Chapter 2:
Concepts and Terms Relevant to Transboundary Harm Caused by Biotechnology

The first chapter has shown that recent advances in biotechnology open up many new possibilities, but also pose challenges to the law, including at the international level. While the environmental and ethical implications of genome editing techniques remain controversial, it seems undisputed that techniques aimed at self-propagation, such as engineered gene drives, involve considerable environmental risks. In contrast to conventional applications of genetic engineering, these techniques also entail a considerable likelihood of uncontrolled transboundary effects. This raises the question of how international law addresses potential transboundary damage caused by the application of biotechnology.

Before we embark on a detailed analysis of the applicable rules and gaps in international law, the present chapter sets the scene by introducing a number of key terms which are fundamental to the topic and will be frequently used in the following chapters. To begin with, the terms 'living' and 'genetically' modified organisms are defined and the differences between both terms will be explained (A.). The ensuing section provides an overview of the different types of damage which may result from LMOs (B.). Moreover, the terms 'responsibility' and 'liability' must be distinguished (C.).

The imposition of liability for damage caused by LMOs is mandated by the 'polluter-pays' principle, although it is questionable whether liability should be imposed on states or on private operators (D.). Although liability is normally attached to proof of fault, this may be inappropriate in the case of hazardous activities, which may justify the imposition of 'strict' liability (E.). While international law focuses on interactions between states, it may also need to provide for harmonized rules on civil liability in a transboundary context (F.). Finally, a recent trend of international law-making is to provide for 'administrative liability' to complement the conventional 'civil liability' of operators (G.).

A. 'Genetically Modified' and 'Living Modified' Organisms

To denote organisms whose genome was engineered through molecular biotechnology, most national and regional regimes refer to 'genetically modified organisms' or GMOs.[1] In contrast, many treaties and instruments at the global level instead refer to 'living modified organisms' or LMOs.[2] This term was first used in the *Convention on Biological Diversity* (CBD) of 1992,[3] because it was assumed that many of the concerns directed at GMOs – such as the risk of invasiveness or uncontrolled spread, selection for resistant organisms from biopesticides, and the production of toxic by-products – were, in some circumstances, equally applicable to traditionally developed or bred organisms.[4] However, when the parties to the CBD mandated the negotiations of the *Cartagena Protocol on Biosafety*, the scope was restricted to LMOs 'resulting from *modern* biotechnology', which was meant to exclude conventional breeding methods.[5]

It is widely assumed that the terms 'genetically modified' and 'living modified' organisms are largely synonymous,[6] although the latter excludes processed materials derived from modified organisms.[7] However, as will be shown in chapter 3, more recent genome editing techniques challenge

1 Cf. *David Hamburger*, Comparative Analysis: The Regulation of Plants Derived from Genome Editing in Argentina, Australia, Canada, the European Union, Japan and the United States, in: Hans-Georg Dederer/David Hamburger (eds.), Regulation of Genome Editing in Plant Biotechnology (2019) 313, 327–336.

2 See chapter 3, sections A.I.1, B.III, D, E, and H.

3 Convention on Biological Diversity (05 June 1992; effective 29 December 1993), 1760 UNTS 79, Article 8g(g).

4 *Lyle Glowka* et al., A Guide to the Convention on Biological Diversity (1994), 45.

5 CBD COP, Decision II/5. Consideration of the Need for and Modalities of a Protocol for the Safe Transfer, Handling and Use of Living Modified Organisms, UN Doc. UNEP/CBD/COP/2/19, p. 49 (1995), operative para. 1 (emphasis added); cf. *Ruth Mackenzie* et al., An Explanatory Guide to the Cartagena Protocol on Biosafety (2003), MN. 46.

6 See Commission of the European Communities, Proposal for a Regulation of the European Parliament and of the Council on the Transboundary Movement of Genetically Modified Organisms, Explanatory Memorandum (25 June 2002), COM(2002) 85 final – 2002/0046(COD); *Jan Husby*, Definitions of GMO/LMO and Modern Biotechnology, in: Terje Traavik/Li C. Lim (eds.), Biosafety First (2009) 365; *Piet van der Meer* et al., The Status Under EU Law of Organisms Developed Through Novel Genomic Techniques (2021) European Journal of Risk Regulation 1, 15.

7 *Husby* (n. 6), 370–371.

the existing definitions of both terms under the various instruments.[8] A major source of controversy seems to be the contention that the definitions presume that the resulting organisms contain *transgenes*, i.e. genetic information from a different, sexually incompatible species.[9]

Except where stated otherwise, the present study uses the terms LMO and GMO synonymously. When referring to a particular instrument, the term employed by that instrument is used. This is without prejudice to the question of applicability, which will have to be assessed individually for each organism and each instrument, but which is presumed here in some instances to avoid repetition.

B. Types of Damage Potentially Caused by LMOs

The development and use of LMOs are considered to involve risks for various legally protected rights and interests. On the one hand, LMOs may cause damage to the rights and interests of individual persons. These types of damage are usually categorized into three sub-categories: personal injury, property damage and economic loss.

Firstly, *personal injury* denotes bodily or mental injury to a human person or any invasion of a personal right.[10] Such injury may be caused by direct interaction between the LMO and an individual, for instance by (intentional or unintentional) ingestion, or by stinging or biting by insects. This includes the infection of humans with a genetically modified virus.[11] Personal injury may also be suffered as a consequence of human rights violations.

Secondly, *property damage* or *material injury* refers to the destruction or devaluation of material or intellectual property.[12] The scope of this second

8 See chapter 3, sections A.I.1 and A.IV.

9 Cf. *Motoko Araki* et al., Caution Required for Handling Genome Editing Technology, 32 (2014) Trends in Biotechnology 234, 234–235 and the references in chapter 3; see 'transgene', in: *Eleanor Lawrence* (ed.), Henderson's Dictionary of Biology (16th ed. 2016), 595.

10 Cf. 'personal injury', in: *Bryan A. Garner* (ed.), Black's Law Dictionary (11th ed. 2019), 939.

11 *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, 76.

12 See *Drew L. Kershen*, Legal Liability Issues in Agricultural Biotechnology, 44 (2004) Crop Science 456, 459–460.

category essentially depends on the scope of protection awarded to such interests by domestic law.[13] Thirdly, *economic loss* refers to a monetary loss, such as lost wages or profits that would have been earned had the undesired event not occurred.[14]

In the context of international environmental law, these types of damage are sometimes referred to as 'traditional damage' because their compensability is generally recognised and established in most jurisdictions.[15] A frequent example of traditional damage caused by LMOs is the contamination of organic or conventionally grown crops with LMOs.[16] Claims for such damage have been brought in many jurisdictions, including the United States, Canada, and the European Union.[17] Notably, contamination may not only originate from genetically modified seeds but also from other applications such as genetically modified insects.[18]

On the other hand, damage caused by LMOs may also take the form of injury caused to *common goods* and *public interests*. This includes damage to the environment, such as to biological diversity, which may be caused by the loss of a certain species or the spread of an invasive species as a consequence of the release of an LMO. Such damage may include the costs of response measures taken to prevent further loss or to restore the loss,

13 See chapter 6, section D.I.1.

14 Cf. 'economic loss', in: Black's Law Dictionary (n. 10), 649; see *Kershen* (n. 12), 460–461.

15 The notion of 'traditional damage' seems to stem from the development of the Environmental Liability Directive in the then European Communities (now European Union), cf. European Commission, White Paper on Environmental Liability, COM(2000) 66 final (2000), 16–17; Directive 2004/35/CE on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage (21 April 2004), OJ L 143, p. 56 (hereinafter 'EU Environmental Liability Directive'), Preamble, Recitals 11 and 14; see *Armelle Gouritin*, EU Environmental Law, International Environmental Law, and Human Rights Law (2016), 39–40.

16 *Kershen* (n. 12), 456.

17 See *A. B. Endres*, "GMO:" Genetically Modified Organism or Gigantic Monetary Obligation? The Liability Schemes for GMO Damage in the United States and the European Union, 22 (2000) Loyola of Los Angeles International and Comparative Law Review 453; *Kershen* (n. 12); *Stuart J. Smyth/Drew L. Kershen*, Agricultural Biotechnology, 6 (2006) Global Jurist Advances 1; *Bernhard A. Koch/Bjarte Askeland* (eds.), Economic Loss Caused by Genetically Modified Organisms (2008); *Odile J. Lim Tung*, Genetically Modified Organisms and Transboundary Damage, 38 (2013) SAYIL 67, 72–74.

18 *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.

or public health costs for medical screening or vaccination. However, it is controversial whether environmental damage is compensable beyond the reimbursement of such *incidental expenses*, i.e. expenses which become necessary as a result of the damage but do not repair the actual damage sustained.[19] Besides, it is also controversial whether adverse effects of LMOs on wider socio-economic considerations, such as cultural, social and spiritual values, food security, agricultural biodiversity and economic competitiveness, can be considered as damage. Usually, a major obstacle to making successful claims for such effects will be the requirement to establish a causal link with the required degree of certainty.[20]

Finally, there are two groups of cases in which the adverse effects described above may materialize in a transboundary setting. In the first scenario, an LMO uncontrolledly spreads in the territory of another state and causes adverse effects there.[21] This includes both situations of an uncontrolled natural spread (either through natural migration of the LMO or when carried by animals, pollen or seed) and situations where an LMO is inadvertently carried across the border by humans (e.g. through contaminated cargo or baggage) and subsequently released.

In the second scenario, an LMO causes adverse effects after being deliberately imported into the receiving state (be it lawfully or unlawfully) and subsequently released into the environment (be it intentionally or unintentionally).[22] This distinction is also relevant to the question of liability and responsibility. In the first scenario, the LMO enters the affected state without the latter's consent. The situation thus resembles the occurrence of transboundary pollution and other forms of environmental interference. In the second group of cases, damage is caused by a series of events involving the state where the LMO originates, the state where the damage occurs, and possibly also other states involved in the transboundary movement of the LMO, making it harder to identify the party (or parties) liable.

19 See chapter 11, section B.I.

20 See *Gouritin* (n. 15), 157–158. On socio-economic considerations in the Cartagena Protocol, see chapter 3, section A.II.1.e).

21 *Susanne Förster*, Internationale Haftungsregeln für schädliche Folgewirkungen gentechnisch veränderter Organismen (2007), 161.

22 *Ibid.*

C. The Distinction Between 'Responsibility' and 'Liability'

In literature dealing with transboundary damage in international law, a distinction is usually made between 'responsibility' and 'liability'. However, there are major differences in how this distinction is made and, consequently, how both terms are used. According to one school of thought, the terms denote two mutually exclusive concepts, with 'responsibility' meaning the legal consequences of *wrongful* conduct and 'liability' referring to an obligation to remedy damage caused by *lawful* acts.[23] This appears to be in line with the terminology used by the *International Law Commission* (ILC), which has distinguished between '*responsibility* for internationally wrongful acts'[24] and '*liability* for damage resulting from acts not prohibited by international law'.[25]

A different view also understands 'responsibility' as the legal consequences of unlawful conduct (i.e. the breach of a 'primary obligation'), whereas 'liability' largely denotes a legal obligation to make reparation regardless of whether it results from the responsibility for wrongful conduct (as a 'secondary obligation'[26]) or as a separate 'primary' obligation that applies regardless of whether there was a legal wrongdoing.[27] The latter

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23 *N.L.J.T. Horbach*, The Confusion About State Responsibility and International Liability, 4 (1991) Leiden J. Int'l L. 47, 52–53; *Julio Barboza*, The Environment, Risk and Liability in International Law (2011), 22–24; *Alexandre Kiss/Dinah Shelton*, Guide to International Environmental Law (2007), 19; *Attila Tanzi*, Liability for Lawful Acts, in: Wolfrum/Peters (ed.), MPEPIL, MN. 2; *Ulrich Beyerlin/Thilo Marauhn*, International Environmental Law (2011), 361.

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

25 Cf. UNGA, Resolution 32/151. Report of the International Law Commission, UN Doc. A/RES/32/151 (1977) (emphasis added); also see *Robert Q. Quentin-Baxter*, Preliminary Report on International Liability for Injurious Consequences Arising Out of Acts Not Prohibited by International Law, YBILC 1980, Vol. II, Pt. 1, p. 247 (1980), 250–252; *Barboza* (n. 23), 75–81.

26 In this sense 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, 2011 ITLOS Rep. 10, para. 66.

27 *L.F.E. Goldie*, Concepts of Strict and Absolute Liability and the Ranking of Liability in Terms of Relative Exposure to Risk, 16 (1985) NYL 175, 180; *René Lefeber*, Transboundary Environmental Interference and the Origin of State Liability (1996), 15; *Johan G. Lammers*, International Responsibility and Liability for Damage Caused by Environmental Interferences, 31 (2001) Environmental Policy and Law 42–50 and 94–105, 42; *Hanqin Xue*, Transboundary Damage in International Law (2003), 75–76; *Alena Douhan*, Liability for Environmental

view finds support in a number of international treaties that use 'liability' to denote obligations to compensate for damage resulting from either lawful activities[28] or wrongful conduct.[29]

Notably, both views accept that international law may also provide for 'liability' in situations where damage has been caused by *lawful* conduct. Such liability, which arises whenever damage results from a certain activity, is usually referred to as 'strict liability' or 'absolute liability'.[30] Thus, it could be assumed that the differences are only of a terminological nature. At the same time, the confusion over the meaning and scope of 'responsi-

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Damage, in: Wolfrum/Peters (ed.), MPEPIL, MN. 11–13; *Barbara Saxler* et al., International Liability for Transboundary Damage Arising from Stratospheric Aerosol Injections, 7 (2015) Law, Innovation and Technology 112, 117.

28 See Vienna Convention on Civil Liability for Nuclear Damage (25 May 1963; effective 12 September 1997), 1063 UNTS 358, as amended by the Protocol of 12 September 1997 (effective 4 October 2003), IAEA Doc. INFCIRC/566 (hereinafter '1997 Vienna Convention on Civil Liability for Nuclear Damage'); 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 (hereinafter '1992 Oil Pollution Convention'); 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) (hereinafter 'Antarctic Liability Annex'); 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').

29 Cf. Article 91 of the Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I) (08 June 1977; effective 07 December 1978), 1125 UNTS 3, which is titled 'Responsibility' and reads: 'A Party to the conflict which violates the provisions of the Conventions or of this Protocol shall, if the case demands, be *liable* to pay compensation. It shall be *responsible* for all acts committed by persons forming part of its armed forces' (emphasis added); further cf. Article 139(2) of the United Nations Convention on the Law of the Sea (10 December 1982; effective 16 November 1994), 1833 UNTS 3, which reads: '[…] damage caused by the failure of a State Party or international organization to carry out its *responsibility* under this Part shall entail *liability*' (emphasis added; see *Silja Vöneky/Anja Höfelmeier*, Article 139 UNCLOS, in: Alexander Proelss (ed.), United Nations Convention on the Law of the Sea: A Commentary (2017) 968, MN. 9–16), also see Art. 4(4) of Annex III to UNCLOS.

30 *Louise A. de La Fayette*, International Liability for Damage to the Environment, in: Malgosia A. Fitzmaurice/David Ong/Panos Merkouris (eds.), Research Handbook on International Environmental Law (2010) 320, 325–326; see *infra* section E.

bility' and 'liability' may have contributed significantly to the deadlock that the whole issue of accountability for transboundary harm has faced for many years (and perhaps still does).[31]

For the purposes of the present study, it shall suffice to assume that 'responsibility' denotes the consequences arising from unlawful conduct, while 'liability' refers to a legal obligation to rectify damage, which may either result from responsibility or from a legal provision providing for liability independently from legal wrongdoing. In that sense, the present study follows the latter of the aforementioned views.

D. The 'Polluter-Pays' Principle: State or Operator Liability?

According to the so-called 'polluter-pays principle', the costs of pollution or environmental damage shall be *internalized*, i.e. allocated to the actor who causes the harm and draws the benefits from the polluting activity.[32] From the perspective of international law, however, it is not entirely clear whether the principle directs liability only to the individual(s) in control of the activity or also to the state under whose jurisdiction the activity is conducted.[33]

States are generally reluctant to accept liability for hazardous conduct carried out by private actors within their jurisdiction. Therefore, international law on liability for environmental damage often refers to *operator liability*, which means the liability of private actors when their hazardous activities or substances cause transboundary harm.[34] As private actors are no subjects of public international law, their liability is usually implemented under national law adopted in accordance with international treaty

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31 Cf. *Jutta Brunnée*, Of Sense and Sensibility: Reflections on International Liability Regimes as Tools for Environmental Protection, 53 (2004) ICLQ 351; *Günther Handl*, International Accountability for Transboundary Environmental Harm Revisited: What Role for State Liability?, 37 (2007) Environmental Policy and Law 117.

32 Rio Declaration on Environment and Development (14 June 1992), UN Doc. A/CONF.151/26/Rev.1 (Vol. I) (hereinafter 'Rio Declaration 1992'), Principle 16; see *Priscilla Schwartz*, Principle 16, in: Jorge E. Viñuales (ed.), The Rio Declaration on Environment and Development: A Commentary (2015) 429, 441–442.

33 *Caroline E. Foster*, The ILC Draft Principles on the Allocation of Loss in the Case of Transboundary Harm Arising Out of Hazardous Activities, 14 (2005) RECIEL 265, 270–275; *Lefeber* (n. 11), 76; *de La Fayette* (n. 30), 329–330.

34 *Xue* (n. 27), 75–76.

obligations and enforced by national judicial and administrative systems.[35] In the context of damage caused by LMOs in a transboundary setting, the relevant international instrument providing for operator liability is the *Nagoya – Kuala Lumpur Supplementary Protocol*.[36] Moreover, the *Biodiversity Compact* is a private law instrument by which biotechnology providers have voluntarily assumed liability for potential biodiversity damage caused by their products.[37] But beyond these instruments, it is questionable whether states are generally required to ensure that operators within their jurisdiction are liable for transboundary harm caused by their activities.[38]

Apart from the operator, accountability for transboundary harm may also be imposed on the so-called *state of origin* (or *source state*), which refers to the state under whose jurisdiction the activity that has caused the damage is carried out. As will be shown below, there now is a large body of conventional[39] and customary[40] international law under which states must take steps to ensure that products of biotechnology do not cause harm to other states and the 'global commons'. In principle, it is undisputed that a state is internationally responsible for transboundary harm that results from a breach of its obligations aimed at preventing such harm.[41] However such breaches are often difficult to establish, mainly because the obligations of prevention are cast as obligations 'of conduct' rather than 'of result', which means that the causation of damage does not necessarily indicate a breach of the obligation to prevent such damage.[42]

Arguably, international responsibility may also result from a failure to implement international obligations to provide for the liability of the respective operators which have caused the damage.[43] As phrased by the *Institut de Droit International*, international responsibility can be also be incurred for a

> *'failure of the State to comply with the obligation to establish and implement civil liability mechanisms under national law, including insurance*

35 Cf. *Philippe Sands* et al., Principles of International Environmental Law (4th ed. 2018), 735.
36 Supplementary Protocol (n. 28); see chapter 6.
37 See chapter 7.
38 See chapter 8.
39 See chapter 3.
40 See chapter 4.
41 See chapter 9.
42 See chapter 4, sections C and E.
43 See chapter 9, section A.III.1.

schemes, compensation funds and other remedies and safeguards, as provided for under such regimes'.[44]

Beyond that, however, it is controversial whether the state should also be *liable* for transboundary harm for which it is not *responsible*.[45] According to some authors, the polluter-pays principle could be interpreted extensively to include a residual liability for costs which cannot be imposed on the respective operator.[46]

E. Standards of Liability: Fault-Based, Objective, Strict, and Absolute Liability

Virtually all legal systems recognize that it is 'just' to provide for liability in the case that one person causes injury to another. However, the conditions under which such liability arises vary considerably.[47] In most cases, liability is premised on the injury to be caused by some sort of 'fault', which usually involves a breach of a primary obligation or a duty of care, either by an intentional act or by an act of negligence.[48] This type of liability is commonly referred to as 'tort', 'fault-based', or 'delictual' liability.[49]

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44 Institut de Droit International, Responsibility and Liability Under International Law for Environmental Damage: Resolution Adopted on September 4, 1997, 37 ILM 1474, Article 6(2).

45 In the ILC's parlance, these cases were long referred as 'injurious consequences arising out of acts not prohibited by international law'. This term was later given up in favour of 'liability for loss from transboundary harm arising out of hazardous activities' (and, even later, 'allocation of loss') after the ILC had concluded its work on state responsibility (cf. ARSIWA (n. 24)) and on prevention of transboundary harm, cf. 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').

46 See *de La Fayette* (n. 30), 329; and see chapter 10.

47 Cf. *Robert Jennings/Arthur Watts*, Oppenheim's International Law (9th ed. 1992), 509, noting that there was 'probably no single basis of international responsibility, applicable in all circumstances, but rather several, the nature of which depends on the particular obligation in question'. Also see *André Tunc* (ed.), International Encyclopedia of Comparative Law, Vol. XI: Torts (1986).

48 *Sanford E. Gaines*, International Principles for Transnational Environmental Liability: Can Developments in Municipal Law Help Break the Impasse?, 30 (1989) Harv. Int'l L. J. 311, 333–335; *Xue* (n. 27), 296; *Kershen* (n. 12), 456–459; *de La Fayette* (n. 30), 325; *Barboza* (n. 23), 24.

49 Cf. *Horbach* (n. 23), 49; *Xue* (n. 27), 295–298; *Giuseppe Palmisano*, Fault, in: Wolfrum/Peters (ed.), MPEPIL, MN. 5; *de La Fayette* (n. 30), 324–325; see 'fault liability', in Black's Law Dictionary (n. 10), 1098. Note that besides negligence,

The requirement to prove intent or culpable negligence on the part of the defendant may create unjust results, in particular where the defendant has engaged in a dangerous activity that, albeit lawful or even deemed socially desirable, exposed the victim to an increased risk of harm.[50] In these situations, harm may arise from the inherent risk involved in the activity even when the defendant acted without intent or culpable negligence, or when such fault would be very difficult to prove for the injured party. In order to achieve a just allocation of the risk incurred by operating hazardous activities,[51] many legal systems have adopted 'strict liability' for such activities.[52] Strict liability denotes liability which is incurred regardless of whether the liable actor acted culpably.[53] Hence, in order to obtain compensation, a plaintiff must only prove a causal relationship between the damage he suffered and the hazardous activity of the defendant.[54] Most international treaties on operator liability for environmental damage provide for strict liability as the relevant standard.[55]

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tort law systems usually also provide for a range of other forms of liability, such as *trespass* and *nuisance*, see *Michael G. Faure/Andri Wibisana*, Liability for Damage Caused by GMOs: An Economic Perspective, 23 (2010) Geo. Int'l Envtl. L. Rev. 1, 10–17; *Kershen* (n. 12), 456–459.

50 *Goldie* (n. 27), 204–213; *de La Fayette* (n. 30), 327; *Alan E. Boyle*, Globalising Environmental Liability: The Interplay of National and International Law, 17 (2005) J. Envt'l L. 3, 13.

51 But see *Lucas Bergkamp*, Liability and Environment (2001), 160–164, arguing that regimes providing for strict liability were 'unnecessary, inefficient and ultimately rather pointless' since they did not contribute to an optimal risk allocation, created over-deterrence, imposed unnecessary costs, and inhibited innovation.

52 Cf. ILC, Survey of Liability Regimes Relevant to the Topic of International Liability for Injurious Consequences Arising Out of Acts Not Prohibited by International Law (International Liability in Case of Loss from Transboundary Harm Arising Out of Hazardous Activities): Prepared by the Secretariat, UN Doc. A/CN.4/543 (2004), paras. 29–112; *Xue* (n. 27), 299–302; *Gaines* (n. 48), 330–333.

53 Cf. 'strict liability', in Black's Law Dictionary (n. 10), 1099.

54 *Horbach* (n. 23), 49; *Xue* (n. 27), 300; *de La Fayette* (n. 30), 326; *Barboza* (n. 23), 25.

55 Note that strict liability is rarely expressly provided for, but usually rather follows from the absence of a requirement of fault, see 1992 Oil Pollution Convention (n. 28), Article III(1); Convention on Third Party Liability in the Field of Nuclear Energy (29 July 1960; effective 01 April 1968), 956 UNTS 251, as amended by the Additional Protocol of 28 January 1964 and the Protocol of 16 November 1982 (effective 7 October 1988), 1519 UNTS 329 (hereinafter 'Paris Convention'), Article III(a); 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 (hereinafter 'Basel Protocol on Liability for Hazardous Wastes'), Article IV; Kiev Protocol on Civil

While strict liability does not require an element of fault, the defendant may still rely on a number of extenuating circumstances that 'exonerate' him from liability.[56] Exonerations from strict liability commonly include *force majeure* (i.e. an event that could neither be anticipated nor controlled[57]), intervening acts by third parties,[58] actions by public authorities (called 'act of state' defence),[59] and fault of the injured party (or 'contributory negligence').[60] Liability that allows for no such (or only a few) exonerations is called 'absolute liability'.[61] A prominent example of an international treaty providing for absolute liability is the *Space Liability Convention*.[62]

Notably, the responsibility of states for breaches of international law does usually not require an element of fault or negligence, unless expressly provided for by a particular rule.[63] For instance, breaches of the obligation

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Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters (21 May 2003; not yet in force), UN Doc. ECE/MP.WAT/11-ECE/CP.TEIA/9 (hereinafter 'Kiev Liability Protocol'), Article IV. Strict liability is expressly required by the Antarctic Liability Annex (n. 28), Article VI(3). For a comprehensive overview of international agreements providing for strict liability, see ILC, Survey of liability regimes (n. 52), paras. 117–181.

56 *De La Fayette* (n. 30), 326; see e.g. 1992 Oil Pollution Convention (n. 28), Articles III(3) and V(2).

57 Cf. 'force majeure', in Black's Law Dictionary (n. 10), 788; see, e.g., Basel Protocol on Liability for Hazardous Wastes (n. 55), Article IV(5).

58 See, e.g., 1992 Oil Pollution Convention (n. 28), Articles III(3); see *Boyle* (n. 50), 13.

59 It is sometimes argued that when damage is caused by a party which has adhered to the pertinent regulations and authorization of the noxious activity, this party should be exempted from liability (so-called 'regulatory compliance defence'), cf. *Bergkamp* (n. 51), 239–258; also see *André Nollkaemper*, Cluster-Litigation in Cases of Transboundary Environmental Harm, in: Michael G. Faure/Ying Song (eds.), China and International Environmental Liability (2008) 11, 26.

60 *De La Fayette* (n. 30), 326.

61 *Goldie* (n. 27); *Horbach* (n. 23), 50; *Barboza* (n. 23), 26; cf. 'absolute liability', in: Black's Law Dictionary (n. 10), 1097.

62 Cf. Convention on International Liability for Damage Caused by Space Objects (29 March 1972; effective 01 September 1972), 961 UNTS 187, Article II, which provides: 'A launching State shall be absolutely liable to pay compensation for the damage caused by its space object on the surface of the earth or to aircraft in flight.' Also see 1997 Vienna Convention on Civil Liability for Nuclear Damage (n. 28), Article IV(1), which provides for absolute liability of the operator a of nuclear installations.

63 Cf. ARSIWA (n. 24), Commentary to Article 2, para. 3; *Xue* (n. 27), 295–298; see *Palmisano* (n. 49), MN. 17; chapter 9, section A.III.3.

to prevent significant transboundary harm are assessed against the standard of *due diligence*, which does not rely on whether the responsible state acted negligently but rather on what could reasonably be expected from the state in the individual circumstances.[64] Therefore, the responsibility of states for breaches of international obligations is sometimes characterized as 'objective'.[65] Some authors have referred to the legal consequences of state responsibility as 'liability *ex delicto*' as opposed to 'liability *sine delicto*', by which they refer to liability arising regardless of any breach.[66] However, the more common distinction is made between 'state responsibility' and '(strict) state liability'.[67]

F. Procedural Issues in Enforcing Civil Liability in a Transboundary Context

In typical scenarios of transboundary harm, such as in the *Trail Smelter* and *Pulp Mills* cases, hazardous or noxious activities carried out by private actors under the jurisdiction of one state cause injury to persons situated in the jurisdiction of another state. While public international law tends to view these situations exclusively from the perspective of disputes between sovereign states, in many cases the victims of such harm may first attempt to obtain compensation through litigation against the (mostly) private actor that has actually caused the damage.[68] This involves questions relating to the choice of forum, applicable law, and recognition and enforcement of judgments.

Depending on the applicable national law, claims may be brought either in the courts of the state where the damage is caused, where it materializes, or where the defendant is domiciled.[69] In most continental law systems,

64 See chapter 4, section C.

65 Cf. *Barboza* (n. 23), 24–25; *James Crawford*, State Responsibility: The General Part (2013), 60–62.

66 Cf. *Lefeber* (n. 27), 47–53; *Barboza* (n. 23), 25–26.

67 See e.g. *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; *Horbach* (n. 23); *Brunnée* (n. 31); *Kiss/Shelton* (n. 23), 19; see *supra* section C.

68 *Nollkaemper* (n. 59), 14. Private victims of transboundary harm may even be required to first exhaust any available local remedies, see chapter 9, section C.II.

69 Cf. *Boyle* (n. 50), 11; *Burkhardt Hess*, International Civil Litigation, in: Wolfrum/Peters (ed.), MPEPIL, MN. 25–26; *Sufian Jusoh*, Harmonisation of Liability Rules in Transboundary Movement of Biotechnology Crops (2012), 78–87; see Kiev Liability Protocol (n. 55), Article 13.

the latter is the standard case.[70] For instance, in the European Union, the so-called *Brussels I Regulation* provides that 'persons domiciled in a Member State shall, whatever their nationality, be sued in the courts of that Member State'.[71] Alternatively, these persons may also be sued in another Member State 'in matters relating to tort, delict or quasi-delict, in the courts for the place where the harmful event occurred or may occur'.[72] According to the *Court of Justice of the European Union*, this means that the 'plaintiff has an option to commence proceedings either at the place where the damage occurred or the place of the event giving rise to it'.[73]

Once a court has established that it has jurisdiction to adjudicate a case of transboundary harm, the question arises as to which law applies to the dispute. This is usually governed by the laws of the forum, i.e. the state in which the claim is adjudicated. Laws applied to cases of transboundary damage include the *lex fori* (i.e. the law of the forum), *lex loci delicti* (i.e. the law of the place where the tort was committed), *lex domicilii* (i.e. the law of the domicile either of the defendant or the plaintiff),[74] or the law which is most favourable to the plaintiff.[75] In the European Union, the law applicable to non-contractual obligations is determined by the *Rome II Regulation.*[76] Unless the parties to a dispute have agreed on a law of their

70 *Lucas Bergkamp*, Liability and Redress: Existing Legal Solutions for Traditional Damage, in: CropLife International (ed.), Compilation of Expert Papers Concerning Liability and Redress and Living Modified Organisms (2004) 21, 23–24; *Hess* (n. 69), MN. 25–26.

71 Regulation (EU) No 1215/2012 on Jurisdiction and the Recognition and Enforcement of Judgments in Civil and Commercial Matters (12 December 2012), OJ L 351, p. 1 (hereinafter 'Brussels Ia Regulation'), Article 4(1); also see Convention on Jurisdiction and the Recognition and Enforcement of Judgments in Civil and Commercial Matters (30 October 2007; effective 01 October 2010), 2658 UNTS 197, which extends the Brussels regime to Iceland, Switzerland, Norway, and Denmark; also 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, MN. 15–21.

72 Brussels Ia Regulation (n. 71), Article 7(2).

73 CJEU, Bier v. Mines de Potasse d'Alsace, Judgment of 30 November 1976, Case 21/76, 1976 ECR 1735, para. 19.

74 See *Aaron X. Fellmeth/Maurice Horwitz*, Guide to Latin in International Law (2011), 167–168.

75 *Bergkamp* (n. 70), 27–28; *Boyle* (n. 50), 11.

76 Regulation (EC) No 864/2007 on the Law Applicable to Non-Contractual Obligations (11 July 2007), OJ L 199, p. 40 (hereinafter 'Rome II Regulation').

choice,[77] transboundary damage caused by LMOs may be governed either by the rules relating to product liability,[78] environmental damage,[79] or obligations arising out of a tort or delict.[80] In most cases, the applicable law will be that of the country where the damage occurred.[81]

From a choice of forum perspective, it seems most convenient for victims to litigate against a foreign defendant in their 'own' courts, or in a jurisdiction where there is the greatest likelihood of success.[82] However, in common law systems, in particular in the United States, the concept of *forum non conveniens*[83] may create obstacles to bringing claims for an injury suffered abroad.[84] According to this doctrine, a court has the discretion to refuse jurisdiction and dismiss a case if it finds that the case may be heard more appropriately in another court.[85] But even where a court finds that it has jurisdiction, the benefits of litigating in the most convenient forum may be offset by the problems involved with enforcing a judgment obtained there, which becomes relevant when the defendant (or its assets) are not situated in the state where the judgment is obtained.[86]

Under general international law, states are under no obligation to recognize and/or enforce foreign judgments.[87] Although many countries recognize and enforce foreign judgments under some conditions, differences are vast.[88] In the European Union, the aforementioned *Brussels I Regulation* provides that, subject to certain conditions, a judgment given in a Member State shall be recognized and enforceable in all other Member States without any special procedure of recognition or declaration of enforce-

77 *Ibid.*, Article 14.
78 *Ibid.*, Article 5.
79 *Ibid.*, Article 7.
80 *Ibid.*, Article 4.
81 See *Kadner Graziano/Erhardt* (n. 71), MN. 48–110; *Jusoh* (n. 69), 78–94; *Albert A. Ehrenzweig*, Products Liability in the Conflict of Laws–Toward a Theory of Enterprise Liability Under Foreseeable and Insurable Laws, 69 (1960) Yale L.J. 794; also see Convention on the Law Applicable to Products Liability (02 October 1973; effective 01 October 1977), 1056 UNTS 187.
82 *Boyle* (n. 50), 11; *Nollkaemper* (n. 59), 16.
83 See 'Forum non conveniens', in: *Fellmeth/Horwitz* (n. 74), 112.
84 *Boyle* (n. 50), 11.
85 See generally *Ronald A. Brand*, Forum Non Conveniens, in: Wolfrum/Peters (ed.), MPEPIL.
86 *Nollkaemper* (n. 59), 16.
87 *Jan Michaels*, Recognition and Enforcement of Foreign Judgments, in: Wolfrum/Peters (ed.), MPEPIL, MN. 11.
88 *Ibid.*; see *Jusoh* (n. 69), 95–98.

ability being required.[89] Apart from the European Union and the wider *European Economic Area*,[90] comparable regimes exist on regional levels,[91] but attempts to elaborate a global treaty have so far not been successful.[92] Some international agreements on civil operator liability contain special rules on jurisdiction, applicable law, and the recognition and enforcement of judgments.[93] But in the absence of such harmonized rules, the victim will often be required to bring his claim before the courts of the state where the defendant resides and/or where the damage has been caused. This may incur problems relating to equal access and non-discriminatory treatment of foreign plaintiffs. Both the international community[94] and the ILC[95] have repeatedly recognized that victims of transboundary damage should have a right to non-discriminatory access to justice in the state of origin, which has led to the assumption that it 'already reflects existing international law'.[96]

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89 Brussels Ia Regulation (n. 71), Articles 36 and 39.

90 See *supra* n. 71.

91 See, e.g., Inter-American Convention on Extraterritorial Validity of Foreign Judgments and Arbitral Awards (08 May 1979; effective 14 June 1980), 1439 UNTS 87.

92 See *Michaels* (n. 87), MN. 15.

93 Cf. e.g. 1992 Oil Pollution Convention (n. 28), Article X; Convention on Civil Liability for Damage Caused During Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels (10 October 1989; not yet in force), UN Doc. ECE/TRANS/79, Article 20; Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment (21 June 1993; not yet in force), 32 ILM 1228, XXIII; International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (03 May 1996; not yet in force), 25 ILM 1406, as amended by the Protocol of 30 April 2010, IMO Doc. LEG/CONF.17/DC/1 (hereinafter 'HNS Convention'), Article 40; 1997 Vienna Convention on Civil Liability for Nuclear Damage (n. 28), Article XII; Basel Protocol on Liability for Hazardous Wastes (n. 55), Article 21; see *Lammers* (n. 27), 104–105; *Worku D. Yifru* et al., Review of Issues, Instruments and Practices Relevant to Liability and Redress for Damage Resulting from Transboundary Movements of Living Modified Organisms (2012), 20. On the issue generally, see *Jusoh* (n. 69), 78–99.

94 UNGA, World Charter for Nature, UN Doc. A/RES/37/7, Annex (1982), Principle 23; Rio Declaration 1992 (n. 32), Principle 10; 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, Article 32.

95 ILC, Articles on Prevention (n. 45), Article 15 and commentary thereto, para. 3; 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'), Principle 6 and commentary thereto, para. 3.

96 *Boyle* (n. 50), 9; similarly *Nollkaemper* (n. 59), 16; see chapter 8, section F.

G. Civil Liability and 'Administrative Liability' for Damage to the Environment

Most existing international agreements on operator liability for environmental damage seek to harmonize the rules on *civil liability*, which denotes the obligation of the operator of a hazardous activity to make reparation for the damage caused by this activity to the health, property or income of other persons.[97] In most cases, civil liability is governed by rules of national law, which may be harmonized by international treaties on civil liability,[98] and implemented by domestic courts in proceedings initiated by the person who suffered an injury.[99] Depending on the circumstances, the available remedy is either monetary compensation or injunctive relief.[100]

While this approach is appropriate to address 'traditional damage', such as to persons or property, it often faces challenges in adequately accommodating damage to common goods, such as biological diversity. In these cases, there will often be no plaintiff who can establish a legal interest in the subject matter, which is required to have *standing* to make claims in many jurisdictions.[101] Moreover, it will often be difficult or even impossible

97 *Sands* et al. (n. 35), 735.

98 For treaties providing for the harmonization of civil liability, see, e.g., 1997 Vienna Convention on Civil Liability for Nuclear Damage (n. 28); Paris Convention (n. 55); Convention on Civil Liability for Oil Pollution Damage Resulting from Exploration for and Exploitation of Seabed Mineral Resources (01 May 1977; not yet in force), 16 ILM 1451; HNS Convention (n. 93); Basel Protocol on Liability for Hazardous Wastes (n. 55); International Convention on Civil Liability for Bunker Oil Pollution Damage (23 March 2001; effective 21 November 2008), IMO Doc. LEG/CONF.12/19.

99 *Sands* et al. (n. 35), 735; *Gurdial S. Nijar*, Civil Liability in the Supplementary Protocol, in: Akiho Shibata (ed.), International Liability Regime for Biodiversity Damage (2014) 111, 111.

100 *Nijar* (n. 99), 111.

101 See chapter 9, section C.I; also see *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, 274; *Alejandro Lago Candeira*, Administrative Approach to Liability: Its Origin, Negotiation and Outcome, in: Akiho Shibata (ed.), International Liability Regime for Biodiversity Damage (2014) 92, 98; and *Lefeber* (n. 11), 44–45, who argues that the administrative approach could also be used for other activities and/or types of damages, e.g. damage to biological diversity caused by the transboundary movement of invasive alien species, or public health costs resulting from unexpected negative effects of the introduction of medicines.

to express environmental damage in financial terms.[102] This significantly limits the use of civil liability for addressing environmental damage. Many international civil liability treaties even exclude compensation for damage to the environment *per se* by providing that compensation in such cases shall be limited to the costs of reinstatement measures actually undertaken.[103]

To address environmental damage that cannot be reasonably compensated by financial payments, a number of more recent instruments have adopted a so-called 'administrative approach' to environmental liability.[104] *Administrative liability* is characterized by the fact that instead of paying monetary compensation to injured individuals, the operator is required to actively take 'response measures' to mitigate and remediate the damage.[105] Depending on the type of damage, this can result in measures to mitigate the spread of damage, such as containing an escaped LMO, measures to clean up contaminated parts of the environment or measures to reinstate the impaired environment to its unharmed state.[106] If the operator does not implement the necessary response measures itself, it must reimburse the expenses incurred by other operators or states in taking them on its behalf.[107] The approach is termed 'administrative' liability because the obligations of the liable operator are not determined through civil litigation but by an administrative authority empowered to assess the damage and to determine the measures the operator must take.[108]

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102 Cf. *Joachim Wolf*, Gibt es im Völkerrecht einen einheitlichen Schadensbegriff?, 49 (1989) ZaöRV 403, 429–432; *Lefeber* (n. 27), 136–138; *Bergkamp* (n. 51), 332–338; see chapter 11, section B.II.

103 See, e.g., 1992 Oil Pollution Convention (n. 28), Article 1(6); 1997 Vienna Convention on Civil Liability for Nuclear Damage (n. 28), Article 1(1)(k); Basel Protocol on Liability for Hazardous Wastes (n. 55), Article II(2)(c)(iv); see chapter 11, section B.I.1.

104 Kiev Liability Protocol (n. 55), Article 6; EU Environmental Liability Directive (n. 15), Article 6; Antarctic Liability Annex (n. 28), Article V; ILC, Allocation of Loss Principles (n. 95), Principle 5(b).

105 *Lago Candeira* (n. 101), 96–99.

106 Supplementary Protocol (n. 28), Article 2(2)(d); see chapter 6, section C.I.

107 EU Environmental Liability Directive (n. 15), Article 8; Antarctic Liability Annex (n. 28), Article VI; Supplementary Protocol (n. 28), Article 5(5).

108 See *G. Winter* et al., Weighing up the EC Environmental Liability Directive, 20 (2008) J. Envt'l L. 163, 167–171; *Akiho Shibata*, A New Dimension in International Environmental Liability Regimes: A Prelude to the Supplementary Protocol, in: Akiho Shibata (ed.), International Liability Regime for Biodiversity Damage (2014) 17, 35–38; also see *Valerie Fogleman*, Enforcing the Environmen-

At the international level, the administrative approach has been implemented – albeit in varying forms – in the 2003 *Kiev Protocol on Civil Liability*,[109] the 2004 *Environmental Liability Directive* of the European Union,[110] the 2005 *Antarctic Liability Annex*[111] and the ILC's *Articles on Allocation of Loss* of 2006.[112] In the context of the present study, the *Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress* primarily provides for administrative liability.[113]

The administrative approach is particularly valuable for dealing with damage to global commons (such as biodiversity), as such damage often does not (only) affect the legally protected rights and interests of individuals.[114] In these cases, there will be no plaintiff who can establish a legal interest in the subject matter, which is required in many jurisdictions in order to have *legal standing*.[115] Hence, a key merit of the administrative approach is that it allows addressing so-called 'orphan damage' that would otherwise remain unaddressed.[116] Moreover, by providing for tangible action rather than financial compensation, it seeks to ensure that environmental damage is actually redressed and not merely written off.[117]

By empowering the administrative organs of a state to pursue the liability of private operators for damage they have caused to common goods, administrative liability thus fills a significant *lacuna* left open by conventional civil liability regimes. Furthermore, administrative liability is generally *strict* which, as shown above, means it does not depend on whether the operator caused the damage culpably (and whether such fault

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tal Liability Directive: Duties, Powers and Self-Executing Provisions, 4 (2006) Environmental Liability 127, 127–129.

109 Kiev Liability Protocol (n. 55), Article 6.

110 EU Environmental Liability Directive (n. 15), Article 6; see *Edward H. P. Brans/Dorith H. Dongelmans*, The Supplementary Protocol and the EU Environmental Liability Directive, in: Akiho Shibata (ed.), International Liability Regime for Biodiversity Damage (2014) 180.

111 Antarctic Liability Annex (n. 28), Article 5.

112 ILC, Allocation of Loss Principles (n. 95), Article 5; see chapter 8, section C.

113 Supplementary Protocol (n. 28), Article 5; see chapter 6, section C.

114 See chapter 4, section B.II.3.

115 See chapter 9, section C.I; also see *Nijar* (n. 101), 274; *Lago Candeira* (n. 101), 98; and *Lefeber* (n. 11), 44–45, who argues that the administrative approach could also be used for other activities and/or types of damages, e.g. damage to biological diversity caused by the transboundary movement of invasive alien species, or public health costs resulting from unexpected negative effects of the introduction of medicines.

116 *Lago Candeira* (n. 101), 98.

117 Cf. *ibid.*

can be proven), but rather attaches to the mere fact that a certain activity – or in the case of the *Supplementary Protocol*, a certain LMO – led to the occurrence of damage to the environment.[118] In this sense, the administrative approach also contributes to a coherent implementation of the 'polluter pays' principle.[119] Furthermore, the administrative approach has a preventive dimension, because it provides for response measures already when there is an immediate threat of damage even though such damage has not yet materialized.[120]

In sum, civil liability and administrative liability are two complementary approaches that, taken together, aim to ensure that no form of damage remains unredressed. Personal injury, property damage, and economic loss – so-called 'traditional damage' – can be redressed through civil liability by ensuring that the plaintiffs can effectively hold the operator liable through domestic or international adjudication. Environmental damage, such as adverse effects on biodiversity, can be more adequately redressed through administrative liability, i.e. by ensuring that clean-up and remediation measures are taken either by the responsible operator or by other actors who are then reimbursed by the operator.

H. Summary and Outlook

This chapter has elucidated fundamental terms and concepts in the area of international law on responsibility and liability relevant to transboundary harm caused by the development and use of biotechnology. Such harm may take the form of *traditional damage* as well as *environmental damage*. 'Traditional damage' refers to types of damage recognized in most national jurisdictions and international instruments on liability, namely *personal injury*, *property damage*, and *economic loss*. Damage may also be caused to common goods, such as the environment. It is widely accepted that expenses incurred to mitigate environmental damage are subject to liability. However, it is controversial whether permanent, unrestorable damage to the environment *per se* is subject to financial compensation.

In the present context of transboundary harm caused by products of biotechnology, the aforementioned types of harm can occur in various scenarios. An important distinction must be made between harm that

118 Cf. *Nijar* (n. 101), 274; *Lago Candeira* (n. 101), 98–99.
119 *Lim Tung* (n. 17), 76.
120 *Lago Candeira* (n. 101), 98.

involves an uncontrolled movement of an organism from one state into another, and harm that occurs after an organism was deliberately imported into the receiving state and subsequently released there. The former scenario may arise, for instance, when self-spreading GMOs (such as engineered gene drives) spread beyond their intended target range.

The terms *responsibility* and *liability* are used inconsistently in international law dealing with the consequences of transboundary harm. The present study will refer to 'responsibility' as the legal consequences that arise from unlawful conduct. 'Liability' means an obligation to rectify damage, regardless of whether this obligation results from responsibility or a legal rule providing for liability regardless of any wrongdoing.

From a perspective of international law, liability for transboundary harm may be placed either on the *operator* or the *state*. '*Operator liability*' means the liability of the person or entity whose hazardous activity or substance causes harm. Since private operators are no subjects of public international law, operator liability must usually be implemented and enforced by states through their domestic legal systems. However, holding private operators liable for transboundary harm is often difficult because states bear no general obligation to recognize and enforce judgments rendered by the courts of other states.

Against this background, many international instruments on environmental liability seek to harmonize the rules of 'civil liability', which means a legal obligation of the operator to pay monetary compensation for the damage caused by its activity. In contrast, 'administrative liability' refers to measures imposed by an administrative authority of a state requiring the operator to take 'response measures', which means tangible action to contain, mitigate and remediate the damage. Although there are vast differences in terminology, most liability regimes distinguish between 'fault-based liability', which attaches to some form of wrongful or negligent conduct, and 'strict liability', which arises regardless of such fault and is often imposed because of the inherent hazardousness of an activity or substance.

'*State responsibility*' refers to the answerability of a state for conduct that constitutes a breach of international law. Such breaches may result from a failure to implement and enforce rules of international law relating to the prevention of transboundary harm, which are discussed in the second part of this study. Furthermore, state responsibility may follow from a failure to implement and enforce international law relating to the provision of operator liability, assessed in the third part. The requirements and consequences of responsibility in case of a breach will be discussed in the fourth

part, which will also address the controversial question of whether states incur '(strict) state liability' for transboundary harm in cases where they do not bear 'state responsibility' for such harm.