Environment (2001), 276–278.

97 Earlier practice and jurisprudence has referred to other criteria, including that of 'serious' consequences or prejudice (see Affaire du Lac Lanoux (Spain v. France), 16 November 1957, XII RIAA 281, 293; Trail Smelter Case, Decision of 1941 (n. 6), 1965). In the ILC, some preferred the notion of 'appreciable' harm, which was later given in favour of the term 'significant' harm.

98 For a detailed account of the threshold of 'significant harm', see *K. Sachariew*, The Definition of Thresholds of Tolerance for Transboundary Environmental Injury Under International Law: Development and Present Status, 37 (1990) Netherlands International Law Review 193.

99 *Duvic-Paoli* (n. 4), 184–185.

100 See, e.g., UNECE, Convention on Environmental Impact Assessment in a Transboundary Context (25 February 1991; effective 10 September 1997), 1989 UNTS 309, as last amended by the Second Amendment to the Convention (4 June 2004; effective 23 October 2017), UN Doc. ECE/MP.EIA/6, p. 93 (hereinafter 'Espoo Convention'), Article 2(1); CBD (n. 12), Article 14(1)(a); Convention on the Law of the Non-Navigational Uses of International Watercourses (21 May 1997; effective 17 August 2014), UN Doc. A/RES/51/229 (hereinafter 'International Watercourses Convention'), Article 7; Vienna Convention for the Protection of the Ozone Layer (n. 14), Article 1(2); UNCLOS (n. 13), Article 196.

101 See, e.g., ILC, Allocation of Loss Principles (n. 31), Article 2(a); Supplementary Protocol (n. 32), Article 2(3); Annex VI to the Protocol on Environmental Protection to the Antarctic Treaty: Liability Arising from Environmental Emergencies (14 June 2005; not yet in force), ATCM Measure 1 (2005), Article 2(b).

> '"*significant*" *is something more than* "*detectable*" *but need not be at the level of* "*serious*" *or* "*substantial*"*. The harm must lead to a real detrimental effect on matter such as, for example, human health, industry, property, environment or agriculture in other States. Such detrimental effects must be susceptible of being measured by factual and objective standards.*'[102]

The ILC acknowledged that the concept is not without ambiguity and that a determination in specific cases may involve more factual than legal considerations.[103] Yet, some international instruments provide more detailed legal criteria as to when harm is deemed to be significant.[104] For instance, the *Nagoya-Kuala Lumpur Supplementary Protocol* contains a detailed definition of what constitutes 'significant' adverse effects of LMOs on biological diversity. The definition refers to criteria such as the permanence, quality, and quantity of changes to biological diversity, and the effects of such changes on human health.[105]

International jurisprudence has acknowledged the threshold of 'significant' harm in several cases,[106] but so far offered little guidance on how to determine whether the threshold is reached. This is aptly demonstrated by the judgment of the ICJ in the *Certain Activities* case between Costa Rica and Nicaragua.[107] The case concerned a border dispute between both

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102 ILC, Articles on Prevention (n. 22), Commentary to Article 2, para. 4.

103 *Ibid.*

104 On internationally set dose levels for radioactivity, see *Sands* et al. (n. 11), 744–745.

105 Supplementary Protocol (n. 32), Article 3(3); see chapter 6, section B.II.3.

106 See, e.g., PCA, Iron Rhine Arbitration (Belgium v. Netherlands), Award of 24 May 2005, Case No. 2003–02, XXVII RIAA 35, para. 59; ICJ, Pulp Mills (n. 18), para. 101; ITLOS, Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area, Advisory Opinion of 01 November 2011, Case No. 17, ITLOS Rep. 10, para. 116; ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 104; PCA, South China Sea Arbitration (Philippines v. People's Republic of China), Award of 12 July 2016, PCA Case No. 2013–19, para. 941.

107 ICJ, Certain Activities Carried out by Nicaragua in the Border Area (Costa Rica v. Nicaragua), Compensation Owed by Nicaragua to Costa Rica, Judgment of 02 February 2018, ICJ Rep. 15; for commentaries on the judgment, see *Tomme R. Young*, Recognition of "Environmental Services" in the ICJ's First Award of Compensation for International Environmental Damage, 48 (2018) Environmental Policy and Law 36; *Jason Rudall*, Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica V. Nicaragua), 112 (2018) AJIL 288; *Jefferi H. Sendut*, The International Court of Justice and Compensation for Environmental Harm: A Missed Opportunity?, 1 (2018) De Lege Ferenda 17. The ICJ had already confirmed in the *Gabčíkovo-Nagymaros* case that Hungary was

states, which also led to reciprocal allegations about transboundary harm, or a risk thereof, caused by the activities of both parties in the disputed territory.[108] In its judgment on the merits of the case, the ICJ discussed the threshold of significant harm both from the *ex ante* and the *ex post* perspectives. Concerning the existence of a risk of significant harm caused by Nicaragua's excavation of channels in the disputed wetland area, the Court referred to expert evidence to conclude that there was no such risk.[109]

At the same time, with regard to the construction of a road in the border area by Costa Rica, the Court found that there was indeed a risk of significant harm, which it derived from the 'nature and magnitude of the project and the context in which it was to be carried out'.[110] However, addressing the question of whether significant transboundary harm had actually occurred, the Court held that a two percent increase in the sediment load of a shared river (i.e. the amount of solid matter carried by the river) that was caused by the activity in question did not reach the threshold of significant harm.[111] The Court gave no indications on the basis of which criteria it came to this finding.[112] The only conclusion that can be drawn from the judgment is that the ICJ seems to concur with the ILC that harm must be 'more than detectable' in order to be considered significant.[113] But apart from this, the Court 'remained opaque on the method and criteria' it used to assess the threshold of significant harm or a risk thereof.[114]

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entitled to 'compensation for the damage sustained as a result of the diversion of the Danube', although the Court did not specifically indicate that this included reparation for purely environmental damage, cf. ICJ, Gabčíkovo-Nagymaros (n. 17), paras. 151–152; see *Sands* et al. (n. 11), 754.

108 For the background of the dispute, see *Stefan Geens*, About Costa Rica, Nicaragua, Their Mutual Border, and Google, Ogle Earth, 07 November 2010, available at: https://ogleearth.com/2010/11/about-costa-rica-nicaragua-their-border-and-google/ (last accessed 28 May 2022); *Jacob K. Cogan*, Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica V. Nicaragua); Construction of a Road in Costa Rica Along the San Juan River (Nicaragua V. Costa Rica), 110 (2016) AJIL 320.

109 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 105.

110 *Ibid.*, paras. 154–156.

111 *Ibid.*, para. 186.

112 Cf. *Kerryn A. Brent*, The Certain Activities Case: What Implications for the No-Harm Rule?, 20 (2017) Asia Pac. JEL 28, 53.

113 Cf. *ibid.*

114 *Diane Desierto*, Evidence but not Empiricism? Environmental Impact Assessments at the International Court of Justice in Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) and Con-

In any event, it appears to be widely recognized that the threshold of significant harm is lowered when the affected environment is particularly fragile.[115] For instance, the environmental panel of the *UN Compensation Commission*[116] held that damage that might otherwise be characterized as insignificant can nevertheless be significant when it is caused to an area of 'special ecological sensitivity'.[117] Similarly, the ICJ recognized that the proximity of wetlands protected under the *Ramsar Convention*[118] 'heightens the risk of significant damage because it denotes that the receiving environment is particularly sensitive'.[119]

Moreover, the threshold of significance could be influenced by the environmental standards in the country of origin.[120] This roots in the understanding that states shall not discriminate between domestic and transboundary environmental interferences.[121] Support for this approach is also found in Article 15 of the ILC's Prevention Articles, which provides that a state shall not discriminate against persons seeking legal protection against significant harm on the grounds that the harm would occur outside its jurisdiction.[122] Consequently, when the release of a particular LMO (or of LMOs generally) is illegal under the national laws of a state, that

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struction of a Road in Costa Rica Along the San Juan River (Nicaragua v. Costa Rica), EJIL: Talk!, 26 February 2016, available at: http://www.ejiltalk.org/evidence-but-not-empiricism-environmental-impact-assessments-at-the-international-court-of-justice-in-certain-activities-carried-out-by-nicaragua-in-the-border-area-costa-rica-v-nicaragua-and-con/ (last accessed 28 May 2022); also see *Cameron A. Miles*, Introductory Note to Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua)/Construction of a Road in Costa Rica Along the San Juan River (Nicaragua v. Costa Rica) (I.C.J.), *55* (2016) ILM 417, 421.

115 Cf. Espoo Convention (n. 100), Appendix III, para. 1(b); ILC, Draft Articles on the Law of Transboundary Aquifers, with Commentaries, YBILC 2008, vol. II(2) (2008), Commentary to Article 6, para. 3; see *Duvic-Paoli* (n. 4), 186–187.

116 See chapter 11, section B.I.3.

117 UNCC, Report and Recommendations Made by the Panel of Commissioners Concerning the Third Instalment of "F4" Claims, UN Doc. S/AC.26/2003/31 (2003), para. 36.

118 See Convention on Wetlands of International Importance Especially as Waterfowl Habitat (02 February 1971; effective 21 December 1975), *996* UNTS 245.

119 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 155.

120 *Duvic-Paoli* (n. 4), 188.

121 WCED Expert Group on Environmental Law, Legal Principles and Recommendations (n. 37), Article 13 and commentary thereto, p. 88–90; OECD, Recommendation of the Council on Principles Concerning Transfrontier Pollution (14 November 1974), Doc. OECD/LEGAL/0133, Annex, Title C.

122 ILC, Articles on Prevention (n. 22), Article 15 and commentary thereto, para. 3.

state cannot argue that an unintentional spread of that LMO into the environment of another state was insignificant.

V. Risk of Harm

A core element of the principle of prevention is that of risk anticipation. In addition to the *magnitude* of potential harm, the *probability* that such harm occurs is the second criterion that defines whether there is a risk of transboundary harm which requires the state of origin to take preventive measures.[123]

The ILC summarized this concept in the notion 'risk of significant transboundary harm', which it defined as including 'risks taking the form of a high probability of causing significant transboundary harm and a low probability of causing disastrous transboundary harm'.[124] Consequently, it is the combined effect of the probability of a harmful event and the magnitude of its injurious impact which triggers the obligation to take preventive measures.[125] Contrary to what the definition may imply, the obligation is not limited to 'high risk of impact' and 'low risk of high impact' situations. Instead, the ILC intended to provide a spectrum within which the preventive obligation is triggered.[126] Therefore, the obligation also includes situations involving a moderate risk of significant (but not catastrophic) transboundary harm.[127] At the same time, activities involving a very low probability of causing only significant but not more serious harm fall outside the scope of the obligation.[128]

VI. Foreseeability of Harm and the Role of Precaution

1. Foreseeability as a Precondition of Prevention

Both the determination of the probability of harm and its potential magnitude presuppose that the causation of harm is at all *foreseeable*, i.e. that it

123 *Ibid.*, Commentary to Article 2, para. 2.
124 *Ibid.*, Article 2(a).
125 *Ibid.*, Commentary to Article 2, para. 2.
126 *Ibid.*, Commentary to Article 2, para. 3.
127 *Duvic-Paoli* (n. 4), 182.
128 ILC, Articles on Prevention (n. 22), Commentary to Article 2, para. 2.

is possible to identify plausible, albeit unlikely, scenarios in which harm would occur. It is generally accepted that a state cannot be held responsible for damage that could have not reasonably been foreseen.[129] This is logically inherent in the idea that a risk of significant harm triggers an obligation to take preventive measures: only when the risk is known to the parties concerned can it entail positive legal obligations.[130]

The reference point for the foreseeability of harm is the *best scientific knowledge* at the time when preventive action is required.[131] However, the obligation to prevent transboundary harm does not require the causation of harm to be established by 'clear and convincing evidence' as suggested by the arbitral tribunal in the *Trail Smelter* case.[132] If such a high threshold was required, irreversible or very serious harm would often occur before the causes were fully understood and preventive action could be initiated.[133]

2. The Precautionary Principle (or Approach)

States could be required to take preventive action already when there are indications, but no proof (or scientific certainty) that an activity might lead to significant transboundary harm. Such an obligation might be derived from the precautionary principle (or approach[134]). In essence, the principle provides that preventive measures can be justified – or even required – even when there is no scientific certainty whether an activity or substance is harmful to the environment. On the international level, the principle found express recognition for the first time in Principle 15 of the Rio Declaration, which provides:

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129 *Boyle/Redgwell* (n. 19), 171; also see ICJ, Corfu Channel (Merits) (n. 3), 18–22; ICJ, Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina v. Serbia and Montenegro), Judgment of 26 February 2007, ICJ Rep. 43, para. 432.

130 Cf. ILC, Articles on Prevention (n. 22), Commentary to Article 3, para. 18; see *Duvic-Paoli* (n. 4), 181–183; *Bergkamp* (n. 96), 261.

131 *Boyle/Redgwell* (n. 19), 171.

132 Cf. Trail Smelter Case, Decision of 1941 (n. 6), 1965.

133 *Boyle/Redgwell* (n. 19), 171.

134 The terms 'precautionary principle' and 'precautionary approach' are more or less interchangeable; the latter term concerns goes back to concerns by the United States and others that the term 'principle' would imply a normative character, see *ibid.*, 172–173.

> *'Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'.*[135]

Subsequently, the precautionary principle has been recognized in numerous international environmental agreements[136] and domestic jurisdictions.[137] However, there are substantial variations in how the principle is understood and applied.[138] In some contexts, it embodies a positive obligation to take preventive action (*obligatory function*).[139] In others, it is only used to justify restrictive or cost-incurring measures that cannot be fully based on scientific evidence (*facilitative function*).[140] The fact that there are 'strong' and 'weak' versions (or interpretations) of the principle is

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135 Rio Declaration 1992 (n. 9), Principle 15, see *Antônio A. Cançado Trindade*, Principle 15, in: Jorge E. Viñuales (ed.), The Rio Declaration on Environment and Development: A Commentary (2015) 403.

136 See, e.g. Vienna Convention for the Protection of the Ozone Layer (n. 14), Preambular para. 5; CBD (n. 12), Preambular para. 9; Convention on the Protection and Use of Transboundary Watercourses and International Lakes (17 March 1992; effective 06 October 1996), 1936 UNTS 269 (hereinafter 'UN-ECE Watercourses Convention'), Article 2(5)(a); UNFCCC (n. 14), Article 3(3); 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (07 November 1996; effective 24 March 2016), 36 ILM 1, Article 3(1); Cartagena Protocol (n. 91), Articles 1, 10(6), and 11(8); for more references, see *Cançado Trindade*, Principle 15 (n. 135), 414–417; *Boyle/Redgwell* (n. 19), 175.

137 Unlike often asserted in the European legal discourse, this is even true for the United States, see *Jonathan B. Wiener/Michael D. Rogers*, Comparing Precaution in the United States and Europe, 5 (2002) Journal of Risk Research 317.

138 *Sands* et al. (n. 11), 234.

139 See, e.g., CJEU, Alpharma Inc. v. Council of the European Union, Judgment of 11 September 2002, T-70/99, ruling that under the precautionary principle as embodied in EU law, 'a public authority *may be required* to take action even before adverse effects have become apparent' (emphasis added). Also see Convention for the Protection of Marine Environment of the Baltic Sea Area (09 April 1992; effective 17 January 2000), 2099 UNTS 197, Article 3(2), which provides that states parties '*shall* […] *take preventive measures* when there is reason to assume that substances or energy […] may create hazards to human health, harm living resources and marine ecosystems, […] even when there is no conclusive evidence of a causal relationship between inputs and their alleged effects' (emphasis added).

140 See *Arie Trouwborst*, Precautionary Rights and Duties of States (2006), 120–124; *Daniel Bodansky*, Deconstructing the Precautionary Principle, in: David D. Caron/Harry N. Scheiber (eds.), Bringing New Law to Ocean Waters (2010) 381, 383–386.

often used to challenge the concept as a whole.[141] As a result, and despite its ubiquity, the status of precaution as a rule of customary international law, as well as its specific meaning, remain some of the most controversial topics in contemporary international environmental law.[142]

International courts and tribunals have also been hesitant to expressly recognize the precautionary principle as a rule of custom.[143] For instance, the World Trade Organization's *Dispute Settlement Body* has repeatedly questioned its customary status.[144] At the same time, the DSB recognized that the principle of precautionary action was reflected in Article 5(7) of the SPS Agreement,[145] although it applied a high threshold for when this provision can be invoked to justify trade restrictions.[146]

The *International Tribunal on the Law of the Sea* (ITLOS) has repeatedly relied on the precautionary principle, although without expressly referring to it.[147] Moreover, the jurisprudence of ITLOS must be seen in the context

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141 See *Daniel Steel*, Philosophy and the Precautionary Principle (2015), 3–43 with further references.

142 See, e.g., *Bergkamp* (n. 96), 445–450; *Arie Trouwborst*, Evolution and Status of the Precautionary Principle in International Law (2002), 260–284; *Gerhard Hafner/Isabelle Buffard*, Obligations of Prevention and the Precautionary Principle, in: James Crawford/Alain Pellet/Simon Olleson (eds.), The Law of International Responsibility (2010) 521, 530–532; *Daniel Kazhdan*, Precautionary Pulp: Pulp Mills and the Evolving Dispute Between International Tribunals over the Reach of the Precautionary Principle, 38 (2011) ELQ 527; *Ole W. Pedersen*, From Abundance to Indeterminacy: The Precautionary Principle and Its Two Camps of Custom, 3 (2014) Transnational Environmental Law 323; *Cançado Trindade*, Principle 15 (n. 135), 412–414; *Maria Monnheimer*, Due Diligence Obligations in International Human Rights Law (2021), 147–149.

143 For an overview, see *Tullio Treves*, Environmental Impact Assessment and the Precautionary Approach: Why Are International Courts and Tribunals Reluctant to Consider Them as General Principles of Law?, in: Mads T. Andenæs/Malgosia A. Fitzmaurice et al. (eds.), General Principles and the Coherence of International Law (2019) 379; *Cançado Trindade*, Principle 15 (n. 135), 417–421.

144 WTO DSB, EC Measures Concerning Meat and Meat Products (Hormones), Report of the Appellate Body of 16 January 1998, WT/DS26/AB/R, WT/DS48/AB/R, para. 123; WTO DSB, European Communities – Measures Affecting the Approval and Marketing of Biotech Products, Report of the Panel of 29 September 2006, WT/DS291/R, WT/DS292/R, WT/DS293/R, para. 7.89.

145 Cf. WTO DSB, EC-Hormones, Appellate Body report (n. 144), para. 125; see Agreement on the Application of Sanitary and Phytosanitary Measures (15 April 1994), 1867 UNTS 493, Article 5(7), also see chapter 3, section C.II.

146 Cf. WTO DSB, EC-Biotech (n. 144), para. 7.89.

147 Instead, ITLOS based its provisional measures on considerations of 'prudence and caution', cf. ITLOS, Southern Bluefin Tuna Cases (New Zealand v. Japan; Australia v. Japan), Provisional Measures, Order of 27 August 1999, ITLO cases

of UNCLOS as a multilateral treaty and thus cannot be construed as a recognition of a customary status of the principle.[148] Nevertheless, the Seabed Disputes Chamber of ITLOS observed in 2011 that the precautionary principle had been incorporated into a growing number of international treaties and other instruments, which, in the view of the Chamber, had 'initiated a trend towards making this approach part of customary international law'.[149]

The ICJ, on its part, has not yet adopted a conclusive stand on the status of the precautionary principle. Although the principle was invoked by parties in the 1995 revision of the *Nuclear Tests* case[150] and in the *Gabčíkovo-Nagymaros* case, the Court made no reference to it in either of the cases.[151] In *Pulp Mills*, the ICJ merely recognized that the 'precautionary approach may be relevant in the interpretation and application of the provisions of the [disputed treaty]'.[152] In its 2015 merits judgment in the *Certain Activities* case, the ICJ again remained silent on the role of the precautionary principle.[153]

Nos. 3 and 4, ITLOS Rep. 288, paras. 77–79; ITLOS, The MOX Plant Case (Ireland v. United Kingdom), Order of 03 December 2001, Case No. 10, ITLOS Rep. 89, para. 84; ITLOS, Case concerning Land Reclamation by Singapore in and around the Straits of Johor (Malaysia v. Singapore), Provisional Measures, Order of 08 October 2003, Case No. 12, ITLOS Rep. 10, para. 99. However, the Seabed Dispute Chamber of ITLOS later acknowledged the 'implicit link between an obligation of due diligence and the precautionary approach' in the Court's order in *Southern Bluefin Tuna*, cf. ITLOS, Responsibilities and Obligations of States (n. 106), para. 132.

148 *Boyle/Redgwell* (n. 19), 178.

149 ITLOS, Responsibilities and Obligations of States (n. 106), para. 135; see *Silja Vöneky/Felix Beck*, Article 145 UNCLOS, in: Alexander Proelss (ed.), United Nations Convention on the Law of the Sea: A Commentary (2017) 1007, MN. 40–41.

150 But see ICJ, Request for an Examination of the Situation in Accordance with Paragraph 63 of the Court's Judgment of 20 December 1974 in the Nuclear Tests (New Zealand v. France) Case, Order of 22 September 1995, ICJ Rep. 288, Dissenting Opinion of Judge Weeramantry, p. 342–344.

151 Cf. *Sands* et al. (n. 11), 234–236.

152 ICJ, Pulp Mills (n. 18), para. 164; but see ICJ, Pulp Mills (n. 18), Separate Opinion of Judge ad hoc Vinuesa, p. 152.

153 Cf. ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 218.

3. Precaution and the Burden of Proof

In principle, the party which asserts a certain fact bears the burden of proof, which means that it has to adduce evidence to establish the existence of the said fact.[154] Hence, a state opposing another state's hazardous activity has to prove that the activity will cause – or is likely to cause – significant transboundary harm.[155] This can be difficult for a number of reasons, but may prove impossible when there is scientific uncertainty as to whether the activity in question is likely to cause harm at all. For this reason, it has sometimes been asserted that the application of the precautionary principle shifted the burden of proof onto the state which intends to undertake or authorize a hazardous activity.[156] In this case, the latter would be required to prove that the activity will not cause transboundary harm, either because it does not pose a risk of doing so or because the state has taken sufficient measures to avert the risk.[157] In his separate opinion in the *MOX Plant* case, ITLOS Judge *Wolfrum* even assumed that a reversal of the burden of proof was the only tangible content of the precautionary principle.[158]

However, this position appears not to be supported by the jurisprudence of international courts and tribunals, which have generally required the party asserting a risk of environmental harm to adduce enough evidence to establish at least a *prima facie* case.[159] In the *Pulp Mills* case, the ICJ expressly underlined that the precautionary approach did not operate as a

154 Cf. ICJ, Military and Paramilitary Activities in and against Nicaragua (Nicaragua v. United States of America), Judgment on Jurisdiction and Admissibility of 26 November 1984, ICJ Rep. 392, para. 101; ICJ, Bosnian Genocide (n. 129), para. 204; ICJ, Pulp Mills (n. 18), para. 216.

155 ICJ, Pulp Mills (n. 18), para. 216.

156 This argument was made in a number of international cases, including by New Zealand in the 1995 revision of the *Nuclear Tests* case (cf. ICJ, Nuclear Tests Case 1995 (New Zealand v. France) (n. 150), para. 34), by Argentina in the Pulp Mills case (cf. ICJ, Pulp Mills (n. 18), para. 160), and by Ireland in the *MOX Plant* case (cf. ITLOS, The MOX Plant Case (Ireland v. United Kingdom) (n. 147), para. 71). See *Caroline E. Foster*, Science and the Precautionary Principle in International Courts and Tribunals (2011), 240–277; *Sands* et al. (n. 11), 234; *Boyle/Redgwell* (n. 19), 176–177.

157 *Sands* et al. (n. 11), 234, for a critical position, see *Bergkamp* (n. 96), 445–446.

158 ITLOS, The MOX Plant Case (Ireland v. United Kingdom) (n. 147), Separate Opinion of Judge Wolfrum, p. 134.

159 Cf. WTO DSB, EC-Hormones, Appellate Body report (n. 144), paras. 97–109; ITLOS, Land Reclamation (n. 147), para. 96, see *Boyle/Redgwell* (n. 19), 176.

reversal of the burden of proof.[160] What remains is that precaution has the effect of 'lowering the knowledge threshold to a significant extent'.[161] At the same time, when the evidence is sufficiently conclusive and leaves little or no room for uncertainty in the calculation of risk, there is no need to apply the precautionary principle at all.[162]

4. Precaution in the Area of Biosafety

In the area of biosafety, the same result follows from the provisions of the Cartagena Protocol. Although the Cartagena Protocol requires the party of export to carry out a risk assessment of an LMO intended for transboundary movement,[163] it does not require the exporting party to prove that the LMO in question is 'safe' – instead, it is for the importing party alone to decide, based on the information made available to it, whether it approves or denies the transboundary movement of the LMO.[164]

When there is a lack of scientific certainty about the potential adverse effects of the LMO in question, the party of import may invoke the precautionary principle when denying the transboundary movement 'in order to avoid or minimize such potential adverse effects'.[165] However, it is left to each party of import to decide whether and to what extent it invokes the precautionary principle to justify denials of imports. After all, such decisions must also be in compliance with other obligations incumbent on that state, including international trade law which imposes strict requirements for the lawfulness of invoking the insufficiency of scientific evidence to justify trade restrictions.[166]

VII. Living Modified Organisms and the Risk of Transboundary Harm

During the negotiations of the Cartagena Protocol, an argument against the inclusion of provisions on liability was that the existing rules of state

160 ICJ, Pulp Mills (n. 18), para. 164.
161 *Monnheimer* (n. 142), 149.
162 *Boyle/Redgwell* (n. 19), 174; cf. ITLOS, The MOX Plant Case (Ireland v. United Kingdom) (n. 147), paras. 71–81.
163 Cartagena Protocol (n. 91), Articles 10(1) and 15, see chapter 3, section A.II.1.c).
164 *Boyle/Redgwell* (n. 19), 176–177.
165 Cartagena Protocol (n. 91), Article 10(6) see chapter 3, section A.II.1.d).
166 On this problem, see chapter 3, section C.

responsibility were sufficient to address possible occurrences of harm.[167] But interestingly, the question of whether – and if so, to what extent – the obligation to prevent transboundary harm applies to the transboundary effects caused by LMOs has so far only received limited attention in legal scholarship.[168]

1. Scholarly Opinions

In one of the first scholarly treatments of the topic, *Cripps* argued in 1980 that there was 'room for doubt regarding the application of recognized general principles of state responsibility to the release of genetically engineered viruses and organisms which traverse national boundaries'.[169] In her view, the conventions and declarations existing at that time were insufficient to address the potential transboundary effects involved with the development of genetically modified organisms.[170] At the same time, Cripps recognized that the *Stockholm Declaration* of 1972 would be relevant for genetic engineering activities which cause damage in other states.[171]

More recently, the majority of writers appear to acknowledge that the risks posed by LMOs fall within the scope of the obligation to prevent significant transboundary harm. According to *Ascencio*, 'the general obligation of due diligence is applicable in respect of any damage to the environment and biological diversity resulting from the deliberate or unintended transboundary movements of LMOs.'[172] As an example, he refers to a case where an unintended propagation of LMOs across national

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167 See *Kate Cook*, Liability: 'No Liability, No Protocol', in: Christoph Bail/Robert Falkner/Helen Marquard (eds.), The Cartagena Protocol on Biosafety (2002) 371, 374; *Gurdial S. Nijar*, The Nagoya–Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety: An Analysis and Implementation Challenges, 13 (2013) Int. Environ. Agreements 271, 278–279.

168 See *Heidi J. Mitchell/Detlef Bartsch*, Regulation of GM Organisms for Invasive Species Control, 7 (2020) Front. Bioeng. & Biotechnol. 927, 4, assuming that whether the customary international law on state responsibility 'may apply for negative effects caused by GD releases is – as far as the authors know – not completely solved yet'.

169 *Yvonne Cripps*, A New Frontier for International Law, 29 (1980) ICLQ 1, 6.

170 *Ibid.*, 10.

171 *Ibid.*, 7.

172 *Alfonso Ascencio*, The Transboundary Movement of Living Modified Organisms: Issues Relating to Liability and Compensation, 6 (1997) RECIEL 293, 295.

boundaries damages wild relatives of important crop plants.[173] Similarly, *Förster* assumes that the obligation to prevent significant transboundary harm applies to the environmental spread of LMOs which cause harmful effects to foreign territory in the same manner as it applies to harm caused by toxic or hazardous substances.[174] In the view of *Lefeber*, cases of *unintentional* transboundary movements can result in transboundary damage when the LMO in question 'is likely to have significant adverse effects on biological diversity'.[175] However, he assumes that cases of *intentional* transboundary movements are not covered by the customary obligation to prevent transboundary harm, as in this case harm was not caused by the 'physical consequences' of an activity.[176]

2. Transboundary Effects of LMOs and the Notion of 'Significant Harm'

In order to determine whether the obligation to prevent significant transboundary harm is applicable to transboundary effects of LMOs, several scenarios need to be distinguished.

First of all, intentional transboundary movements, regardless of their legality, do not fall under the obligation to prevent transboundary harm. In such cases, there is no *transboundary* harm which is caused by the *physical consequences* of an activity.[177] As shown above, adverse effects that follow from the deliberate movement of LMOs are less an issue of international environmental law than of international trade law.[178] An obligation of states to prevent deliberate transboundary movements carried out without the prior agreement of the importing state is laid down in the Cartagena Protocol,[179] but is not yet established as a general rule of customary international law.

Secondly, situations where an LMO is subject to an unintentional transboundary movement and subsequently causes harm in the territory of the receiving state clearly constitute situations of transboundary harm. In

173 *Ibid.*
174 *Förster* (n. 86), 166.
175 *René Lefeber*, The Legal Significance of the Supplementary Protocol: The Result of a Paradigm Evolution, in: Akiho Shibata (ed.), International Liability Regime for Biodiversity Damage (2014) 73, 77.
176 *Ibid.*, 82.
177 *Ibid.*
178 See *supra* section B.III and chapter 3.
179 Cf. Cartagena Protocol (n. 91), Article 25(1); see chapter 3, section A.II.2.c)aa).

principle, this is true for all kinds of harm, regardless whether it affects persons, property, or the environment (in terms of the biological diversity in the territory of other states or in areas beyond the limits of national jurisdiction). As noted earlier, adverse effects of LMOs can be regarded as 'physical consequences' of their release: there is no essential difference between such harm and other types of harm caused by hazardous substances, pollution, or other forms of transboundary environmental interference. This also applies to LMOs that are not released intentionally, but accidentally. If a state engages in research involving hazardous biological agents such as infectious viruses,[180] it must employ due diligence to prevent such agents from escaping or, at least, from spreading beyond its own territory.[181] However, proving a laboratory accident as the source of a new virus will often be difficult, as shown by attempts to trace the origins of the SARS-CoV-2 coronavirus that caused the COVID-19 pandemic.[182]

More difficult issues arise, *thirdly*, when an LMO uncontrolledly spreads in the environment of another state but does not cause any substantial damage (to persons, property, or the environment) there. In these situations, the decisive question is whether the *mere presence* of an LMO in a foreign territory constitutes significant transboundary harm. As shown earlier, the notion of harm has no specific meaning in international law, which means that it is capable of covering any form of transboundary environmental interference. In fact, under some jurisdictions, already the mere environmental release of LMOs (or GMOs) is deemed to constitute damage to the environment.[183] However, it is questionable whether the

180 See, for instance, *Sander Herfst* et al., Airborne Transmission of Influenza A/H5N1 Virus Between Ferrets, 336 (2012) Science 1534; see chapter 1, section E.I.

181 On international standards for containment and laboratory biosafety, see chapter 5, section C.III.

182 See *Kristian G. Andersen* et al., The Proximal Origin of SARS-CoV-2, 26 (2020) Nature Medicine 450.

183 See United Kingdom, Environmental Protection Act, 1990 c, 43, as amended, Section 107(3), which provides that: '"Damage to the environment" is caused by the presence in the environment of genetically modified organisms which have (or of a single such organism which has) escaped or been released from a person's control and are (or is) capable of causing harm.' The notion 'harm' is broadly defined in Section 107(6) as 'adverse effects as regards the health of humans or *the environment*' (emphasis added). Moreover, see Constitution of the Republic of Hungary (18 April 2011; effective 01 January 2012), Unofficial English translation available in Oxford Constitutions of the World, Article XX(2), which provides that Hungary shall promote the exercise of the right of every person to physical and mental health by, inter alia, by 'making sure that its agriculture remains free from any genetically modified organism'.

mere presence of an LMO meets the threshold of *significant* harm, which requires such harm to be 'more than detectable'. As shown above, to be regarded as significant, the harm must lead to a 'real detrimental effect' on matters such as human health, industry, property, environment or agriculture.[184] Moreover, the detrimental effects must also be 'susceptible of being measured by factual and objective standards'.[185] For these reasons, it appears difficult to assume that the mere presence of an LMO in the environment of another state *per se* constitutes transboundary harm as long as the LMO does not cause any 'real detriment'. This result is in line with the *Nagoya – Kuala Lumpur Supplementary Protocol*: while unintentional transboundary movements are explicitly included in the Protocol's scope,[186] a case of damage is assumed only when a transboundary movement results in adverse effects that are both measurable and significant.[187] Similarly, the obligation to notify other states about unintentional transboundary movements only applies when the LMO concerned is 'likely to have significant adverse effects' on biological diversity.[188]

Fourthly, a closely related issue is whether there is a case of transboundary harm when LMOs do not cause physical injury but economic damage, for instance by contaminating agricultural commodities which can then be no longer sold as 'GMO-free'.[189] Here, on the one hand, the affected farmers suffer damage that is measurable by factual and objective standards, namely by comparing the market value of conventional crops with that of GMO-free or organic crops. On the other hand, it could be argued that damage does not result from the *physical consequences* of the LMO, but rather from economic or regulatory policies in the affected state that discriminate against products of modern biotechnology. Still, contamination with LMOs undermines the ability of states to determine for themselves

184 ILC, Articles on Prevention (n. 22), Commentary to Article 2, para. 4; see *supra* section B.IV.

185 *Ibid.*

186 See Supplementary Protocol (n. 32), Article 3(3) and chapter 6, section B.III.2.

187 See *ibid.*, Article 2(2)(b) and chapter 6, section B.II.3.

188 Cartagena Protocol (n. 91), Article 17(1).

189 *Förster* (n. 86), 177; see *R. Guy Reeves/Martin Phillipson*, Mass Releases of Genetically Modified Insects in Area-Wide Pest Control Programs and Their Impact on Organic Farmers, 9 (2017) Sustainability 59. For an assessment of the private international law aspects of this scenario, see *Thomas Kadner Graziano/Matthias Erhardt*, Cross-Broder Damage Caused by Genetically Modified Organisms: Jurisdiction and Applicable Law, in: Bernhard A. Koch (ed.), Damage Caused by Genetically Modified Organisms (2010) 784.

how to regulate the use of modern biotechnology.[190] Therefore, a case of significant transboundary harm could be presumed at least when there is a large-scale introduction of LMOs into the environment of another state or contamination of large amounts of agricultural commodities.[191]

3. Anticipation of Risk

One of the main features of the obligation to prevent transboundary harm is the anticipation of risk. Hence, any invocation of state responsibility requires that the occurrence of harm is objectively foreseeable at the time when the relevant activity, such as the release of LMOs, is carried out. In this regard, *Lefeber* argued that the release of LMOs into the environment was unlikely to constitute a 'hazardous activity' as governments would be expected not to approve such releases if the risk assessment revealed either a high probability of causing significant transboundary damage or a low probability of causing disastrous transboundary damage.[192] But this confuses the question of whether a risk exists and the question of whether a state has lived up to its duties that follow from such a risk: a hazardous activity remains objectively hazardous even when appropriate measures are put in place to prevent the risk from materializing.

VIII. Conclusions

In sum, the obligation to prevent transboundary harm generally applies to unintended transboundary effects of LMOs. This includes unintentional transboundary movements, although the mere presence of an LMO in foreign territory as such is unlikely to be considered *significant* harm. The precautionary principle provides that a lack of scientific certainty does not justify taking no preventive measures, although the principle should not be misunderstood as requiring action when the alleged risks remain purely theoretical and are not supported at least by *prima facie* evidence.

Harm resulting from LMOs after they have been deliberately introduced into the receiving state is not covered by the obligation to prevent trans-

190 *Alison Peck*, The New Imperialism: Toward an Advocacy Strategy for GMO Accountability, 21 (2008) Geo. Int'l Envtl. L. Rev. 37, 39.
191 *Förster* (n. 86), 177.
192 *Lefeber* (n. 175), 82.

boundary harm, as there are no physical transboundary consequences. Yet, states are still under the general obligation to not knowingly allow their territory to be used for acts contrary to the rights of other states,[193] which also applies to unauthorized transboundary movements of LMOs.

C. *Prevention of Transboundary Harm as an Obligation of 'Due Diligence'*

Once it is established that the obligation to prevent transboundary harm applies to a given situation, the question of the content of this obligation arises. While it is possible to flesh out a number of specific procedural duties related to prevention,[194] determining the substantive content of the obligation is more difficult. Most importantly, the obligation to prevent transboundary harm is not absolute, which means that not every occurrence of harm is unlawful.[195] On the other hand, states are not only expected to refrain from harmful conduct but also to take proactive steps to prevent harm. In international treaties, this two-fold obligation is usually described as an obligation to take 'appropriate measures'. For instance, the ILC's Prevention Articles provide that states shall 'take all appropriate measures to prevent significant transboundary harm or at [sic] any event minimize the risk thereof'.[196] Similarly, the Cartagena Protocol requires states to 'take appropriate measures to prevent unintentional transboundary movements of living modified organisms'.[197] Comparable expressions can be found in many other instruments relating to the prevention of transboundary or environmental harm.[198]

Obligations to take *appropriate measures* or *reasonable steps* towards a given aim (such as to prevent harm or to provide for operator liability in certain cases) are often characterized as obligations of 'due diligence'.[199]

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193 Cf. ICJ, Corfu Channel (Merits) (n. 3), 22.
194 See *infra* section D.
195 ILC, Articles on Prevention (n. 22), Commentary to Article 3, para. 7.
196 *Ibid.*, Article 3.
197 Cartagena Protocol (n. 91), Article 16(3).
198 See, e.g., UNCLOS (n. 13), Article 194(2); Espoo Convention (n. 100), Article 2(1); International Watercourses Convention (n. 100), Article 7(1), also see *Riccardo Pisillo-Mazzeschi*, The Due Diligence Rule and the Nature of the International Responsibility of States, 35 (1992) German YBIL 9, 36–41.
199 See, e.g., ILC, Articles on Prevention (n. 22), Article 3, commentary para. 7; *Boyle/Redgwell* (n. 19), 163–164. In the ILC, it was assumed that the terms 'all appropriate measures' and 'due diligence' were synonymous, cf. ILC, Report of the International Law Commission on the Work of Its Fifty-Second Session,

According to its ordinary meaning, the term *due diligence* refers to the degree of care reasonably expected from a person in order to discharge an obligation.[200] Consequently, obligations of due diligence do not require states to guarantee a particular result (i.e. 'no harm occurs') but to implement a certain conduct (i.e. 'appropriate measures to prevent harm are being taken').[201] This takes account of the fact that most hazardous activities are not carried out by the states themselves, but by private actors whose actions cannot be generally attributed solely because they are committed within the state's jurisdictional sphere.[202] For the same reason, obligations of due diligence can also be found in many other areas of international law including human rights law, humanitarian law, and international investment law,[203] although the role of due diligence varies depending on the respective context and the pertinent primary norms.[204]

While the precise nature of the due diligence standard in international law remains subject to scholarly and judicial debate,[205] it appears that due diligence is not an obligation in itself, but rather a legal standard of conduct which serves to determine whether a state has complied with a particular (primary) rule.[206] In the context of international environmental law, the pertinent key primary rule is the obligation to prevent significant transboundary harm.[207] In this regard, due diligence requires a standard of care which is 'generally considered to be appropriate and proportional

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YBILC 2000, vol. II(2) (2000), para. 718. Also see *Pisillo-Mazzeschi* (n. 198), 46–49; *Monnheimer* (n. 142).

200 Cf. 'diligence' and 'due diligence', in: Black's Law Dictionary (n. 35), 573.

201 See *Constantin P. Economides*, Content of the Obligation: Obligations of Means and Obligations of Result, in: James Crawford/Alain Pellet/Simon Olleson (eds.), The Law of International Responsibility (2010) 373; *James Crawford*, State Responsibility: The General Part (2013), 227–228.

202 *Duvic-Paoli* (n. 4), 201; see chapter 9, section A.II.2.b).

203 See *Kulesza* (n. 31), 55–113; ILA, ILA Study Group on Due Diligence in International Law: First Report (2014), 6–31.

204 *Neil McDonald*, The Role of Due Diligence in International Law, 68 (2019) ICLQ 1041, 1044–1054; *Duvic-Paoli* (n. 4), 201.

205 See e.g. *Pisillo-Mazzeschi* (n. 198); *Kulesza* (n. 31), 262–270; *McDonald* (n. 204).

206 *McDonald* (n. 204), 1044–1049; but see *Duvic-Paoli* (n. 4), 206–207, who concludes that there is still disagreement on whether due diligence is a discrete obligation or a standard of care. Also see ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge ad hoc Dugard, paras. 9–10, pointing out that '[t]he duty of due diligence […] is the standard of conduct required to implement the principle of prevention.'

207 See *Kulesza* (n. 31), 91–105; see *supra* section A.

to the degree of risk of transboundary harm in the particular instance'.[208] In contrast to what was suggested by the United Kingdom in the *Alabama Arbitration* of 1872,[209] due diligence is an objective standard and does not depend on the degree of care employed by the respective government in its domestic concerns.[210] Instead, due diligence requires what can reasonably be expected from a responsible government (or 'good' government[211]) under normal conditions.[212]

In the context of prevention, the state is required to 'act in exact proportion to the risks'.[213] Hence, the required standard of care depends on the probability that harm might occur, and the nature and scope of such harm.[214] The more hazardous the activity, or the more severe the potential damage, the higher the duty of care will be.[215] Some scholars have even argued that certain 'ultra-hazardous' activities could be forbidden altogether if they involve a risk of catastrophic damage that cannot be entirely averted.[216] However, this point of view seems not to correspond with the *opinio juris* of states, especially considering the multitude of ultra-hazardous activ-

208 ILC, Articles on Prevention (n. 22), Article 3, commentary para. 11.

209 Cf. Alabama Arbitration (United States v. Great Britain), reported in: Moore (ed.), History and Digest of the International Arbitrations to Which the United States Has Been a Party, vol. I (1898), p. 495, 610.

210 *Xue* (n. 30), 163; see Alabama Arbitration (United States v. Great Britain) (n. 209), 572–573; cf. ICJ, Military and Paramilitary Activities in and against Nicaragua (n. 46), para. 157; ICSID, Asian Agricultural Products Ltd. v. Republic of Sri Lanka, Award of 27 June 1990, ICSID Case No. ARB/87/3, para. 77.

211 Cf. *Pierre-Marie Dupuy*, Due Diligence in the International Law of Liability, in: OECD (ed.), Legal Aspects of Transfrontier Pollution (1977) 369, 369–370, who assumes that 'Due diligence […] is the diligence expected from a "good government"'; ILA, ILA Study Group on Due Diligence in International Law: Second Report (2016), 9–10.

212 ILC, Articles on Prevention (n. 22), Article 3, commentary para. 17; see *Xue* (n. 30), 162–164.

213 Alabama Arbitration (United States v. Great Britain) (n. 209), 654.

214 ILC, Articles on Prevention (n. 22), Article 3 MN. 11; *Günther Handl*, Transboundary Impacts, in: Daniel Bodansky/Jutta Brunnée/Ellen Hey (eds.), The Oxford Handbook of International Environmental Law (2007) 531, 540; ITLOS, Responsibilities and Obligations of States (n. 106), paras. 117–120.

215 ILC, Articles on Prevention (n. 22), Commentary to Article 3, para. 18; ITLOS, Responsibilities and Obligations of States (n. 106), para. 117.

216 *Günther Handl*, An International Legal Perspective on the Conduct of Abnormally Dangerous Activities in Frontier Areas: The Case of Nuclear Power Plant Siting, 7 (1978) ELQ 1, 47–48; *Boyle/Redgwell* (n. 19), 168.

ities that are regularly conducted by states and generally deemed lawful, such as the operation of nuclear power plants.[217]

The standard of due diligence does not *per se* prescribe specific measures that a state must take. Due diligence is a 'variable concept'[218] which grants the states concerned significant 'autonomy and flexibility'[219] in choosing their means of preventing harm, based on their individual circumstances, policy preferences, and the characteristics of the risk.[220] Due to this flexibility, it remains difficult to describe in precise terms what the content of due diligence obligations is,[221] and in consequence, what measures will be considered 'appropriate' or 'reasonable' in a particular situation.[222] Hence, it may be difficult for states to ascertain 'clearly, and in advance, that they are satisfactorily meeting – and continuing to meet – their obligations of conduct'.[223] Consequently, whether or not a state has acted with due diligence is often assessed only after the harm that was to be prevented has (allegedly) already occurred.[224] The due diligence standard in the prevention of transboundary harm has thus rightfully been described as an '*ex post* framework for an anticipatory obligation'.[225] As will be seen below, this is an important caveat for determining breaches of the obligation to prevent transboundary harm.[226]

D. Procedural Duties in the Context of Prevention

The previous section has shown that the specific requirements ensuing from the due diligence standard depend on the individual circumstances of each case, which makes it difficult to define in abstract terms what

217 *Alan E. Boyle*, State Responsibility and International Liability for Injurious Consequences of Acts Not Prohibited by International Law: A Necessary Distinction?, 39 (1990) ICLQ 1, 12–14; *Phoebe N. Okowa*, Procedural Obligations in International Environmental Agreements, 67 (1997) BYIL 275, 314–320; see *Handl* (n. 214), 540.
218 ITLOS, Responsibilities and Obligations of States (n. 106), para. 117.
219 ILA, Second Report on Due Diligence (n. 211), 2.
220 *Duvic-Paoli* (n. 4), 201.
221 ITLOS, Responsibilities and Obligations of States (n. 106), para. 117.
222 *Duvic-Paoli* (n. 4), 201.
223 ILA, Second Report on Due Diligence (n. 211), 7.
224 *Duvic-Paoli* (n. 4), 332.
225 *Ibid.*
226 See *infra* section E.

measures a state must adopt in order to comply with the required standard of care.

Nevertheless, a number of – mostly procedural – obligations have emerged in both international treaties and customary law, which contribute to a 'minimum standard of conduct' in the prevention of transboundary harm.[227] These obligations include a requirement to adopt and implement an effective domestic regulatory framework to prevent harm from being caused by private actors (I.), the requirement to carry out environmental impact or risk assessments for hazardous activities (II.), the use of the best available technologies and compliance with internationally agreed standards (III.), the duty to cooperate with potentially affected states (IV.) a requirement to allow for public participation from the potentially affected population (V.). Besides, additional duties arise when damage is imminent or has already occurred (VI.).

I. Adoption and Enforcement of Effective Domestic Regulation

First and foremost, the effective prevention of significant transboundary harm requires that states adopt and implement national legislative and administrative frameworks to regulate the conduct of (private or public) actors which may cause such harm.[228] Where available, such legislation shall incorporate accepted international standards, which can 'constitute a necessary reference point' to determine whether domestic measures are appropriate.[229] In the absence of relevant international standards, states are free to decide on the nature and design of their national laws and regulations, provided that these laws and regulations are capable of effectively preventing transboundary harm.[230]

In addition to adopting appropriate legal measures at the national level, states must also ensure that these measures are effectively implemented

227 *Xue* (n. 30), 165. On the question whether these duties are elements of the due diligence standard or self-standing obligations of customary international law, see *infra* section E.III.

228 Rio Declaration 1992 (n. 9), Principle 11; ILC, Articles on Prevention (n. 22), Article 5; see *Boyle/Redgwell* (n. 19), 164.

229 ILC, Articles on Prevention (n. 22), Article 3, commentary para. 3; cf. ICJ, Pulp Mills (n. 18), para. 197.

230 ITLOS, Sub-Regional Fisheries Commission (n. 66), para. 138; *Duvic-Paoli* (n. 4), 208–209.

and enforced.[231] In the *Pulp Mills* case, the ICJ underscored that the obligation to employ due diligence

> *'is an obligation which entails not only the adoption of appropriate rules and measures, but also a certain level of vigilance in their enforcement and the exercise of administrative control applicable to public and private operators, such as the monitoring of activities undertaken by such operators, to safeguard the rights of the other party.'*[232]

Similarly, the ILC's Prevention Articles provide that states shall take the necessary legislative, administrative or other action, 'including the establishment of suitable monitoring mechanisms', to discharge their obligation to prevent transboundary harm.[233] The commentary emphasizes the 'continuing character of the obligations, which require action to be taken from time to time to prevent transboundary harm'.[234] This includes, in particular, the obligation to require prior authorization for activities that may involve a risk of significant transboundary harm.[235]

Consequently, a state may not only be internationally responsible for not enacting appropriate laws, but also for not sufficiently implementing and enforcing these laws, for not preventing or terminating an illegal activity, or for not punishing the person responsible for it.[236]

II. Environmental Impact (or Risk) Assessment

One of the cornerstones of international law relating to the prevention of transboundary harm is the requirement of environmental impact assessments (EIA) or risk assessments.[237] Characterized as an 'obligation

231 *Xue* (n. 30), 164.
232 ICJ, Pulp Mills (n. 18), MN. 197; also see ITLOS, Sub-Regional Fisheries Commission (n. 66), paras. 138–139; ICJ, Gabčíkovo-Nagymaros (n. 17), para. 185; PCA, South China Sea Arbitration (Philippines v. People's Republic of China) (n. 106), paras. 961, 964, and 974.
233 ILC, Articles on Prevention (n. 22), Article 5.
234 *Ibid.*, Article 5, commentary para. 1.
235 *Ibid.*, Article 6 and commentary, para. 2; also see *McDonald* (n. 204), 1045.
236 ALI, Restatement of the Law Third: Foreign Relations of the United States, Volume 2 (1987), p. 105, section 601, comment (d); ILC, Draft Articles on the Law of the Non-Navigational Uses of International Watercourses and Commentaries Thereto, YBILC 1994, vol. II(2), p. 89 (1994), Article 7, commentary para. 4.
237 See generally *Neil Craik*, The International Law of Environmental Impact Assessment (2008). Note that there is no clear distinction between the terms

to acquire knowledge',[238] the overall purpose of such assessments is to evaluate the potential effects of an activity, including their likeliness and magnitude, on persons, property and the environment.[239] Therefore, they are a 'central means' for states to determine the potential environmental consequences of hazardous activities and, consequently, the required degree of care in ensuring that no harm is caused by these activities.[240]

1. Legal Status

Numerous multilateral treaties require that the environmental impacts of potentially harmful activities be assessed before such activities are authorized.[241] The most comprehensive elaboration of EIA requirements in international law can be found in the *Espoo Convention*,[242] which provides detailed rules on EIAs for hazardous activities that may cause transboundary harm but which binds only 45 (mostly European) states.[243] At the universal level, Principle 17 of the Rio Declaration calls for environmental impact assessments to be undertaken for 'proposed activities that are likely to have a significant adverse impact on the environment'.[244] The ILC's Articles on Prevention also provide that decisions concerning the authorization of hazardous activities shall be based on an assessment of

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'risk assessment' and 'environmental impact assessment'. Article 7 of the ILC's Prevention Articles refers to 'an assessment of the possible transboundary harm […], including any environmental impact assessment', which implies the former term to denote the more general concept and the latter to be more specific. But it appears to largely depend on the context which of the terms is used. The present study will treat the terms EIA and risk assessment synonymously as referring to the study of the potential adverse effects of LMOs.

238 *Monnheimer* (n. 142), 150.

239 Cf. ILC, Articles on Prevention (n. 22), Commentary to Article 7, para. 8; see *Kulesza* (n. 31), 104–105.

240 *Duvic-Paoli* (n. 4), 211.

241 See, e.g., UNCLOS (n. 13), Article 206; Espoo Convention (n. 100); Protocol on Environmental Protection to the Antarctic Treaty (n. 54), Article 8; UNFCCC (n. 14), Article 4(1)(f); CBD (n. 12), Article 14. For references to regional agreements, see *Xue* (n. 30), p. 165, n. 12.

242 Espoo Convention (n. 100).

243 UN OLA, Status of the Convention on Environmental Impact Assessment in a Transboundary Context, available at: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-4&chapter=27&clang=_en (last accessed 28 May 2022).

244 Rio Declaration 1992 (n. 9), Principle 17.

the possible transboundary harm caused by that activity, 'including any environmental impact assessment'.[245]

The obligation to conduct an EIA has also found recognition in international jurisprudence. In its judgment in the *Pulp Mills* case, the ICJ held it 'may now be considered a requirement under general international law' to undertake an EIA where a proposed industrial activity may have significant adverse transboundary impacts.[246] Moreover, the Court expressly held that 'due diligence, and the duty of vigilance and prevention which it implies, would not be considered to have been exercised' if a party planning a hazardous activity likely to have transboundary effects did not undertake an environmental impact assessment on the potential effects of the activity.[247] This position was reaffirmed in the *Certain Activities* case, where the Court also clarified that the obligation to conduct an EIA is not limited to industrial activities, but applies 'generally to proposed activities which may have a significant adverse impact in a transboundary context'.[248]

A still controversial issue is whether the requirement to carry out an EIA is an independent customary obligation[249] or whether it constitutes a manifestation of the due diligence standard.[250] This distinction is not merely an academic problem but has considerable practical implications,[251] including for the question of whether a failure to conduct an EIA does by itself constitute a violation of international law even when no damage has occurred (yet).[252] Moreover, the legal status of the EIA requirement

245 ILC, Articles on Prevention (n. 22), Article 7.
246 ICJ, Pulp Mills (n. 18), para. 204; also see ILC, Articles on Prevention (n. 22), Article 7; *Handl* (n. 214), 541–542.
247 ICJ, Pulp Mills (n. 18), para. 204.
248 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 104.
249 Cf. ITLOS, Responsibilities and Obligations of States (n. 106), para. 145; ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge ad hoc Dugard, para. 9.
250 Cf. ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge Donoghue, para. 1; also see *Duvic-Paoli* (n. 4), 213–215; *Justine Bendel/James Harrison*, Determining the Legal Nature and Content of EIAs in International Environmental Law: What Does the ICJ Decision in the Joined Costa Rica v Nicaragua/Nicaragua v Costa Rica Cases Tell Us?, 42 (2017) QIL 13, 14–18.
251 *Bendel/Harrison* (n. 250), 17.
252 *Jutta Brunnée*, International Environmental Law and Community Interests: Procedural Aspects, in: Eyal Benvenisti/Georg Nolte/Keren Yalin-Mor (eds.), Community Interests Across International Law (2018) 151, 158–159; see *infra* section E.II.

also has ramifications on the obligation to notify other states potentially affected by a hazardous activity.[253]

2. Triggers of the Obligation

Another fundamental question is when exactly the obligation to carry out an EIA is triggered. On the one hand, the performance of an EIA shall be required whenever an activity might have significant adverse effects; on the other hand, the very purpose of EIAs is to determine whether a risk of adverse effects exists at all.[254] Some international instruments try to solve this 'circularity problem'[255] by requiring an EIA for specific activities or substances because they are (legally) presumed to involve a risk of adverse effects.[256] This approach is also reflected in the Cartagena Protocol, which provides for a mandatory risk assessment whenever there is a transboundary movement of an LMO intended for introduction into the environment.[257] Where international law does not provide such specific guidance, states are required to ascertain whether there is a risk of significant transboundary harm which would trigger the requirement to carry out an EIA.[258] Consequently, they must ensure that there are criteria or preliminary assessment procedures in their domestic authorization procedures to determine whether a proposed activity should be subject to an EIA.[259]

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253 See *infra* section D.IV.1.

254 *Duvic-Paoli* (n. 4), 211–212; *Boyle/Redgwell* (n. 19), 191.

255 *Duvic-Paoli* (n. 4), 212.

256 Espoo Convention (n. 100), Appendix I; Cartagena Protocol (n. 91), Articles 10(1) and 15.

257 Cartagena Protocol (n. 91), Article 10(1), 15.

258 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 104, see *Brent* (n. 112), 53, observing that the Court affirmed a 'new procedural obligation'.

259 *Duvic-Paoli* (n. 4), 212; ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 154; *Boyle/Redgwell* (n. 19), 192–193. Also see Protocol on Environmental Protection to the Antarctic Treaty (n. 54), Annex I, Article 2, which provides for a dedicated 'Initial Environmental Evaluation' to determine whether a more detailed assessment is required; moreover, see UNEP, Goals and Principles of Environmental Impact Assessment (1987), UN Doc. UNEP/GC.14/17, Annex III (adopted by UNEP GC decision 14/25, contained in UN Doc. A/42/25, p. 77), Principle 2, which proposes an 'initial environmental evaluation' besides other mechanisms to determine whether an EIA is required.

3. Process and Content of EIAs

Once the requirement to conduct an EIA has been established, the question arises of what should be the process and content of such an assessment. In this regard, it is widely assumed that international law prescribes neither a specific methodology nor a catalogue of aspects that should be considered.[260] In the commentaries of its Articles on Prevention, the ILC assumed that the 'specifics of what ought to be the content of assessment is left to the domestic laws of the state conducting such assessment'.[261] Similarly, the ICJ held in *Pulp Mills* that 'it is for each state to determine in its domestic legislation […] the specific content of the environmental impact assessment required in each case, having regard to the nature and magnitude of the proposed development and its likely adverse impact on the environment.'[262] This principle was reaffirmed in the *Certain Activities* case, where the Court added that the content of the EIA should be determined 'in light of the specific circumstances of each case'.[263]

But this does not mean that international law does not make any prescriptions as to how the process and content of EIAs should be designed.[264] A wide array of international legal sources indicate that there are at least certain minimum requirements that states must meet in order to satisfy their due diligence obligations.[265] Such requirements can be found, for instance, in the *Goals and Principles on Environmental Impact Assessment* adopted by the Governing Council of the UN Environment Programme in 1987.[266] The Goals and Principles contain a list of the issues that should at least be addressed by an EIA.[267] The list includes an assessment of the likely or potential impacts of the proposed activity, a discussion of available measures to mitigate adverse impacts, an indication of gaps in knowledge, as well as an indication of whether the activity is likely to affect the environment of other states or areas beyond national jurisdic-

260 See, e.g., *Xue* (n. 30), 167; *Duvic-Paoli* (n. 4), 216.
261 ILC, Articles on Prevention (n. 22), Commentary to Article 7, paras. 7.
262 ICJ, Pulp Mills (n. 18), para. 205.
263 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 104; also see ITLOS, Responsibilities and Obligations of States (n. 106), para. 149.
264 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Seperate Opinion of Judge ad hoc Dugard, para. 18.
265 See *Craik* (n. 237), 90–111.
266 UNEP, Goals and Principles of EIA (n. 259).
267 *Ibid.*, Principle 4.

tion.[268] Minimum requirements and other standards for EIAs have also been developed, both in treaties and *soft law* instruments, with regard to specific types of hazardous activities or substances.[269]

4. Standards for Risk Assessments of LMOs/GMOs

Standards for the risk assessment of LMOs or GMOs can be found, *inter alia*, in Annex III to the Cartagena Protocol, in a dedicated *Guidance on Risk Assessment and Monitoring of LMOs* elaborated by a working group established by the meeting of parties to the Cartagena Protocol,[270] and in the respective documents developed under the auspices of the International Plant Protection Convention,[271] the World Organization for Animal Health,[272] and the Codex Alimentarius Commission.[273] It can be assumed that these standards, where applicable, will be referred to by international courts and tribunals when examining EIAs in particular cases.[274] However, it is questionable to what extent the existing risk assessment frameworks are sufficient to capture the particular risks posed by LMOs capable of self-propagation, such as gene drives.[275]

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268 *Ibid.*

269 See, e.g., the Espoo Convention (n. 100), the Regulations and Recommendations adopted by the International Seabed Authority (cf. *Vöneky/Beck*, Article 145 UNCLOS (n. 149), MN. 45–47; ITLOS, Responsibilities and Obligations of States (n. 106), para. 149); and ISO, Risk Management – Risk Assessment Techniques, ISO/IEC 31010:2019 (2019).

270 AHTEG on Risk Assessment, Guidance on Risk Assessment of Living Modified Organisms and Monitoring in the Context of Risk Assessment, UN Doc. UNEP/CBD/BS/COP-MOP/8/8/Add.1, Annex (2016); see chapter 5, section C.II.1.b)aa).

271 See chapter 3, section D.

272 See chapter 3, section E.

273 See chapter 3, section F.

274 *Duvic-Paoli* (n. 4), 217.

275 Cf. *Marion Dolezel* et al., Beyond Limits – The Pitfalls of Global Gene Drives for Environmental Risk Assessment in the European Union, 15 (2020) BioRisk 1; *Jennifer Kuzma*, Procedurally Robust Risk Assessment Framework for Novel Genetically Engineered Organisms and Gene Drives, 15 (2021) Regulation & Governance 1144.

5. Conclusions

In conclusion, the requirement to conduct an environmental impact (or risk) assessment for activities that may have significant transboundary effects is well-established in international law. The precise process and content of these assessments largely depend on the context, whether there are internationally agreed standards in the relevant field, and on the domestic legislation of the state concerned. However, in the context of biotechnology multiple instruments provide detailed scientific standards on the methodology and content of risk assessments. Moreover, the content of EIAs can be assessed against the general obligation of states to employ due diligence to prevent transboundary harm.[276] For instance, in *Pulp Mills* the ICJ assessed whether Uruguay failed to exercise due diligence by not considering alternative locations for the disputed pulp mills in its EIA.[277] The WTO Dispute Settlement Body has also reviewed the adequacy of risk assessments in several cases.[278]

III. Use of the Best Available Technologies

Another expression of the due diligence standard is the requirement to ensure that the operators of hazardous activities make use of 'the best available technologies that minimize significant risks to nature or other adverse effects'.[279] Under the *UNECE Watercourses Convention*, the term

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276 *Duvic-Paoli* (n. 4), 217.

277 Cf. ICJ, Pulp Mills (n. 18), paras. 207–214.

278 Cf. WTO DSB, Australia – Measures Affecting Importation of Salmon, Report of the Appellate Body of 20 October 1998, WT/DS18/AB/R, para. 135; WTO DSB, EC-Hormones, Appellate Body report (n. 144), para. 199; WTO DSB, Japan – Measures Affecting the Importation of Apples, Report of the Appellate Body of 26 November 2003, WT/DS245/AB/R, para. 202; also see chapter 3, section C.II.

279 UNGA, World Charter for Nature, UN Doc. A/RES/37/7, Annex (1982), para. 11; cf. UNECE Watercourses Convention (n. 136), Annex I, para. 1; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (22 March 1989; effective 05 May 1992), 1673 UNTS 57 (hereinafter 'Basel Convention'), Article 2(8) and 4(2)(b); Convention for the Protection of the Marine Environment of the North-East Atlantic (22 September 1992; effective 25 March 1998), 2354 UNTS 67, Article 2(3)(b) and Appendix 1; but see *Kiss/Shelton* (n. 65), 120–121, who argue that the requirement to use the best available technology or the best practical means 'can be seen as

'best available technology' has been defined as 'the latest stage of development of processes, facilities or methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste'.[280] The Convention also recognizes that what is 'best available technology' for a particular process will change over time in light of technological advances and changes in scientific knowledge and understanding.[281]

Some earlier instruments limit the obligation insofar that states must only use the best technology *actually at their disposal*.[282] It has also been discussed whether the degree of care expected under the due diligence standard is variable, depending on the technical and economical capabilities of the state concerned.[283] Indeed, the obligation to employ due diligence is generally reflective of the means actually available to the state in question.[284] At the same time, however, it is doubtful whether states with a comparatively low level of economic development are allowed to operate hazardous activities at a lower standard of care than other, better-developed states. In the commentary to its Prevention Articles, the ILC expressly stated:

> *'The economic level of States is one of the factors to be taken into account in determining whether a State has complied with its obligation of due diligence. But a State's economic level cannot be used to dispense the State from its obligation under the present articles.'*[285]

This view has also been adopted in international case law. In the *Pulp Mills* case, the ICJ held that the mills erected by Uruguay (a developing state)

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deriving in part from the customary international obligation of 'due diligence' to prevent environmental harm.'

280 UNECE Watercourses Convention (n. 136), Annex I, para. 1.

281 *Ibid.*, Annex I, para. 2.

282 See e.g., Stockholm Declaration 1972 (n. 8), Principle 23; Convention on Long-Range Transboundary Air Pollution (13 November 1979; effective 16 March 1983), 1302 UNTS 217 (hereinafter 'LRTAP'), Article 6; UNCLOS (n. 13), Article 194(1); Montreal Protocol on Substances that Deplete the Ozone Layer (16 September 1987; effective 01 January 1989), 1522 UNTS 3, as last amended by the Meeting of Parties in 2018, Article 5; Rio Declaration 1992 (n. 9), Principles 6 and 7.

283 Cf. WCED Expert Group on Environmental Law, Legal Principles and Recommendations (n. 37), 80; see *Lefeber* (n. 30), 68–69; *Duvic-Paoli* (n. 4), 287–291.

284 Cf. ICJ, United States Diplomatic and Consular Staff in Tehran, Judgment of 24 May 1980, ICJ Rep. 3, paras. 61 and 63.

285 ILC, Articles on Prevention (n. 22), Commentary to Article 3, para. 13.

had to be operated in line with the highest international standards.[286] Similarly, the ITLOS Seabed Disputes Chamber held that the provisions concerning the responsibilities and liability of state sponsoring activities in the international seabed area applied equally to all sponsoring states, as otherwise commercial enterprises could choose states 'of convenience' with lower environmental standards.[287] Hence, while the actual capabilities of a state may be taken into account when assessing a state's compliance with its obligation to employ due diligence in preventing transboundary harm,[288] this does not result in a generally lowered standard of care applicable to developing states.[289]

IV. Cooperation

The duty of states to cooperate with each other in the prevention of environmental harm is widely recognized as a 'fundamental principle' of international law.[290] It is generally viewed as a procedural obligation that extends to all phases of planning and implementation of a (potentially) hazardous activity.[291] The general duty to cooperate finds its expression in three core obligations, namely a duty to notify (1.), a duty to exchange relevant information (2.), and an obligation to consult and negotiate (3.).

1. Notification

The obligation to notify other states has been characterized by the ILC as an 'indispensable part of any system designed to prevent harm'.[292] It generally takes two different forms: The first, which will be addressed in the present section, is that states which engage in hazardous activities that may have significant transboundary effects shall inform the states which

286 Cf. ICJ, Pulp Mills (n. 18), paras. 220–228.
287 ITLOS, Responsibilities and Obligations of States (n. 106), para. 159.
288 ILA, Second Report on Due Diligence (n. 211), 22; see *Duvic-Paoli* (n. 4), 202.
289 *Boyle/Redgwell* (n. 19), 166–167.
290 ICJ, Pulp Mills (n. 18), para. 77; ITLOS, The MOX Plant Case (Ireland v. United Kingdom) (n. 147), para. 81; PCA, South China Sea Arbitration (Philippines v. People's Republic of China) (n. 106), para. 985.
291 ILC, Articles on Prevention (n. 22), Commentary to Article 4, para. 1.
292 *Ibid.*, Commentary to Article 8, para. 2; see *Okowa* (n. 217), 289–300.

may potentially be affected by those effects.[293] The second form, which is a notification in cases of imminent damage, will be addressed separately below.[294]

The duty to notify other states about hazardous activities that may have significant transboundary effects has been reiterated in numerous international instruments[295] as well as in international case law.[296] It can now be regarded as a general obligation of customary international law that has 'gained pre-eminence in the context of environmental protection'.[297] At the same time, however, the duty to notify faces a number of unsettled questions and problems.

a) Timing

The first problem concerns the question as to when exactly the potentially affected states have to be notified and, more specifically, how the notification relates to the obligation to conduct a risk assessment or EIA.[298] In this respect, the Espoo Convention and the ILC's Articles on Prevention follow contradictory approaches. According to the *Espoo Convention*, parties are required to notify potentially affected states *before* conducting the EIA so as to allow these states to contribute to the assessment.[299] But the ILC's Prevention Articles provide that potentially affected states shall only be notified '[i]f the risk assessment indicates a risk of causing significant transboundary harm',[300] which implies that the duty to notify is only triggered *after* the risk assessment has been conducted and has revealed the existence of a risk.[301]

In the *Certain Activities* case, the ICJ apparently followed the latter approach.[302] Because it had already established that Costa Rica had violated

293 Rio Declaration 1992 (n. 9), Principle 19; *Xue* (n. 30), 169.
294 See *supra* section D.VI.1.
295 See, e.g., LRTAP (n. 282), Article 5; Espoo Convention (n. 100), Article 5; Rio Declaration 1992 (n. 9), Principle 19; International Watercourses Convention (n. 100), Article 12.
296 ICJ, Pulp Mills (n. 18), para. 113; ICJ, Corfu Channel (Merits) (n. 3), 22.
297 *Duvic-Paoli* (n. 4), 219.
298 See *Okowa* (n. 217), 291; *Xue* (n. 30), 170–172.
299 Espoo Convention (n. 100), Article 3(3).
300 ILC, Articles on Prevention (n. 22), Article 8(1).
301 *Duvic-Paoli* (n. 4), 226.
302 Cf. ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 104.

its obligation to carry out an EIA for its construction of a road in the border area with Nicaragua, the Court saw no need to examine whether Costa Rica had also violated its obligation to notify Nicaragua about the project.[303] Thus, the Court implied that it considered the obligation to notify to be contingent upon a prior finding of risk through an EIA.[304]

After all, international law seems to provide no specific guidance as to when the notification must be made, except for the vague indications that it should be 'timely'[305] or 'as early as possible'.[306] In particular, there is no general rule that potentially affected states shall be given the opportunity to participate in the EIA process.

b) Addressees

The second issue relates to the recipients of the notification, i.e. the question of which states should be notified about a proposed hazardous activity.[307] In principle, a notification must be made to all states that are 'likely to be affected' by transboundary harm.[308] This largely depends on the nature of the activity and the types of risk it involves.[309] For instance, an undesired spread of a highly invasive gene drive may not only affect the neighbouring states but all states in which the relevant species is present as well as other states which may be affected by secondary ecosystem effects.[310] Hence, the question of who should be notified is closely linked to the issue of when the duty of notification is triggered in the first place.[311]

303 *Ibid.*, para. 168; see *Duvic-Paoli* (n. 4), 224–225.
304 *Ibid.*, 226; *Brunnée* (n. 252), 158; but see ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Seperate Opinion of Judge Donoghue, paras. 21–23, who pointed out that she did not understand the judgment to mean that the obligation to notify only applied when an EIA found a risk of significant transboundary harm.
305 ILC, Articles on Prevention (n. 22), Article 8(1).
306 Espoo Convention (n. 100), Article 3(1); see *Duvic-Paoli* (n. 4), 225.
307 See *Okowa* (n. 217), 290–291.
308 ILC, Articles on Prevention (n. 22), Article 8(1).
309 *Duvic-Paoli* (n. 4), 220.
310 See chapter 1, section C.IV.4.
311 *Xue* (n. 30), 172.

c) Content

The third issue concerns the content of a notification.[312] In principle, the state undertaking the hazardous activity is required to provide all relevant information on the nature of the activity, the risks involved and the injury it may cause, so as to allow the potentially affected states to make their own evaluation of the situation.[313] When the state of origin has already conducted an EIA, it appears reasonable to assume that it will have to submit the assessment itself as well as any relevant information on which the assessment is based.[314]

d) Procedure

Finally, it is questionable whether states need to observe any particular procedure when making the notification. In this regard, the ILC's Prevention Articles set out detailed rules on the procedure of notification, including a six-month waiting period during which the state of origin may not proceed with the activity until it has received a response from the notified state.[315]

Moreover, the Articles stipulate a right of the potentially affected state to request information about activities which it believes involve a risk of causing significant transboundary harm.[316] While these provisions are based on examples contained in treaties,[317] they seem to go beyond existing customary law and should rather be qualified as an instance of *progressive development* of international law.[318] As with the content of EIAs, the details of the notification procedure are left for each state to decide.[319]

312 See *Okowa* (n. 217), 291–293.
313 *Ibid.*, 291; *Duvic-Paoli* (n. 4), 219.
314 ILC, Articles on Prevention (n. 22), Article 8(1).
315 *Ibid.*, Article 8(2); on the failure to respond to notification, see *Okowa* (n. 217), 297–299.
316 ILC, Articles on Prevention (n. 22), Article 11.
317 See Espoo Convention (n. 100), Article 3(7); International Watercourses Convention (n. 100), Articles 13 and 18.
318 *Duvic-Paoli* (n. 4), 219; see Statute of the International Law Commission (n. 21), Article 1(1).
319 See *Duvic-Paoli* (n. 4), 219, noting that as a general rule, states will directly contact the other states through diplomatic channels.

2. Exchange of Information

The obligation to exchange relevant information on the hazardous activity is, to a certain extent, inherent in the obligation to notify, which requires disclosure of the 'available technical and all other relevant information'.[320] The exchange of information was characterized as a 'routine process' in international environmental law, especially in the context of activities that might have transboundary or global impacts.[321] Numerous international instruments provide for some form of information exchange, although with large differences in the degree of detail concerning both the content of the information and the process of exchange.[322] Usually, a distinction is made between information exchange in the planning period of an activity[323] and at the time during which the activity is undertaken.[324]

The exchange of information can be performed either directly between the states concerned or by using a competent international organization as an intermediary.[325] The latter is usually advisable when the information is relevant for a larger number of states or where appropriate mechanisms for information-sharing have already been established.[326]

For instance, the exchange of information regarding living modified organisms is facilitated by the *Biosafety Clearing-House* (BCH), which is a dedicated internet platform established under the Cartagena Protocol and maintained by the CBD Secretariat.[327] As shown above, parties to the Cartagena Protocol are legally required to submit certain information to the BCH, including decisions on the transboundary movement and release of LMOs, and underlying environmental reviews generated by their regulatory processes.[328]

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320 ILC, Articles on Prevention (n. 22), Commentary to Article 8, para. 6.
321 *Duvic-Paoli* (n. 4), para. 220.
322 See, e.g., UNCLOS (n. 13), Article 200; Espoo Convention (n. 100), Article 4(2) and Appendix II; CBD (n. 12), Article 17.
323 ILC, Articles on Prevention (n. 22), Article 8(1), which provides that the notification of potentially affected states shall include the 'available technical and all other relevant information on which the [risk] assessment is based'.
324 *Ibid.*, Article 12, see *Duvic-Paoli* (n. 4), 220.
325 ILC, Articles on Prevention (n. 22), Commentary to Article 12, para. 4; see *Okowa* (n. 217), 300–301.
326 ILC, Articles on Prevention (n. 22), Commentary to Article 12, para. 4.
327 Biosafety Clearing-House, available at: http://bch.cbd.int/ (last accessed 28 May 2022).
328 See chapter 3, section A.II.3.

As the BCH is open to states which are not parties to the Cartagena Protocol,[329] the BCH may also serve as an appropriate means to discharge the obligation to exchange information under general international law. However, in situations specifically affecting certain other states, it may not be sufficient to simply upload the information to the BCH, but it may be necessary to expressly inform the affected states that the relevant information has been made available on the BCH and how it can be retrieved.

3. Consultations and Negotiations

As a third element, the duty to cooperate entails an obligation to enter into consultations and negotiate with the potentially affected states.[330] As stipulated in Article 9(2) ARSIWA, the purpose of such consultations is to accommodate the interests of the potentially affected states and to find mutually acceptable solutions for how the risk of adverse transboundary impacts can be limited.[331]

Article 10 ARSIWA provides a catalogue of factors that the states concerned shall take into account in order to achieve an equitable balance of interests. Besides factors such as the degree of risk of transboundary and environmental harm, and the availability of means to minimize the risk or to repair resulting harm, the catalogue also specifies 'the importance of the activity […] for the State of origin in relation to the potential harm for the State likely to be affected' as a factor for the equitable balancing of interests.[332] While the Article does not indicate how the 'importance' of activity could be objectively established, it suggests that hazardous activities carried out to address serious public health issues, such as the use of engineered gene drives to suppress vectors of dreadful diseases, may be given more consideration than activities only carried out for economic purposes. The Article also expressly recognizes the need to consider alternatives to the activity.[333]

329 Cartagena Protocol (n. 91), Article 24(2).
330 ILC, Articles on Prevention (n. 22), Article 9; Rio Declaration 1992 (n. 9), Principle 19.
331 Cf. ILC, Articles on Prevention (n. 22), Commentary to Article 9, para. 5; *Okowa* (n. 217), 302.
332 ARSIWA (n. 43), Article 10(b).
333 Cf. *ibid.*, Article 10(e).

It is generally recognized that consultations shall be carried out 'at an early stage and in good faith'.[334] In the *Lac Lanoux* arbitration between France and Spain, the tribunal held that consultations 'must be genuine, must comply with the rules of good faith and must not be mere formalities'.[335] The tribunal also provided examples of behaviour that would violate the obligation to negotiate, including an unjustified termination of the discussions, abnormal delays, disregard of agreed procedures, and a systematic refusal to take into consideration adverse proposals or interests.[336]

The responsible state should not move forward with the project while negotiations are still ongoing.[337] But at the same time, this does not grant the potentially affected state a right to veto the proposed hazardous activity.[338] The obligation to consult remains a purely procedural duty that does not require the states concerned to reach an agreement before any action can be taken. State practice clearly indicates that proposed hazardous activities are not subject to the consent of the potentially affected states.[339] Still, the ILC's Articles on Prevention provide that even when negotiations fail to produce an agreed solution, the state of origin shall 'take into account' the interests of the potentially affected states as expressed in the negotiations.[340] Although the ILC has characterized this obligation as a 'measure of self-regulation',[341] it cannot be construed as resulting in a change to the substantive obligations of the state of origin.[342]

Consultations and negotiations can be conducted bilaterally among the states concerned or by using existing international bodies, such as international organizations or meetings of parties to multilateral conventions.[343] The ILC's Prevention Articles expressly provide that states shall seek the assistance of 'competent international organizations' in preventing significant transboundary harm.[344] The requirement to involve relevant interna-

334 Rio Declaration 1992 (n. 9), Principle 19.
335 Affaire du Lac Lanoux (Spain v. France) (n. 97), 310; also see ICJ, North Sea Continental Shelf (n. 2), para. 85; ICJ, Gabčíkovo-Nagymaros (n. 17), para. 141.
336 Affaire du Lac Lanoux (Spain v. France) (n. 97), 307; see *Okowa* (n. 217), 306–307.
337 *Duvic-Paoli* (n. 4), 222.
338 *Ibid.; Okowa* (n. 217), 314–316.
339 *Xue* (n. 30), 174; see Affaire du Lac Lanoux (Spain v. France) (n. 97), 306; ILC, Articles on Prevention (n. 22), Commentary to Article 9, para. 10.
340 ILC, Articles on Prevention (n. 22), Article 9(3) and commentary, para. 10.
341 *Ibid.*, Commentary to Article 9, para. 10.
342 *Duvic-Paoli* (n. 4), 222; *Boyle/Redgwell* (n. 19), 205–206.
343 *Duvic-Paoli* (n. 4), 222–224.
344 ILC, Articles on Prevention (n. 22), Article 4.

tional bodies has also been acknowledged in international case law.[345] Hence, whether a state reasonably engaged with relevant international organizations is a factor to determine whether it complied with the due diligence standard.[346]

V. Public Participation

Public participation in decision-making processes on environmental matters is increasingly recognized as an important element of prevention.[347] It has been expressly recognized in the Rio Declaration[348] and in a number of multilateral instruments.[349] The *Aarhus Convention* stipulates detailed obligations with regard to three 'pillars' of public participation, namely access to information, participation in decision-making, and access to justice,[350] although its membership is comprised of European and Central Asian states only.[351] At the universal level, the ILC's Articles on Prevention stipulate that states shall provide the public likely to be affected with relevant information about the activity, the risk involved, and the harm which

345 ICJ, Certain Activities Carried out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) (Provisional Measures), Order of 08 March 2011, ICJ Rep. 6, para. 80; ICJ, Certain Activities Carried out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) (Provisional Measures), Order of 22 November 2013, ICJ Rep. 354, para. 54; ITLOS, Responsibilities and Obligations of States (n. 106), paras. 124 and 142; ITLOS, Sub-Regional Fisheries Commission (n. 66), para. 210.

346 *Duvic-Paoli* (n. 4), 223.

347 See generally *Jonas Ebbesson*, Public Participation in Environmental Matters, in: Wolfrum/Peters (ed.), MPEPIL.

348 Rio Declaration 1992 (n. 9), Principle 10.

349 See, e.g., Espoo Convention (n. 100), Articles 2(6) and 3(8); UNFCCC (n. 14), Article 6; UNCCD (n. 14), Article 3(a).

350 Cf. Convention on Access to Information, Public Participation and Decision Making and Access to Justice in Environmental Matters (25 June 1998; effective 30 October 2001), 2161 UNTS 447 (hereinafter 'Aarhus Convention'), Articles 4, 6 and 9; see *Leslie-Anne Duvic-Paoli*, The Status of the Right to Public Participation in International Environmental Law: An Analysis of the Jurisprudence, 23 (2012) YB Int'l Env. L. 80, 90–96.

351 Cf. UN OLA, Status of the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, available at: https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-13&chapter=27&clang=_en (last accessed 28 May 2022).

might result.[352] With regard to the participation of the affected public, the Articles merely provide that states shall 'ascertain their views',[353] but do not explain this obligation further.

1. Legal Status Under General International Law

Whether or not there is an obligation in customary international law to ensure (meaningful) public participation in decisions about projects that may have adverse environmental impacts is still an unsettled question. In the *Pulp Mills* case, the ICJ rejected the argument that such a customary obligation could arise from, *inter alia*, the Aarhus Convention, the ILC Prevention Articles, or the UNEP Goals and Principles on EIA.[354] However, it could be argued that access to information and public participation in environmental decision-making processes is an element of the obligation to exercise due diligence, at least with regard to activities that may have transboundary impacts.[355]

Moreover, minimum requirements for the participation of the affected populations may arise from international human rights law.[356] For instance, the *European Court of Human Rights* has repeatedly held that individuals affected by decisions relating to the environment have a right to access to information as well as a right to seek judicial redress against such decisions.[357] Similar jurisprudence does also exist from other international human rights bodies.[358]

352 ILC, Articles on Prevention (n. 22), Article 13.
353 *Ibid.*
354 ICJ, Pulp Mills (n. 18), para. 216; cf. UNEP, Goals and Principles of EIA (n. 259); see *Duvic-Paoli* (n. 350), 84–85.
355 *Duvic-Paoli* (n. 4), 229–230.
356 For an assessment of the jurisprudence of human rights bodies on the right to participate in environmental decision-making, see *Duvic-Paoli* (n. 350), 96–105.
357 Cf. e.g. ECtHR, Tătar v. Romania, Judgment of 21 January 2009, Application no. 67021/01, paras. 122–125; ECtHR, Taşkın et al. v. Turkey, Judgment of 20 March 2005, Application no. 46117/99, paras. 118–119.
358 For a detailed assessment, see *Duvic-Paoli* (n. 350), 96–105.

2. Public Participation Under the Cartagena Protocol

As regards public participation in the context of modern biotechnology, Article 23(2) of the Cartagena Protocol requires its parties to consult the public in the decision-making process regarding LMOs and to make the results of such decisions available to the public. However, parties are only required to do so 'in accordance with their respective laws and regulations', and while respecting confidential information.[359] Consequently, the scope, extent and methods for public participation under the Cartagena Protocol are subject to the parties' national laws and regulations.[360]

3. GMOs Under the Aarhus Convention

a) Status Quo

Rules on public participation in decisions pertaining to LMOs can also be found in the aforementioned *Aarhus Convention*. According to Article 6(11) of the Convention, parties shall apply the Convention's rules on public participation also to decisions on whether to permit the deliberate release of genetically modified organisms into the environment, but only 'within the framework of their national laws' and 'to the extent feasible and appropriate'. These limitations, which essentially leave it to the states parties to decide whether or not to allow for public participation, go back to a compromise in the negotiations of the Aarhus Convention, during which no agreement could be reached on the extent to which the convention should apply to GMOs.[361]

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359 Cartagena Protocol (n. 91), Article 23(2).

360 *Ruth Mackenzie* et al., An Explanatory Guide to the Cartagena Protocol on Biosafety (2003), MN. 596–597; also see *Christine Toczeck Skarlatakis/Julian Kinderlerer*, The Importance of Public Participation, in: Marie-Claire Cordonier Segger/Frederic Perron-Welch/Christine Frison (eds.), Legal Aspects of Implementing the Cartagena Protocol on Biosafety (2013) 111, 119–121.

361 UNECE, The Aarhus Convention: An Implementation Guide (2nd ed. 2014), 160.

b) The GMO Amendment

In 2005, the meeting of the parties to the Aarhus Convention adopted an Amendment to the Convention introducing specific rules on public participation in decisions concerning the environmental release and placing on the market of GMOs.[362] According to these rules, which shall apply instead of the Aarhus Convention's general provisions, each party shall make arrangements in its regulatory framework to provide for effective information and public participation in these decisions.[363] This includes the release of information, a transparent decision-making process and adequate opportunities for the public to comment on the proposed decisions. Moreover, parties shall ensure that 'due account is taken of' the outcome of the public participation procedure.[364]

Compared to the procedural rules already existing in the Aarhus Convention, the GMO Amendment does not appear to introduce any significant new obligations.[365] However, the Amendment significantly reduces the parties' margin of appreciation, as the minimum standards provided in the amendment are no longer subject to compatibility with existing national frameworks or a test of feasibility and appropriateness.[366] Moreover, the Amendment expressly provides that certain information about the GMO in question shall in no case be considered confidential and shall thus not be withheld from the public.[367] The Amendment also recognizes potential overlaps with the Cartagena Protocol by providing that the national implementing measures should be 'consistent with objectives of the

362 Amendment to the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (27 May 2005; not yet in force), ECE/MP.PP/2005/2/Add.2 (hereinafter 'GMO Amendment to the Aarhus Convention').

363 *Ibid.*, Article 6 bis, para. 1, and Annex I bis, para. 1.

364 *Ibid.*, Annex I bis, para. 7.

365 For a detailed analysis of the obligations provided in the GMO amendment, see UNECE, Aarhus Implementation Guide (n. 361), 165–172; also see *Balázs Horváthy*, New Impulses: Aarhus Convention and Genetically Modified Organisms, in: Hanna Müllerová (ed.), Public Participation in Environmental Decision-Making: Implementation of the Aarhus Convention (2013) 29, 50–51, pointing out that the amendment does not mention judicial review and, in this regard, steps back from the requirements under the previous Article 6(11) of the Aarhus Convention.

366 For a comparison of differences, see *ibid.*, 38.

367 GMO Amendment to the Aarhus Convention (n. 362), Annex I bis, para. 4.

Cartagena Protocol on Biosafety'.[368] The Amendment has not yet entered into force, as this requires one further ratification to reach the required threshold of three quarters of those parties that were already party to the Aarhus Convention when the amendment was adopted.[369]

c) The Lucca Guidelines

The 2005 amendment was preceded by the so-called *Lucca Guidelines*,[370] which is a set of formally non-binding recommendations on how the Aarhus Convention can be applied to GMOs. Unlike Article 6(11) of the Convention, the Guidelines also apply to the contained use of GMOs. Moreover, compared to the formal GMO amendment to the Aarhus Convention, the Lucca Guidelines contain much more detailed rules and are not limited to public participation in decision-making, but also address access to information pertaining to GMOs and access to justice. The Guidelines can thus be seen as a valuable *soft law* document which formulates a best practice standard regarding public participation in the context of modern biotechnology.[371]

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368 *Ibid.*, Article 6 bis, para. 2. In Decision II/1 of the Meeting of Parties to the Aarhus Convention, which adopted the GMO amendment, the need for collaboration both with the Cartagena Protocol and between the secretariats of both instruments was explicitly recognized. So far, three joint workshops on access to information and public participation with respect to GMOs have been held in 2008, 2010, and 2019; see UNECE, The Aarhus Convention's GMO Amendment (12 March 2020), available at: http://www.unece.org/env/pp/gmos.html (last accessed 28 May 2022).

369 Cf. Aarhus Convention (n. 350), Article 14(4); see UN OLA, Status of the GMO Amendment to the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, available at: https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-13-b&chapter=27&clang=_en (last accessed 28 May 2022).

370 Meeting of the Parties to the Aarhus Convention, Guidelines on Access to Information, Public Participation and Access to Justice with Respect to Genetically Modified Organisms (23 October 2002), UN Doc. ECE/MP.PP/2003/3, adopted by decision I/4 (UN Doc. ECE/MP.PP/2/Add.5), para. 1.

371 *Horváthy* (n. 365), 36.

VI. Obligations When Damage Is Imminent or Inevitable

In situations where significant transboundary harm is imminent or inevitable, the responsible state is obliged to take all available measures to ensure that the damage is limited. In particular, it must notify the states likely to be affected (1.) and take available measures to mitigate the damage as much as possible (2.).

1. Notification in Emergency Situations

When there is an emergency situation that causes or is likely to cause transboundary harm, the state of origin must immediately notify the states affected or likely to be affected. This obligation has found recognition in the Rio Declaration,[372] the ILC's Prevention Articles,[373] and in many international agreements including the CBD.[374] Moreover, Article 17 of the Cartagena Protocol requires parties to notify potentially affected states about any release of a living modified organism that leads, or may lead, to an unintentional transboundary movement. The common rationale behind these obligations is to allow the affected state(s) to take measures to minimize or mitigate the damage to the greatest extent possible.[375] For this reason, notification shall be made 'without delay and by the most expeditious means' as soon as the responsible state learns about the emergency.[376]

A problem related to the obligation to notify is that international law often does not indicate a clear threshold above which damage is 'imminent' and the obligation to notify is triggered.[377] This problem also exists in the international biosafety regime: The aforementioned obligation in

372 Rio Declaration 1992 (n. 9), Principle 18; also see *Phoebe N. Okowa*, Principle 18, in: Jorge E. Viñuales (ed.), The Rio Declaration on Environment and Development: A Commentary (2015) 471.

373 Cf. ILC, Articles on Prevention (n. 22), Article 17.

374 Cf. CBD (n. 12), Article 14(1(d); UNCLOS (n. 13), Article 188; Basel Convention (n. 279), Article 13(1); International Watercourses Convention (n. 100), Article 28(2); for further instances, see *Okowa*, Principle 18 (n. 372), 484–488.

375 ILC, Articles on Prevention (n. 22), Commentary to Article 17, para. 2; see *Xue* (n. 30), 168; *Okowa* (n. 217), 296–297.

376 ILC, Articles on Prevention (n. 22), Commentary to Article 17, para. 2.

377 *Okowa* (n. 217), 296–297, points out that under the 1986 Convention on Early Notification of a Nuclear Accident, it is left to the source state to determine whether an incident is of 'radiological safety significance for another State' and thus subject to the obligation to notify.

the Cartagena Protocol is contingent on the LMO being 'likely' to have significant adverse effects on biodiversity, which may be uncertain or even disputed among the states concerned.[378] Considering the objective of the present obligation, notification should be made about any unintentional release of LMOs containing self-spreading genetic elements that may be subject to a transboundary movement.

2. Obligation to Control and Mitigate Damage

In situations in which damage can no longer be prevented, states are required to take measures to control, reduce or mitigate damage to the largest extent possible. This obligation is recognized in various international agreements, which often do not clearly distinguish between the *prevention* of damage and the *mitigation* of damage.[379] Indeed, it is questionable whether it is necessary (or even possible) to sharply distinguish between both obligations, as both are corollaries of the fundamental principle of *sic utere*.[380] The obligation to prevent undue transboundary interference does not cease to exist when such interference occurs.[381] Rather, its focus is shifted to minimizing those adverse that can no longer be averted. Hence, the obligation to prevent does not only operate *ex ante*, i.e. prior to the occurrence of damage, but also *ex post* as an obligation to prevent further damage.[382] Yet, it must not be confused with obligations to ensure compensation or reparation (whether as primary obligations or as a consequence of responsibility for wrongful conduct), which operate in a different realm.[383]

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378 See chapter 3, section A.I.2; see *Mackenzie* et al., IUCN Guide (n. 360), MN. 484–485.
379 UNCLOS (n. 13), Article 194; UNFCCC (n. 14), Artiicle 3(3); CBD (n. 12), Article 14(1)(d).
380 *Shinya Murase*, Third Report on the Protection of the Atmosphere, UN Doc. A/CN.4/692 (2015), para. 15.
381 See ARSIWA (n. 43), Article 14(3).
382 *Duvic-Paoli* (n. 4), 193–194.
383 *Ibid.*, 194.

VII. Conclusions

It has been observed that 'environmental treaties tend to stipulate procedural obligations that are narrower and more concrete than their relatively amorphous substantive obligations.'[384] This observation also holds true in the realm of customary international law on the prevention of environmental harm: while the substantive obligation to prevent the causation of significant harm to the environment of other states and areas beyond national jurisdiction remains a difficult to grasp obligation of 'due diligence', the entailing procedural obligations are more specific and compliance is easier to determine.

The cornerstone of procedural environmental law is the obligation to conduct an EIA to determine the likely consequences of a project, which enjoys general recognition as a requirement under customary international law. This obligation is an important entry-point for international 'soft law' standards since by informing the EIA, these standards can guide the decision-making process without unduly interfering with the sovereign decision whether to approve a project or not. Yet, as will be seen in the following section, deficits in the EIA do not necessarily allow to conclude that a state has also breached its substantive obligation to prevent harm.

E. Establishing Breaches of the Obligation to Prevent Transboundary Harm

As elaborated above, the content of the due diligence obligation to prevent transboundary harm is largely context-dependent, which means that the specific measures required from a state which undertakes or authorizes a hazardous activity significantly depend on the circumstances of the particular situation.[385] Consequently, it can be difficult to clearly determine whether or not a state has breached its obligation.

This is aggravated by a number of dogmatic uncertainties concerning the nature of the preventive obligation: First, it is generally assumed that the occurrence of transboundary harm does not necessarily indicate a breach of the obligation to prevent such harm (I.). But at the same time, it is also unclear whether the preventive obligation can be breached even when harm has not (yet) occurred (II.). The third problem concerns the

384 *Bratspies* (n. 20), 194.
385 See *supra* section C.

relationship between the substantive obligation to prevent harm and the associated procedural duties (III.).

I. Occurrence of Harm as an Indication of a Breach

It could be assumed that the obligation to prevent significant transboundary harm is breached whenever such harm actually occurs. This seems to be supported by Article 14(3) of the ILC's Articles on State Responsibility, which specifically addresses obligations to prevent a given event:

> *'The breach of an international obligation requiring a State to prevent a given event occurs when the event occurs and extends over the entire period during which the event continues and remains not in conformity with that obligation.'*

If the occurrence of transboundary harm was understood to be the 'given event' that the state is required to prevent, it could be assumed that the obligation is breached whenever transboundary harm occurs.

But in fact, it is generally agreed that preventive obligations in international law do not require the responsible state to guarantee that the undesired event occurs under no circumstances.[386] This was also pointed out by the ICJ in the *Bosnian Genocide* case: with regard to the obligation to prevent and punish genocide under the Genocide Convention,[387] the Court recognized that this obligation was one of conduct and not one of result, 'in the sense that a State cannot be under an obligation to succeed, whatever the circumstances, in preventing the commission of genocide'.[388] Instead, the Court held that states are required to employ all means reasonably available to them, but do not incur responsibility simply because the desired result is not achieved.[389] However, a state would incur responsibility when it 'manifestly failed' to take all measures which were within its power and which might have contributed to preventing genocide.[390] This

386 See *supra* section C.

387 Convention on the Prevention and Punishment of the Crime of Genocide (09 December 1948; effective 12 January 1951), 78 UNTS 228, Article 1.

388 ICJ, Bosnian Genocide (n. 129), para. 430.

389 *Ibid.*

390 *Ibid.* Interestingly, the Court seems not to require but-for causality (a state only incurs responsibility if the genocide would have actually been prevented by the measures the state was required but failed to take), but finds it sufficient that the omitted measures 'might have contributed to preventing' the undesired event.

is also generally recognized regarding the obligation to prevent significant transboundary harm:

> *'The duty of due diligence […] is not intended to guarantee that significant harm be totally prevented, if it is not possible to do so. In that eventuality, the State of origin is required, as noted above, to exert its best possible efforts to minimize the risk. In this sense, it does not guarantee that the harm would not occur.'*[391]

Consequently, the obligation to prevent significant transboundary harm is not necessarily violated simply because damage has occurred. Rather, in order to hold another state responsible for a breach of due diligence, a claimant state would need to demonstrate that the state has violated its due diligence obligation by not taking 'all appropriate measures', and that there is a causal link between this obligation and the occurrence of harm in the territory of the claimant state. In many cases, this will require an *ex post* determination of what measures would have been appropriate in the individual case from an *ex ante* perspective.[392] This will often be difficult, especially since it requires evidence of what information was available to the responsible party at the time when the action necessary to prevent harm should have been taken.

For this reason, it has been proposed to reverse the burden of proof in the event of damage by requiring the responsible state to demonstrate that it has taken all preventive measures that were objectively required.[393] However, as with the burden of proof concerning the existence of a risk, there is no general consensus that the burden of proof should be reversed in the event that damage has occurred.[394]

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391 ILC, Articles on Prevention (n. 22), Article 3, commentary para. 7.

392 Cf. *Pierre-Marie Dupuy*, Reviewing the Difficulties of Codification: On Ago's Classification of Obligations of Means and Obligations of Result in Relation to State Responsibility, 10 (1999) EJIL 371, 381; *Bergkamp* (n. 96), 269; *Ulrich Beyerlin/Thilo Marauhn*, International Environmental Law (2011), 42–43.

393 Cf. *Stephen C. McCaffrey*, The Law of International Watercourses (2019), 501; *Beyerlin/Marauhn* (n. 392), 43; similarly *Bergkamp* (n. 96), 270–271, who suggests that the injured party would only need to bring *prima* facie evidence of a breach of due diligence, which the defendant state would then have to rebut; also see *Schmitt* (n. 69), 204.

394 See *supra* section B.VI.

II. Occurrence of Harm as a Prerequisite of a Breach

The preceding section has established that the mere occurrence of transboundary harm does not *per se* indicate a violation of the preventive obligation. But *vice versa*, it is also questionable whether a breach of the preventive obligation can only be assumed when harm has actually occurred, or whether a state can incur responsibility for not taking appropriate measures to prevent harm even though no damage has occurred (yet).

In the *Bosnian Genocide* case, the ICJ expressly ruled that a state can only be held responsible for breaching the obligation to prevent genocide when genocide was actually committed.[395] The Court referred to Article 14(3) ARSIWA to point out that 'it is at the time when commission of the prohibited act […] begins that the breach of an obligation of prevention occurs'.[396] Consequently, the Court held that a state cannot incur responsibility *a posteriori* for an omission to act when the apprehended event did not actually occur.[397]

It is questionable whether this conclusion can also be applied to the obligation to prevent transboundary harm. Notably, the ICJ itself stated that it did not purport to establish a general jurisprudence applicable to all cases concerning an obligation to prevent certain acts.[398] However, the Court's jurisprudence in environmental matters appears to go in a similar direction. In the *Pulp Mills* case, the ICJ held that there was neither conclusive evidence that Uruguay had not acted with due diligence, nor that the discharges from the disputed mills had actually caused harm to the river shared with Argentina.[399] Moreover, in the *Certain Activities* case, the Court dismissed Nicaragua's claim that Costa Rica had breached its substantive preventive obligations expressly because the disputed activity had not actually caused significant transboundary harm.[400] Hence, it seems that the Court is willing to assume a violation of the obligation to prevent transboundary harm only when such harm actually occurs.[401] If this interpretation of the obligation to prevent significant transboundary harm pre-

395 ICJ, Bosnian Genocide (n. 129), para. 431.
396 *Ibid.*
397 *Ibid.*
398 *Ibid.*, para. 429.
399 ICJ, Pulp Mills (n. 18), para. 265.
400 *Ibid.*, para. 217.
401 *Hafner/Buffard* (n. 142), 523; *Brent* (n. 112), 55; *Brunnée* (n. 252), 158–159.

vailed, the capacity of the rule to respond to contemporary environmental challenges would be significantly inhibited.[402]

According to a different position, the obligation to prevent transboundary harm is breached whenever a state does not act with due diligence, regardless of whether or not the breach results in actual harm.[403] This is because the obligation to prevent transboundary harm is not a (negative) obligation of result, but an obligation of conduct that continuously requires acting with due diligence. If the occurrence of harm was construed as a prerequisite for a breach of this obligation, it would be impossible to hold a state responsible for not taking all appropriate measures unless and until harm actually occurs. The legal consequences of state responsibility other than reparation, namely the obligation to cease the wrongful conduct[404] and the obligation to offer appropriate assurances and guarantees of non-repetition,[405] would be inapplicable. But whether a state is required to cease a wrongful conduct by returning to diligent action does not depend on the occurrence of harm, which is only relevant to the question of whether the responsible state must also make reparation for any harm caused during the period of non-compliance.[406] This was aptly summarized by judge *Donoghue* in her separate opinion to the merits judgment in the *Certain Activities* case:

> *'In the planning phase, a failure to exercise due diligence to prevent significant transboundary environmental harm can engage the responsibility of the State of origin even in the absence of material damage to potentially affected States. […] If, at a subsequent phase, the failure of the State of origin to exercise due diligence in the implementation of a project causes significant transboundary harm, the primary norm that is breached remains one of due diligence, but the reparations due to the affected State must also address the material damage caused to the affected State.'*[407]

This also appears to be in line with the ILC's position. As mentioned earlier, Article 14 ARSIWA addresses the temporal dimension of breach-

402 *Brent* (n. 112), 55.
403 *Lefeber* (n. 30), 85–86; *Crawford* (n. 201), 227; *Duvic-Paoli* (n. 4), 335–336; ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge Donoghue, para. 9.
404 ARSIWA (n. 43), Articles 29 and 30(a).
405 *Ibid.*, Article 30(b); see chapter 9, section B.I.
406 *Duvic-Paoli* (n. 4), 336.
407 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge Donoghue, para. 9.

es of international obligations. In this respect, the Article distinguishes between obligations which have or do not have a continuing character. Article 14(3), which addresses international obligations 'requiring a State to prevent a given event', provides that the breach 'extends over the entire period during which the event continues and remains not in conformity with that obligation'. But the ILC expressly recognized in its commentary that 'not all obligations directed at preventing an act from occurring will be of this kind'.[408] Indeed, the ILC recognized that there is a difference between obligations to prevent a given event, which are construed as (negative) obligations of result, and obligations of due diligence, which the ILC describes as 'best efforts obligations, requiring States to take all reasonable or necessary measures to prevent a given event from occurring, but without warranting that the event will not occur'.[409]

Consequently, there is a difference between obligations of prevention *strictu sensu* on the one hand and preventive obligations of due diligence on the other.[410] While the former are (negative) obligations of result, which are deemed to be breached whenever the apprehended event occurs,[411] due diligence obligations are obligations of conduct which can be breached independently from whether the event to be averted actually

408 ARSIWA (n. 43), Commentary to Article 14, para. 14.

409 *Ibid.*, Article 14, para. 14; but see *Economides* (n. 201), 378, who appears to regard due diligence obligations as obligations of result, as 'their common feature is their general formulation and their lack of precise stipulation of the means to achieve the specified result'. Moreover, *Economides* (n. 201), 374, cites the obligation to take all appropriate measures to prevent significant transboundary harm as enshrined in Article 3 of the ILC's Articles on Prevention (n. 22) as an example for an obligation of prevention.

410 *Crawford* (n. 201), 227.

411 It may be questioned whether such obligations (i.e. '"negative" obligations of result') do exist at all. The commentary to Draft Article 23 (ILC, Report of the International Law Commission on the Work of Its Thirtieth Session, UN Doc. A/33/10, YBILC 1978, Vol. II, Pt. 2 (1978), 81) cites Article 22(2) of the Vienna Convention on Diplomatic Relations (18 April 1961; effective 24 April 1964), 500 UNTS 95, which provides that the state receiving a diplomatic mission 'is under a special duty to take all appropriate steps to protect the premises of the mission […] and to prevent any disturbance of the peace of the mission'. However, as shown by *Crawford* (n. 201), 228–229, this obligation is equally an obligation of conduct (and, essentially, also one of due diligence). Interestingly, the Draft Article 23 was deleted altogether, and the final ARSIWA only mention obligations of prevention in Article 14(3) in the context of the temporal elements of a breach, see *Crawford* (n. 201), 230; *Hafner/Buffard* (n. 142), 523. On a side note, obligations of prevention refer to the prevention of acts by third parties (or private actors) and must not be confused with negative obligations

occurs.[412] The wrongful conduct giving rise to a breach of a due diligence obligation is the state's failure to take the required measure. A state is not allowed to argue, retrospectively, that because no harm has occurred at the time of the legal proceeding, there was no duty of due diligence at the time the project was planned.[413] The due diligence obligation to prevent harm arises whenever there is a risk of significant transboundary harm.

Therefore, a breach occurs whenever and as long as the state fails to act with due diligence, but regardless of whether the breach causes the undesired event (such as transboundary harm) to occur.[414] Proving the existence of a risk from an *ex post* perspective in cases in which the risk has not materialized may be associated with difficulties. But this is more of an evidentiary issue than a legal problem. Consequently, the obligation to prevent transboundary harm is breached whenever the state does not act with due diligence, regardless of whether transboundary harm has (already) occurred.[415]

III. Relationship Between Procedural and Substantive Obligations of Prevention

The third problem concerns the relationship between the substantive obligation to prevent transboundary harm and the corresponding procedural obligations, in particular the obligation to carry out an EIA. In particular, it is unclear whether the breach of a procedural obligation automatically entails a breach of the substantive obligation to prevent transboundary harm. This depends on whether the procedural obligations are regarded as expressions of the due diligence standard required to prevent transboundary harm or as independent obligations of customary international law.

The ICJ's jurisprudence on this matter is rather ambiguous. In the *Pulp Mills* case, the ICJ considered the obligation to undertake an EIA to be 'a requirement under general international law'.[416] But the Court also stated

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that require a state to refrain from a certain conduct (see *Economides* (n. 201), 373–374).

412 But see *Dupuy* (n. 392), 380, arguing that obligations of prevention should always be viewed as a sub-category of obligations of conduct.

413 Cf. ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge ad hoc Dugard, para. 10.

414 See ILC (n. 411), fn. 397 on p. 81; cf. *Dupuy* (n. 392), 382.

415 Cf. *Crawford* (n. 201), 227.

416 ICJ, Pulp Mills (n. 18), 204.

that 'due diligence, and the duty of vigilance and prevention which it implies, would not be considered to have been exercised' when a state has failed to carry out an EIA.[417] At the same time, however, the Court sharply distinguished between procedural and substantive obligations contained in the bilateral treaty which governed the dispute. In this regard, the Court expressly held that a breach of a procedural obligation does not automatically entail the breach of substantive obligations.[418] Likewise, it stated that the fact that the parties have complied with their substantive obligations does not mean that they are deemed to have complied *ipso facto* with their procedural obligations, or were excused from doing so.[419]

Similarly, in the *Certain Activities* case, the ICJ concluded that Costa Rica had breached its obligation to conduct an EIA. This procedural obligation was triggered by the risk that Costa Rica's activity posed to Nicaragua's environment.[420] Nonetheless, the ICJ found that Costa Rica had not violated its substantive obligation to prevent transboundary harm.[421] Thus, the judgment affirms that the fact that no significant transboundary harm has occurred does not exonerate a state for its failure to carry out an EIA in the first place, but also that such a failure is irrelevant for the assessment as to whether the substantive obligation was breached.[422] Consequently, the Court treats alleged breaches of procedural obligations entirely independently from the question of whether the substantive obligation to prevent transboundary harm has been breached.[423]

The ICJ's position is plausible, particularly in view of the fact that the Court seems to hold that the substantive prevention obligation can only be breached if damage has actually occurred.[424] However, the strict distinction between substantive and procedural obligations is problematic. Most crucially, the position disregards the fact that respect for procedural obligations can serve as an 'essential indicator' of whether substantive obli-

417 *Ibid.*
418 *Ibid.*, para. 78.
419 *Ibid.*; see *Duvic-Paoli* (n. 4), 337.
420 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), para. 162.
421 *Ibid.*, para. 217.
422 Cf. *ibid.*, Separate Opinion of Judge ad hoc Dugard, para. 19.
423 *Duvic-Paoli* (n. 4), 337; also see ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge ad hoc Dugard, para. 9, stressing that the obligation to conduct an EIA is an 'independent obligation' which is not dependent on the obligation to exercise due diligence in preventing significant transboundary harm.
424 See *supra* section E.II.

gations were breached or not.[425] Non-compliance with procedural duties will often have direct effects on the substantive elements of prevention. For instance, a duly performed EIA could reveal means to reduce the risk of transboundary harm and thus contribute to defining the content of the substantive obligation to prevent such harm in a particular situation.[426] On the other hand, the affected state might face difficulties proving the existence of harm or its causation when the responsible state has breached its procedural obligations and, for instance, not given the affected state proper access to the necessary information.[427] Hence, there is a certain 'disconnect' between the Court's repeated recognition of the anticipatory nature of prevention and its treatment of the obligation in the context of state responsibility.[428]

It appears more convincing to view the procedural duties not (only) as independent customary obligations, but (also) as expressions of the substantive obligation to prevent harm.[429] This would recognize that the substantive content of the due diligence obligations can be informed through the application of the procedural elements of due diligence, such as the obligation to conduct an EIA, and to notify and consult with affected states.[430] At the same time, states may use their compliance with procedural rules – including from soft law instruments – as evidence that they have acted with due diligence when responding to potential claims that they have breached their preventive obligations.[431]

More fundamentally, international jurisprudence should also take account of the evidentiary challenges an injured state may face in proving a breach of due diligence. In disputes concerning alleged transboundary harm caused by LMOs, the defendant state should be required to provide all relevant information about the LMO it obtained in the course of regulatory procedures. Although the precautionary principle alone may not

425 ICJ, Pulp Mills (n. 18), Joint Dissenting Opinion of Judges Al-Khasawneh and Simma, para. 26; also see *Bratspies* (n. 20), 194.
426 Cf. ICJ, Pulp Mills (n. 18), Joint Dissenting Opinion of Judges Al-Khasawneh and Simma, para. 26.
427 *Duvic-Paoli* (n. 4), 338.
428 *Ibid.*
429 *Bendel/Harrison* (n. 250), 18–19; *Duvic-Paoli* (n. 4), 336–339; *Brunnée* (n. 252), 161.
430 ICJ, Certain Activities/Construction of a Road (Merits) (n. 19), Separate Opinion of Judge Donoghue, para. 9.
431 *Bendel/Harrison* (n. 250), 19.

result in a shift of the burden of proof,[432] the broad information-sharing obligations under the CBD[433] and the Cartagena Protocol[434] as well as under national law[435] indicate that withholding information about a harmful LMO is not a legitimate litigation strategy to defend against potential claims for compensation.

F. Summary

This chapter shows that the general customary obligation of states to prevent significant transboundary harm from being caused by activities under their jurisdiction or control applies to adverse transboundary effects caused by LMOs in the same manner as it applies to other forms of transboundary environmental interference. It has also confirmed that the obligation to prevent unintentional transboundary movements contained in Article 16(3) of the Cartagena Protocol is based on a universally recognized rule of customary international law, at least when the LMO in question causes significant adverse effects to the receiving environment, persons, or property.

Yet, there are a number of important caveats. At first, the obligation does not apply to harm caused following an intentional transboundary movement. A general obligation to obtain the prior consent of the receiving state before exporting an LMO, as set out in the Cartagena Protocol, is currently not part of customary international law.

Moreover, while international responsibility for transboundary harm requires such harm to be 'significant', the mere presence of an LMO in the territory of another state is unlikely to reach this threshold. Therefore, the affected state will have to show that a foreign LMO which occurs in its territory causes some form of 'real detriment'. However, a large-scale introduction of LMOs into the environment of another state, such as that caused by an invasive gene drive uncontrolledly spreading across borders, arguably reaches the threshold of 'significant' transboundary harm.[436] In

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432 See *supra* section B.VI.3.

433 Article 19(4) CBD (n. 12); see chapter 3, section B.IV.

434 Article 20 Cartagena Protocol (n. 91); see chapter 3, section A.II.3.

435 See Gentechnikgesetz (Genetic Engineering Act) (16 December 1993), last amended by Article 8 of the law of 27 September 2021 (Bundesgesetzblatt, Pt. I, p. 4530), Section 35, which provides an (enforceable) right of the injured party against both the operator and the responsible authorities to be provided with all relevant information about the GMO presumed to have caused damage.

436 *Förster* (n. 86), 177; see supra section B.VII.2.

any event, such an uncontrolled spread is also likely to cause significant damage to ecosystems.[437]

Nevertheless, the mere occurrence of such harm does not *per se* indicate a violation of international law. Instead, the obligation only requires the exercise of due diligence, which means that a state must make reasonable efforts to inform itself about the factual and legal circumstances that relate to a proposed activity and take appropriate preventive measures in due time.[438] Hence, in order to establish a violation, a claimant would need to demonstrate that the responsible state has failed to employ due diligence and that this failure caused the occurrence of transboundary harm. Ultimately, this will require an *ex post* determination of what measures would have been appropriate in the individual case from an *ex ante* perspective. International jurisprudence should take account of the unavoidable evidentiary challenges any injured state will face in such a situation by requiring the responsible state to submit any relevant information it possesses about the cause of harm, such as any scientific or regulatory knowledge about the characteristics of a harmful LMO. It should also correct the view that the obligation to prevent harm can only be breached when harm has already occurred. Instead, a breach should be assumed whenever a state fails to employ due diligence to prevent such harm, regardless of whether this failure has already led to actual harm.

While the substantive content of due diligence remains rather 'amorphous',[439] the corollary procedural obligations are more specific. In particular, the obligation to carry out an environmental impact assessment prior to commencing a hazardous activity has become widely accepted as a requirement under customary international law. After all, the documentation prepared during the EIA procedure can be regarded as written evidence of the exercise of due diligence, as it commonly includes a description of the potential impacts of the proposed activity as well as of the required prevention and mitigation measures. Against this background, it comes as no surprise that the adequacy of EIAs carried out in individual cases is increasingly subject to legal review by international courts and arbitral tribunals.[440] At the same time, the greater level of detail in the procedural manifestations of prevention has often led international jurisprudence to focus on procedural aspects while applying less scrutiny to

437 See chapter 1, section C.IV.
438 ILC, Articles on Prevention (n. 22), Commentary to Article 10, para. 10.
439 Cf. *Bratspies* (n. 20), 194.
440 See *supra* section D.II.

the question whether the substantive obligation to prevent harm has been observed. Ultimately, the relationship between procedural and substantive aspects of prevention is still an unsettled question. When knowledge about the environmental risks of a certain activity is insufficient, the precautionary approach lowers the evidentiary threshold for invoking preventive measures, but does not operate as a reversal of the burden of proof.

To date, no state has ever claimed a breach of international law for adverse transboundary effects caused by LMOs uncontrolledly entering its territory. In light of recent advances in developing self-spreading biotechnology like engineered gene drives, such claims are likely to arise in the future. As noted earlier, the potential of these techniques to create organisms that traverse political borders it widely recognized.[441] But doubts remain whether customary international law is capable of preventing unilateral releases when the potential for a transboundary spread of the organism is controversial. The following chapter shows that the international regulation of engineered gene drives is currently subject to vivid and controversial debates. While these discussions have resulted in a first substantive decision carried by near-universal consensus, it remains to be seen whether it effectively guardrails safe deployments of this emerging technique.

441 See chapter 1, section C.IV.4.