Chapter 11: Compensation for Environmental Damage in International Law

The preceding chapters have identified potential sources of responsibility and liability for damage caused by applications of modern biotechnology in a transboundary context. A remaining question is whether damage to the environment is subject to reparation and how the 'nature and quantum' of such reparation can be determined. It has been observed that the 'complexity of the environment means that the traditional principles of compensation in international law are challenged'.[1] These challenges result, at least in part, from the fact that there is still no universally accepted definition of what constitutes 'environmental damage'.[2] According to a narrow understanding, the meaning of this term is limited to damage to natural resources such as air, water, soil, flora and fauna, and their interaction,[3] while a broader definition also includes the loss of 'non-use values' or 'environmental amenities'.[4]

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1 *Jason Rudall*, Compensation for Environmental Damage Under International Law (2020), 24.

2 Cf. *Philippe Sands* et al., Principles of International Environmental Law (4th ed. 2018), 741–743.

3 *Ibid.*, 741; see United States, Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund), as Amended Through P.L. 109–591, Enacted August 10, 2005, 42 U.S.C. §§ 9601–9675, 42 U.S.C. § 9607(a)(4)(C). The term 'natural resources' is defined as 'land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources […]'; see *ibid.*, 42 U.S.C. § 9601(16).

4 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 2, MN. 20; UNEP Working Group of Experts on Liability and Compensation for Environmental Damage Arising from Military Activities, Conclusions by the Working Group, in: Aleksandr S. Timoshenko (ed.), Liability and Compensation for Environmental Damage (1998) 119, para. 34. See Convention on the Regulation of Antarctic Mineral Resource Activities (02 June 1988; not in force), 27 ILM 868 (hereinafter 'CRAMRA'), Article 1(15); Protocol on Environmental Protection to the Antarctic Treaty (04 October 1991; effective 14 January 1998), 30 ILM 1455, Article 3(1); Convention on Civil Liability for Damage Resulting from Activities

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Some liability instruments focus on specific components of the environment. For instance, the *Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress* applies exclusively to adverse effects caused by LMOs on the conservation and sustainable use of biological diversity. At the same time, the scope of the European Union's *Environmental Liability Directive* is limited to adverse effects on protected species and natural habitats, water damage, and land contamination.[5] The vast majority of international treaties on liability for environmental damage do not define the term 'environmental damage' at all, but merely stipulate that liability for impairment of the environment shall be limited to the costs of reasonable clean-up and reinstatement measures.[6] In the commentary to its *Draft Articles on Prevention of Transboundary Harm*, the *International Law Commission* (ILC) even assumed that the notion of *harm to the environment* was 'self-explanatory'.[7]

Against this background, it has been asserted that 'general international law neither defines environmental damage nor provides any guidance as to

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Dangerous to the Environment (21 June 1993; not yet in force), 32 ILM 1228 (hereinafter 'Lugano Convention on Civil Liability'), Article II(10).

5 See 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'), Article 2(1)(a).

6 See, e.g., 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'), Article 1(1)(k)(iv); 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 (hereinafter 'CRTD'), Article 1(10)(c); Kiev Protocol on Civil 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 II(2)(d); 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 2(2)(c); International Convention on Civil Liability for Bunker Oil Pollution Damage (23 March 2001; effective 21 November 2008), IMO Doc. LEG/CONF.12/19 (hereinafter 'Bunker Oil Convention'), Article 1(10); 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'), Article 6(2).

7 ILC, Draft Articles on Prevention of Transboundary Harm from Hazardous Activities, with Commentaries (2001), YBILC 2001, vol. II(2), p. 148, Article 2, MN. 8.

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how it should be valued'.[8] Although a wide range of international treaties provides for some form of liability for environmental damage,[9] the instances of relevant practice at the intergovernmental level are rare.[10] There have only been a few contentious international cases in which compensation for environmental damage was claimed and awarded.[11] But in recent years, international courts and tribunals have increasingly recognized that responsibility for environmental damage can entail an obligation to serve pecuniary relief.[12] In its recent judgment on compensation in the case concerning *Certain Activities Carried out by Nicaragua in the Border Area*, the

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8 *Alan E. Boyle*, Reparation for Environmental Damage in International Law: Some Preliminary Problems, in: Michael Bowman/Alan E. Boyle (eds.), Environmental Damage in International and Comparative Law (2002) 17, 26.

9 See *supra* n. 6 and *Hannes Descamps/Robin Slabbinck* et al. (eds.), International Documents on Environmental Liability (2008).

10 See 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); *Julio Barboza*, The Environment, Risk and Liability in International Law (2011), 50–62; *Sands* et al. (n. 2), 752–755. Notable cases in which the responsible state agreed to pay compensation were the crash of the Soviet nuclear-powered satellite *Cosmos 954* (see *Alexander F. Cohen*, Cosmos 954 and the International Law of Satellite Accidents, 10 (1984) Yale L.J. 78), the chemical accident at *Sandoz* which polluted the shared river *Rhine* (see *Astrid Boos-Hersberger*, Transboundary Water Pollution and State Responsibility: The Sandoz Spill, 4 (1997) Annual Survey of International & Comparative Law 103), the *Gut Dam arbitration* (see *Said Mahmoudi*, Gut Dam Claims, in: Wolfrum/Peters (ed.), MPEPIL), the compensation paid by Australia for rehabilitation of certain phosphate lands in *Nauru* mined under Australian administration (see *Nico J. Schrijver*, Certain Phosphate Lands in Nauru Case (Nauru v Australia), in: Wolfrum/Peters (ed.), MPEPIL), and the responsibilities accepted by the United States following nuclear tests in the South Pacific (see *Barboza* (n. 10), 55–57).

11 See e.g. Trail Smelter Case (United States v. Canada), Decision of 16 April 1938, III RIAA 1911, 1933; ICSID, Burlington Resources v. Ecuador, Decision on Ecuador's Counterclaim of 07 February 2017, ICSID Case No. ARB/08/05, paras. 79–889. On the award of environmental damages in investor-state disputes, see *Rudall* (n. 1), 31–36.

12 Cf. 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, MN. 193–198; ICSID, Perenco v. Ecuador and Empresa Estatal Petróleos del Ecuador (Petroecuador), Interim Decision on the Environmental Counterclaim of 11 August 2015, ICSID Case No. ARB/08/6; also see IACtHR, The Environment and Human Rights (State Obligations in Relation to the Environment in the Context of the Protection and Guarantee of the Rights to Life and to Personal Integrity – Interpretation and Scope of Articles

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ICJ expressly stated that 'damage to the environment, and the consequent impairment or loss of the ability of the environment to provide goods and services, is compensable under international law'.[13]

Based on the international treaties, instances of state practice, and case law mentioned above, the present chapter seeks to identify the pertinent principles on compensation and valuation of environmental damage. These principles will likely also be relevant when determining compensation for damage caused by applications of self-spreading biotechnology such as engineered gene drives.

There are two different approaches to rectifying environmental damage in international law. The first approach is through *response measures*, i.e. 'tangible action' aimed at containing the cause of the damage, preventing and mitigating further damage, and restoring the impaired environment as much as possible to its *status quo ante*. Compensation for response measures is generally served by reimbursing the expenses incurred by the affected state(s) in taking the necessary measures. This approach is applied in most of the civil liability treaties mentioned above[14] and appears to be generally recognized (A.).

The second approach is compensation *stricto sensu*, i.e. pecuniary relief for environmental damage that cannot be remedied by response measures. This includes both interim losses incurred until the impaired environment has recovered and irrecoverable permanent injury, such as the loss of a species. However, it is both controversial whether such 'pure' environmental damage is compensable at all and how it can be expressed in financial terms (B).

A. *The Reparative Approach: Mitigating, Evaluating, and Restoring Environmental Damage*

The first approach to remedying environmental damage is to take *response measures*, i.e. measures to prevent further harm, clean up pollution or contamination, and restore the impaired components of the environment

4(1) and 5(1) of the American Convention on Human Rights), Advisory Opinion OC-23/18 of 15 November 2017, IACtHR Ser. A, No. 23, para. 103.

13 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, para. 42.

14 See *supra* n. 6.

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to their previous state. As shown earlier, the so-called 'administrative approach' to operator liability seeks to require the responsible operator to implement such measures instead of merely holding the operator liable for financial compensation.[15] But in a transboundary context, response measures will most often not be implemented by a foreign liable party (i.e., the responsible operator or the state of origin) but by the state in whose territory the damage occurred.[16] This raises the question of under what conditions the injured party is entitled to be reimbursed for the expenses incurred in taking such response measures.

It appears to be uncontroversial that costs incurred for response measures are, in principle, subject to compensation under international law. In its commentary to the *Articles on State Responsibility* (ARSIWA), the ILC expressly recognized 'the costs incurred in responding to pollution damage' as one of the appropriate heads of compensable damage.[17] Similarly, the *International Court of Justice* (ICJ) held in the *Certain Activities* case that the injured state is entitled to compensation for its expenses incurred as a consequence of the internationally wrongful act, provided that there is a 'sufficiently direct and certain causal nexus' between the wrongful conduct and the heads of expenses for which compensation is sought.[18] Moreover, most international treaties on operator liability, including the *Nagoya – Kuala Lumpur Supplementary Protocol*, provide for the reimbursement of costs incurred for implementing reasonable measures of reinstatement and prevention.[19]

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15 See chapter 2, section G, and chapter 6, section C.I.

16 See chapter 9, section B.II.3.a)bb).

17 ILC, Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries (2001), YBILC 2001, vol. II(2), p. 31 (hereinafter 'ARSIWA'), Commentary to Article 36, para. 8.

18 ICJ, Certain Activities (Compensation) (n. 13), para. 89. For details on the case, see *infra* section B.I.4 and B.III.

19 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 (hereinafter '1992 Oil Pollution Convention'), Article I(6) and (7); Bunker Oil Convention (n. 6), Article I(9); Lugano Convention on Civil Liability (n. 4), Article II(7)(c) and (d); 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 I(6)(c) and (d); Basel Protocol on Liability for Hazardous Wastes (n. 6), Article II(c)(c)(iv) and (v); 1997 Vienna Convention on Civil Liability for Nuclear Damage (n. 6), Article I(1)(k) and (m-o); Kiev Liability Protocol

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International case law and treaty practice allow distinguishing between different types of response measures that are commonly subject to reimbursement (I.). However, compensation for expenses is usually subject to certain conditions and limitations (II.). A special question concerns the reimbursement of costs incurred by third states who assist the affected states in abating and mitigating environmental damage (III.).

I. Types of Response Measures Subject to Reimbursement

Three different types of response measures are generally accepted as being compensable under international law, namely *mitigation measures* to prevent further injury (1.), *restoration measures* to repair the injury already suffered (2.), and *evaluation measures* to assess the damage and to determine the necessary responses (3.).

1. Mitigation Measures

'Mitigation measures' refer to measures to avoid further damage to the environment from the consequences of the internationally wrongful act. Expenses incurred for such measures are generally accepted as a compensable head of damage. For instance, following Iraq's invasion of Kuwait in 1990, the *United Nations Compensation Commission* (UNCC) awarded compensation for expenses relating to fighting oil fires and stemming the flow of oil in coastal and international waters caused by Iraq.[20] Payments

(n. 6), Article II82)(d)(iv-v) and, (g-h); Antarctic Liability Annex (n. 6), Article VI(1); 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 5(5); see *infra* section B.I.1.

20 UNCC, Governing Council Decision 7. Criteria for Additional Categories of Claims (16 March 1992), UN Doc. S/AC.26/1991/7/Rev.1, 35(a); see *Philippe Gautier*, Environmental Damage and the United Nations Claims Commission: New Directions for Future International Environmental Cases?, in: Tafsir M. Ndiaye/Rüdiger Wolfrum (eds.), Law of the Sea, Environmental Law, and Settlement of Disputes (2010) 177, 188. On the mandate of the UNCC, see *infra* section B.I.3.

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were also awarded for removing landmines and other remnants of war and for recovering oil from oil lakes.[21]

In the *Certain Activities* case, the ICJ awarded compensation for costs and expenses incurred in taking measures to prevent 'irreparable prejudice to the environment'. In that case, Costa Rica constructed a dyke to ensure that waters from the San Juan River were not diverted through one of the channels unlawfully excavated by Nicaragua.[22] The Court held that Costa Rica was to be compensated for both the construction of the dyke and overflights required to monitor its effectiveness.[23]

In the context of damage resulting from biotechnology, mitigation measures may include actions taken to contain a malicious LMO or, where possible, to remove it from the affected environment. This is in line with Article 25(2) of the *Cartagena Protocol on Biosafety*, under which the affected party may request the party of origin to dispose of the LMO in question by repatriation or destruction.[24] Moreover, Article 5(5) of the *Nagoya–Kuala Lumpur Supplementary Protocol* provides that the competent authority of an affected party has the right to recover from the responsible operator the costs and expenses of, and incidental to, the evaluation of the damage and the implementation of appropriate response measures.[25]

2. Restoration Measures

'Restoration measures' refer to actions aimed at restoring the impaired environment to its baseline condition or *status quo ante*, i.e. the condition it had before it was affected by the consequences of the internationally wrongful act.[26] Restoration measures are thus aimed to achieve *restitution*

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21 UNCC, Report and Recommendations Made by the Panel of Commissioners Concerning the Second Instalment of "F4" Claims, S/AC.26/2002/26 (2002), paras. 85–133.

22 ICJ, Certain Activities (Compensation) (n. 13), paras. 135–138.

23 *Ibid.*, para. 146.

24 See chapter 3, section A.II.2.c.bb).

25 See chapter 6, section C.IV.5.

26 See 'Status quo ante', in: *Aaron X. Fellmeth/Maurice Horwitz*, Guide to Latin in International Law (2011), 267. These measures are also referred to as 'primary restoration', as opposed to 'compensatory restoration' which seeks to compensate for interim or irreparable losses, see *Michael T. Huguenin* et al., Assessment and Valuation of Damage to the Environment, in: Cymie R. Payne/Peter H. Sand (eds.), Gulf War Reparations and the UN Compensation Commission (2011) 67, 77. On compensatory restoration, see *infra* section B.II.1.

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in the sense of Article 35 of the ILC's Articles on State Responsibility, which means the re-establishment of the situation which existed before the wrongful act was committed.[27]

In line with the aforementioned principle established by the PCIJ in the *Chorzów Factory* case,[28] the environmental panel of the UNCC held that the 'appropriate objective of remediation is to restore the damaged environment or resource to the condition in which it would have been if Iraq's invasion and occupation of Kuwait had not occurred'.[29] This was confirmed by the ICJ in its judgment on compensation in the *Certain Activities* case, where it held that compensation for damage to the environment could include 'payment for the restoration of the damaged environment'.[30] Moreover, the ICJ noted that:

> *'Payment for restoration accounts for the fact that natural recovery may not always suffice to return an environment to the state in which it was before the damage occurred. In such instances, active restoration measures may be required in order to return the environment to its prior condition, in so far as that is possible.'*

Interestingly, the ICJ did not actually award any compensation for restoration measures. Although Costa Rica had claimed compensation for 'restoration costs', including for the replacement of soil,[31] it apparently had neither taken such measures nor indicated that it intended to implement them in the future, which led the Court to reject these claims.[32]

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27 See *Barboza* (n. 10), 139, who argues that 'restitutio naturalis' should be the primary form of reparation also in cases of environmental damage, and appears to construe restoration measures to constitute 'reparation' regardless of which party is implementing them. However, if not the responsible state but the injured state implements response measures, reimbursement of the related expenses does not constitute restitution, but compensation under the law of state responsibility.

28 Cf. PCIJ, Factory at Chorzów (Germany v. Poland), Merits Judgment of 13 September 1928, PCJI Rep. Ser. A, No. 17, 47.

29 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. 47; see *Gautier* (n. 20), 207.

30 ICJ, Certain Activities (Compensation) (n. 13), para. 42.

31 *Ibid.*, para. 57.

32 Cf. *ibid.*, para. 74. Insofar as the Court awarded 'payment of compensation for restoration measures in respect of the wetland' (cf. *ibid.*, para. 87), it apparently overlooked that Costa Rica's claim for US$ 2,708.39 for 'restoration of the wetland' was part of a proposed valuation of damaged environment and referred to natural restoration rather than active restoration measures actually carried out, see ICJ, Certain Activities Carried Out by Nicaragua in the Border Area (Costa

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Hence, the Court's conclusions on payments for active restoration measures appear to constitute an *obiter dictum*[33] by which the Court went beyond what was at stake in the case before it.

The reimbursement of expenses for restoration measures is also recognized in many international liability instruments. For instance, the *Nagoya/Kuala Lumpur Supplementary Protocol* provides that the competent authority may recover from the responsible operator the costs and expenses of implementing response measures, including measures to restore impaired biological diversity.[34] Similar provisions can also be found in the *Antarctic Liability Annex*[35] and in some international conventions on civil liability.[36]

In sum, it appears to be an established rule under international law that the obligation to make reparation for environmental damage includes payment for restoration measures. Interestingly, only little attention has so far been paid to the precise legal nature of this form of reparation, especially whether reimbursement of costs for restoration measures taken by the injured state constitutes a form of *restitution in kind* (in terms of Article 35 ARSIWA)[37] or *compensation* (in the sense of Article 36 ARSIWA).[38] It could be argued that since restoration measures are aimed at re-establishing the situation which existed prior to the wrongful act, payments for implementing such measures are a form of restitution.[39] However, restitution is commonly understood as tangible action taken by the responsible state to restore the *status quo ante*.[40] Thus, if the injured state takes response measures, reimbursement of the expenses thereby incurred constitutes a form of compensation in the sense of Article 36 ARSIWA.

Rica V. Nicaragua): Memorial of Costa Rica on Compensation, Volume I (2017), 147.

33 See 'Obiter dictum', in: *Fellmeth/Horwitz* (n. 26), 205.

34 Supplementary Protocol (n. 19), Article 5(5).

35 Antarctic Liability Annex (n. 6), Article 6(1).

36 Cf. 1992 Oil Pollution Convention (n. 19), Article I(6)(a) and (b); Lugano Convention on Civil Liability (n. 4), Article II(7)(c) and (d); HNS Convention (n. 19), Article I(6)(c) and (d); Basel Protocol on Liability for Hazardous Wastes (n. 6), Article II(c)(c)(iv) and (v).

37 See chapter 9, section B.II.3.a).

38 See chapter 9, section B.II.3.b).

39 This seems to be implied by ICJ, Certain Activities (Compensation) (n. 13), Separate Opinion of Judge Cançado Trindade, paras. 53–58.

40 ARSIWA (n. 17), Article 35, para. 5.

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3. Evaluation Measures

Before mitigation and restoration measures can be implemented, it might be necessary to assess and evaluate the damage to determine the necessary measures.[41] The UNCC's environmental panel awarded compensation for monitoring and determined that assessment activities were compensable as long as there was a 'plausible risk' of environmental harm, even if the monitoring eventually established that no damage had been caused.[42] In the panel's view, conclusive proof of environmental damage is not required for a monitoring and assessment activity to be compensable, as such a requirement would be 'both illogical and inequitable'.[43] Instead, the panel only required a 'sufficient nexus' between the proposed activity and the alleged damage or risk of damage.[44] At the same time, it rejected claims which were only theoretical or speculative or which had only a tenuous link with damage resulting from Iraq's invasion.[45]

Similarly, the *International Oil Pollution Compensation Funds* (IOPC Funds) provide for the reimbursement of costs for studies to establish the nature and extent of damage and to determine whether reinstatement measures are necessary and feasible.[46] In this respect, the Funds' Claims Manual clarifies that

> *'[…] the mere fact that a post-spill study demonstrates that no significant long-term environmental damage has occurred or that no reinstatement measures are necessary, does not by itself exclude compensation for the costs of the study.'*[47]

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41 Cf. *Gautier* (n. 20), 202–204; *Daniela M. Schmitt*, Staatenverantwortlichkeit für Schäden an der biologischen Vielfalt (2018), 384–385.

42 UNCC, Report and Recommendations Made by the Panel of Commissioners Concerning the First Instalment of "F4" Claims, UN Doc. S/AC.26/2001/16 (2001), paras. 31–32; see *Peter H. Sand*, Compensation for Environmental Damage from the 1991 Gulf War, 35 (2005) Environmental Policy and Law 244, 246; *Sands* et al. (n. 2), 757; *Cymie R. Payne*, Legal Liability for Environmental Damage: The United Nations Compensation Commission and the 1990–1991 Gulf War, in: Carl Bruch/Carroll Muffett/Sandra S. Nichols (eds.), Governance, Natural Resources, and Post-Conflict Peacebuilding (2016) 719, 727.

43 UNCC Panel Report F4/1 (2001) (n. 42), paras. 29–30.

44 *Ibid.*, para. 31.

45 *Ibid.*

46 IOPC Funds, Claims Manual, as adopted by the 1992 Fund Assembly in April 1998 and amended, most recently in April 2018, by the 1992 Fund Administrative Council (2019), para. 3.6.7–8.

47 *Ibid.*, paras. 3.6.9.

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It has been questioned whether these lowered requirements for the compensability of environmental monitoring and assessment activities can be transferred to other cases.[48] Notably, the UNCC's conclusions were not based on an assessment of general international law but on the Security Council resolutions[49] and Governing Council decisions[50] which had already established that Iraq was liable for the consequences resulting from its unlawful activities.[51] In other cases, such responsibility would still need to be established before any compensation can be awarded, even for activities assessing possible injury and its causes.[52] However, these concerns are rather a matter of timing or procedure than substance. Once a state's international responsibility has been established, compensation extends to all monitoring and assessment measures, including those required to assess the extent of damage and its causes and to determine potential response measures.[53]

The above conclusions were confirmed in the *Certain Activities* case, in which the ICJ concluded that Nicaragua was internationally responsible for environmental damage on Costa Rican territory.[54] Subsequently, the ICJ held that expenses incurred by the injured party for assessing and evaluating the damage resulting from the unlawful act constitute compensable damage under the law of state responsibility.[55] In particular, compensation was awarded for costs incurred for purchasing satellite images of the affected area,[56] obtaining technical evaluations of these images[57] and inspection visits to assess the environmental situation in the area and identify actions needed to prevent further irreparable damage.[58] Hence, costs and expenses for assessing and evaluating environmental damage are compensable

48 Cf. *Gautier* (n. 20), 203.
49 See, in particular, UNSC, Resolution 687 (1991). Iraq-Kuwait (03 April 1991), UN Doc. S/RES/687(1991).
50 See, in particular, UNCC Governing Council Decision 7 (n. 20), para. 35(c).
51 *Gautier* (n. 20), 203; see *infra* section B.I.3.
52 *Ibid.*
53 See *ibid.*, who argues that a court could order studies or an expert opinion to determine the appropriate response measures to be taken; *Schmitt* (n. 41), 385.
54 Cf. 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. 142.
55 ICJ, Certain Activities (Compensation) (n. 13), para. 113.
56 *Ibid.*, paras. 118–120.
57 *Ibid.*, paras. 98, 123–124.
58 *Ibid.*, para. 113.

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under the law of state responsibility, provided that there exists a 'sufficiently direct and certain causal nexus' between the internationally wrongful act and the expenses claimed, even when the assessment reveals that no environmental damage resulted from the internationally wrongful act.[59] In the *Trail Smelter* case, the tribunal even awarded compensation for possible future investigations to establish whether further damage occurred despite the measures ordered in the award.[60]

II. Limitations to Compensability

Costs incurred for response measures are not compensable unconditionally. In particular, reimbursement is limited to such measures that are 'appropriate' or 'reasonable' (1.). Moreover, expenses are only compensable when incurred as a direct consequence of the damage and when they would not have accrued anyway (2.). Finally, some regimes limit compensation for response measures to the monetary value of the impaired environment (3.).

1. Limitation to 'Reasonable' Measures

It is widely recognized that expenses incurred for implementing restoration measures are only compensable to the extent that the measures in question are 'appropriate'[61] or 'reasonable'.[62]

The requirement of reasonableness was also applied by the UNCC's environmental panel, which assessed the cost-effectiveness and appropriateness of proposed monitoring and reinstatement measures by referring

59 Cf. *ibid.*, para. 123; *Schmitt* (n. 41), 385.

60 Trail Smelter Case (United States v. Canada), Decision of 11 March 1941, III RIAA 1938, 1980; see *René Lefeber*, Transboundary Environmental Interference and the Origin of State Liability (1996), 140.

61 See., e.g., Antarctic Liability Annex (n. 6), Article II(e); ILC, Allocation of Loss Principles (n. 4), Principle 5(b); Supplementary Protocol (n. 19), Article 5(1)(c).

62 See, e.g., 1992 Oil Pollution Convention (n. 19), Article I(6)(a); UNCC Governing Council Decision 7 (n. 20), para. 35; Lugano Convention on Civil Liability (n. 4), Article II(7)(c); HNS Convention (n. 19), Article I(6)(c); Basel Protocol on Liability for Hazardous Wastes (n. 6), Article II(c)(c)(iv); Supplementary Protocol (n. 19), Article 2(1)(d).

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to 'generally accepted scientific criteria and methodologies'.[63] According to the panel, the primary emphasis should be placed on restoring the environment to its prior conditions, 'in terms of its overall ecological functioning rather than on the removal of specific contaminants or restoration of the environment to a particular physical condition'.[64] Consequently, the panel held that even where sufficient baseline information allowed to determine the exact historical state of the environment prior to Iraq's invasion of Kuwait, it might not always be feasible or reasonable to fully recreate pre-existing physical conditions.[65]

The panel also refused compensation for restoration measures that were 'likely to result in more negative than positive effects'.[66] For instance, it rejected proposed studies on the release of genetically modified bacteria to combat residual oil pollution.[67] The panel noted that it had 'serious reservations' about the deliberate release of genetically modified organisms into the environment, in particular considering the absence of reliable scientific knowledge about the threat posed by these organisms and in the view of the low probability that such an experiment would have 'any practical utility'.[68] Other proposals rejected by the panel concerned, among others, the introduction of non-native tree species into damaged forest areas,[69] and the removal of contaminated sediments by treating them with *high-temperature thermal desorption*.[70] The panel held that the latter approach would pose 'unacceptable risks of adverse environmental impacts' and preferred an alternative approach that targeted the impediments to ecological recov-

63 UNEP Working Group of Experts on Liability and Compensation for Environmental Damage Arising from Military Activities (n. 4), para. 47; UNCC Panel Report F4/1 (2001) (n. 42), para. 35.

64 UNCC Panel Report F4/3 (2003) (n. 29), para. 48; see *Sands* et al. (n. 2), 759.

65 UNCC Panel Report F4/3 (2003) (n. 29), para. 48.

66 UNCC, Report and Recommendations Made by the Panel of Commissioners Concerning Part One of the Fourth Instalment of "F4" Claims, UN Doc. S/AC.26/2004/16 (2004), para. 50; UNCC, Report and Recommendations Made by the Panel of Commissioners Concerning Part Two of the Fourth Instalment of "F4" Claims, UN Doc. S/AC.26/2004/17 (2004), para. 41; see *Sands* et al. (n. 2), 759; *Gautier* (n. 20), 203–204.

67 UNCC Panel Report F4/1 (2001) (n. 42), paras. 169–172.

68 *Ibid.*, para. 171.

69 *Ibid.*, paras. 238–241.

70 'High temperature thermal desorption' refers to a process using heat to separate contaminants from contaminated material, during which water and organic contaminants are volatilized from the material. The volatilized contaminants usually require further treatment. See the glossary in UNCC Panel Report F4/3 (2003) (n. 29), 56.

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ery and accelerated natural recovery[71] In some instances, the panel also concluded that it was more reasonable to rely on and assist the natural recovery of damaged areas.[72]

The aforementioned examples indicate that the objective of environmental restoration does not justify taking additional environmental risks, at least as long as no clear benefits can be expected from these measures. Applied to the case of a malicious LMO causing environmental harm, this means that the release of other LMOs designed to contain or eliminate the malicious organism is generally not justified. For example, when a gene drive exceeds its intended target species or geographical scope or otherwise causes harm, the release of a 'reversal drive'[73] would at least require that the expected environmental benefits clearly outweigh the additional risks.

2. Limitation of Reimbursement to Incremental and Extraordinary Expenses

In general, the reimbursement of costs incurred for response and restoration action is limited to *incremental costs*, i.e. expenses that would not have been incurred if the internationally wrongful act had not been committed.[74] However, this principle is sometimes questioned concerning the salaries of civil servants and the costs of using state-owned equipment. For instance, in the case concerning the *Amoco Cadiz* oil spill, a *United States District Court* (applying French law) awarded compensation for the time public employees took from their regular duties to devote their efforts to clean-up activities.[75] With regard to the equipment used for clean-up, the District Court only granted the incremental operating costs exceeding those expenses that would have occurred during the regular operation

71 *Ibid.*, paras. 179–183; see *Payne* (n. 42), 730.
72 Cf., e.g., UNCC Panel Report F4/3 (2003) (n. 29), para. 129.
73 See *Kevin M. Esvelt* et al., Concerning RNA-Guided Gene Drives for the Alteration of Wild Populations, 3 (2014) eLife e03401, 10; *Stephanie James* et al., Pathway to Deployment of Gene Drive Mosquitoes as a Potential Biocontrol Tool for Elimination of Malaria in Sub-Saharan Africa: Recommendations of a Scientific Working Group, 98 (2018) Am. J. Trop. Med. Hyg. 1, 13.
74 *Lefeber* (n. 60), 135–136; see *Cohen* (n. 10), 86.
75 United States District Court for the Northern District of Illinois, Eastern Division, In re Oil Spill By "AMOCO Cadiz" etc., Judgment of 11 November 2988, 1988 U.S. Dist. LEXIS 16832, *14–*15; see *Alexandre Kiss/Dinah Shelton*, International Environmental Law (3rd ed. 2004), 283–285; *Gautier* (n. 20), 206.

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of the equipment.[76] Later, the *United States Court of Appeals* found it inconsistent to apply different standards to civil servants and to equipment and also awarded the regular costs of using the equipment during the clean-up.[77]

In the practice of the UNCC, compensation was only awarded for expenses that were 'incurred as a direct result of Iraq's invasion and occupation of Kuwait and were extraordinary in nature'.[78] Consequently, no compensation was awarded for salaries and other expenses for personnel that would have been incurred regardless of Iraq's unlawful conduct.[79] The same stance was taken by the *International Tribunal for the Law of the Sea* (ITLOS) in the second *Saiga* case.[80]

In the *Certain Activities* case, the ICJ held that salaries of government officials dealing with a situation resulting from an internationally wrongful act were only compensable if they were 'temporary and extraordinary in nature'.[81] In the view of the ICJ, this only applies to expenses a state incurred in paying its officials over the regular wage or where it had to hire supplementary personnel.[82] The Court found this approach to be 'in line with international practice'.[83] For the same reason, it also refused compensation for insurance costs for aircraft used in response measures.[84] Hence, current international law only provides compensation for staff and

76 United States District Court for the Northern District of Illinois, Eastern Division, In re Oil Spill By "AMOCO Cadiz" etc. (n. 75), *17–*18.

77 United States Court of Appeals, Oil Spill by the Amoco Cadiz Off the Coast of France on March 16, 1978, Judgment of 24 January 1992, 954 F.2d 1279 (7th Cir. 1992), 1313–1314.

78 UNCC Panel Report F4/2 (2003) (n. 21), para. 30.

79 UNCC, Report and Recommendations Made by the Panel of Commissioners Concerning the First Instalment of "F2" Claims, UN Doc. S/AC.26/1999/23 (1999), para. 101; UNCC, Report and Recommendations Made by the Panel of Commissioners Concerning the Second Instalment of "F2" Claims, UN Doc. S/AC.26/2000/26 (2000), paras. 52–58; UNCC Panel Report F4/2 (2003) (n. 21), paras. 30, 245–246; also see *Gautier* (n. 20), 206.

80 ITLOS, The M/V "SAIGA" (No. 2) Case (Saint Vincent and the Grenadines v. Guinea), Judgment of 01 July 1999, ITLOS Rep. 10, para. 177.

81 ICJ, Certain Activities (Compensation) (n. 13), para. 101.

82 *Ibid.*

83 *Ibid.*

84 *Ibid.*, para. 95; also see *Lefeber* (n. 60), 136. *Jason Rudall*, Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica V. Nicaragua), 112 (2018) AJIL 288, 291 observed that 'it would appear that the Court made a distinction between variable and fixed costs in certain aspects of its valuation methodology'.

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equipment expenses if such expenses are directly related to the internationally wrongful act and would otherwise not have occurred.

3. Limitation of Restoration Costs to the Monetary Value of the Impaired Environment?

Under certain circumstances, the costs to restore the impaired environment to its baseline conditions may exceed the monetary value of the affected environment.[85] In many civil law regimes, damages for injury to property are awarded lesser of the cost of repair or the diminution in the property's market value. It has been proposed that this 'lesser of' rule should also be applied to environmental damage where reinstating an injured environment exceeds the value that is attached to it by society.[86] However, this overlooks that damaged property can be replaced according to its market value, while an impaired environment cannot be substituted in the same manner. Moreover, as shown below, any approaches to valuing environmental damage are necessarily imperfect because they are limited to ascribing values to certain elements or aspects of the environment.[87]

III. Compensability of 'Environmental Solidarity Costs'

In cases of large-scale environmental damage, injured states may require assistance from states from outside the affected region in abating and preventing environmental damage. In these situations, the question arises whether the expenses of these assisting states, also referred to as 'environmental solidarity costs',[88] are compensable under international law. In the case of Iraq's invasion of Kuwait, the UNCC's environmental panel held that expenses incurred by third parties (states from other regions and international organizations) were compensable to the extent that such

85 On monetary valuation of environmental damage, see *infra* section B.II.

86 *Philippe Sands/Richard B. Stewart*, Valuation of Environmental Damage – US and International Law Approaches, 5 (1995) RECIEL 290, 294; CBD COP, Synthesis Report on Technical Information Relating to Damage to Biological Diversity and Approaches to Valuation and Restoration of Damage to Biological Diversity, as Well as Information on National/Domestic Measures and Experiences: Note by the Executive Secretary, UN Doc. UNEP/CBD/COP/9/20/Add.1 (2008), para. 115.

87 See *infra* section B.II.2.

88 See e.g. *Sand* (n. 42), 246.

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assistance was provided for the predominant purpose of responding to actual or threatened environmental damage or damage to public health.[89] Although the panel based its conclusion mainly on the respective resolutions by the UN Security Council and the UNCC's Governing Council,[90] this also appears to reflect general international law. It has been argued that by legitimizing the costs of assistance, the panel reinforced the norm that the international community has a role in assisting with environmental emergencies even though the ultimate responsibility rests with the country that caused the damage.[91] Hence, expenses incurred by third parties in providing assistance are equally compensable, provided that the injured state requested or agreed to such assistance.[92] As with the injured party's own measures, the decisive criterion is whether the measures taken were required and reasonable.[93]

B. *The Compensatory Approach: Monetary Compensation for Damage to the Environment*

The preceding section dealt with the compensability of costs for the assessment, mitigation and remediation of environmental damage. As shown above, the objective of these measures is to restore the injured environment to the condition in which it would be if the wrongful act had not occurred.[94] In many cases, however, neither restoration measures nor

89 UNCC Panel Report F4/2 (2003) (n. 21), paras. 32–35; see *Sands* et al. (n. 2), 758. Note that expenses for military operations were expressly excluded, cf. UNCC, Governing Council Decision 19. Military Costs (24 March 1994), UN Doc. S/AC.26/Dec.19 (1994); see *Sand* (n. 42), 246.

90 UNCC Panel Report F4/2 (2003) (n. 21), para. 33.

91 *Payne* (n. 42), 742; *Sand* (n. 42), 246.

92 See United States Court of Appeals, Oil Spill by the Amoco Cadiz Off the Coast of France on March 16, 1978 (n. 77), 1313, where it was held that instead of devoting its own resources (including the time of its employees) a state could also hire the navy of another state to aid in cleaning oil spills affecting its shoreline.

93 Cf., e.g., UNCC Panel Report F4/2 (2003) (n. 21), para. 228; see *supra* section A.II.1; but see *Hanqin Xue*, Transboundary Damage in International Law (2003), 96, who fears that 'if the author State were required to reimburse all claims submitted by the injured State for operations carried out by the third party, this might be tantamount to requiring the author State to issue a blank check.'

94 Cf. UNCC Panel Report F4/3 (2003) (n. 29), para. 47.

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natural regeneration can fully restore the damaged environment.[95] This is particularly true for damage to biodiversity, as it will often be impossible to restore a lost species or recover complex ecosystems to their original state.[96] In addition, costs for restoration measures are usually only reimbursed to the extent that such measures were 'reasonable'.[97] It has also been argued that the loss of diversity in one place cannot be offset by simply increasing diversity in another place.[98] Even where full restoration is possible, payment for remediation measures does not account for the impairment of the environment in the time period between the injury and the eventual recovery to baseline conditions.[99]

Temporary or permanent impairments of the environment that cannot be remedied by restoration measures, but are also not reflected in 'traditional' heads of damage such as personal injury, property damage, and loss of profit, are referred to as 'pure' environmental damage or 'damage to the environment *per se*'.[100] However, it is questionable whether this type of damage is at all subject to compensation under international (I.) and, if it is, what form compensation should take (II.). The recent judgment of the ICJ on compensation in the case of Costa Rica v. Nicaragua confirmed the compensability of pure environmental damage in principle but applied a questionable methodology to determine the amount of compensation (III.).

95 *Huguenin* et al. (n. 26), 77–78.
96 *Schmitt* (n. 41), 386.
97 See supra section A.II.1.
98 *Susanne Förster*, Internationale Haftungsregeln für schädliche Folgewirkungen gentechnisch veränderter Organismen (2007), 346.
99 *Huguenin* et al. (n. 26), 77.
100 Different terms are used to denote this type of damage, including 'damage caused to the environment, in and of itself' (ICJ, Certain Activities (Compensation) (n. 13), para. 41), 'pure environmental damage' (e.g. ICJ, Certain Activities (Compensation) (n. 13), Separate Opinion of Judge Donoghue, para. 3; *Gautier* (n. 20), 206), 'interim losses' (e.g. *Huguenin* et al. (n. 26), 78), and 'damage to natural resources' (e.g. *Edward H. P. Brans*, Liability for Damage to Public Natural Resources (2001)). Although there are different understandings as to the types, scope and valuation of damage, there appears to be coherence in that certain forms of environmental harm neither materialize in traditional heads of damage nor can be restored by mitigation and restoration measures.

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I. Compensability of 'Pure' Environmental Damage

According to Article 36(2) ARSIWA, compensation only covers damage that is 'financially assessable'. As damage to the environment *per se* is, in many cases, not financially assessable without having recourse to artificial valuation techniques, it has been contended that such pure environmental damage was not eligible for compensation.[101]

1. The Practice of International Liability Treaties

A number of international instruments expressly exclude compensation for pure environmental damage. For instance, most conventions on operator civil liability for hazardous activities provide that compensation for impairment of the environment is limited to costs of reasonable measures of prevention or reinstatement actually undertaken or to be undertaken.[102] Similarly, the IOPC Funds also exclude compensation for interim loss of ecological services (e.g. access to beaches), as it constitutes 'damage in respect of which the quantum of the damage cannot be assessed according

101 Cf. *Joachim Wolf*, Gibt es im Völkerrecht einen einheitlichen Schadensbegriff?, 49 (1989) ZaöRV 403, 429–432; UNCC, Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of "F4" Claims, UN Doc. S/AC.26/2005/10 (2005), para. 46; *Phoebe N. Okowa*, State Responsibility for Transboundary Air Pollution in International Law (2000), 178; *Tullio Scovazzi*, Some Remarks on International Responsibility in the Field of Environmental Protection, in: Maurizio Ragazzi (ed.), International Responsibility Today (2005) 209, 221; also see *Lefeber* (n. 60), 136–138; *Lucas Bergkamp*, Liability and Environment (2001), 332–338; *Boyle* (n. 8), 24; *Förster* (n. 98), 176; *Payne* (n. 42), 737; *Schmitt* (n. 41), 387.

102 See, e.g., 1992 Oil Pollution Convention (n. 19), Article 1(6); 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, Article 1(6) and (7); Bunker Oil Convention (n. 6), Article 1(9); Lugano Convention on Civil Liability (n. 4), Article II(7)(c) and (d); 1997 Vienna Convention on Civil Liability for Nuclear Damage (n. 6), Article 1(1)(k); CRTD (n. 6), Article 1(10); HNS Convention (n. 19), Article 1(6)(c) and (d); Basel Protocol on Liability for Hazardous Wastes (n. 6), Article II(2)(c)(iv) and (v); Kiev Liability Protocol (n. 6), Article II(2)(d)(iv); see *Sand* (n. 42), 247; *Gautier* (n. 20), 185.

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to market price'.[103] By the same token, they reject valuation methods based on 'theoretical models'.[104]

In contrast, other treaties expressly provide for liability for pure environmental damage that cannot be, or has not been, restored. For instance, under the 1988 *Convention on the Regulation of Antarctic Mineral Resource Activities* (CRAMRA), a state can be held liable for 'damage to the Antarctic environment […] including payment in the event that there has been no restoration to the *status quo ante*'.[105] Although the Convention never entered into force, the idea of providing for liability in the event that no response measures were taken was not abandoned. The 2005 *Liability Annex* to the Antarctic Treaty's Protocol on Environmental Protection provides that when no response action was taken in an environmental emergency, the responsible operator shall be liable to pay to an international fund the 'costs of response action which should have been undertaken'.[106] Moreover, the *Nagoya – Kuala Lumpur Supplementary Protocol*[107] and the European Union's *Environmental Liability Directive*[108] provide that damage to the environment that cannot be restored shall be compensated by improving or preserving other components of the environment.[109]

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103 IOPC Funds (n. 46), para. 1.4.12; also see IOPC Funds, Guidelines for Presenting Claims for Environmental Damage, As approved by the 1992 Fund Assembly and Supplementary Fund Assembly in October 2017 (2018), para. 5.24; *Brans* (n. 100), 324–326.

104 IOPC Funds (n. 46), paras 1.4.13; also see IOPC Funds (n. 103), para. 5.25; but see *Schmitt* (n. 41), 389–393, who shows that national courts have indeed awarded compensation for pure environmental damage in cases of oil pollution damage.

105 CRAMRA (n. 4), Article VII(2)(a).

106 Antarctic Liability Annex (n. 6), Article VI(2). During the negotiations of the Annex, it was highly controversial whether liability should go beyond providing for response action to environmental emergencies, see *Mari Skåre*, Liability Annex or Annexes to the Environmental Protocol: A Review of the Process Within the Antarctic Treaty System, in: Davor Vidas (ed.), Implementing the Environmental Protection Regime for the Antarctic (2000) 163, 177; *David J. Bederman/Soniya P. Keskar*, Antarctic Environmental Liability : The Stockholm Annex and Beyond, 19 (2005) Emory International Law Review 1383, 1387–1389.

107 Cf. Supplementary Protocol (n. 19), Article 2(2)(d)(ii)(b), which provides for restoration by 'replacing the loss of biological diversity with other components of biological diversity for the same, or for another type of use either at the same or, as appropriate, at an alternative location'. See chapter 6, section C.I.

108 Cf. EU Environmental Liability Directive (n. 5), Annex II, para. 1.1.2 and 1.1.3.

109 See *infra* section B.II.1.

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2. The Stance of the International Law Commission

In Article 31(2) of its *Articles on State Responsibility*, the International Law Commission concluded that reparation for an internationally wrongful act must be made for 'any damage, whether material or moral'. According to Article 36(2), compensation shall cover 'any financially assessable damage'. In its commentary, the ILC clarified that the criterion 'financially assessable' was only intended to exclude compensation for 'moral damage'.[110] Moreover, the ILC recognized that

> *'[…] environmental damage will often extend beyond that which can be readily quantified in terms of clean-up costs or property devaluation. Damage to such environmental values (biodiversity, amenity, etc – sometimes referred to as 'non-use values') is, as a matter of principle no less real and compensable than damage to property, though it may be difficult to quantify'.*[111]

The ILC has also confirmed the compensability of environmental damage in its *Draft Principles on Allocation of Loss*.[112] According to Principle 2, the term 'damage' expressly includes 'loss or damage by impairment of the environment'.[113] In its commentary, the ILC clarified that this not only encompasses 'loss of income deriving from an economic interest in any use of the environment', but also aspects of the environment that are considered to be common property (*res communis omnium*).[114] Moreover, the ILC found it 'important to emphasize that damage to the environment *per se* could constitute damage subject to prompt and adequate compensation'.[115]

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110 The ILC furthermore clarified that such moral injury 'is the subject matter of satisfaction', dealt with in Article 37 ARSIWA, cf. ARSIWA (n. 17), Commentary to Article 36, para. 1; see chapter 9, section B.II.3.c).

111 *Ibid.*, Article 36, para. 15.

112 See Chapter 8, section A.

113 ILC, Allocation of Loss Principles (n. 4), Principle 2(a)(iii).

114 *Ibid.*, Commentary to Principle 2, paras. 13–14; see 'Res communis (omnium)', in *Fellmeth/Horwitz* (n. 26), 250.

115 ILC, Allocation of Loss Principles (n. 4), Commentary to Principle 3, para. 6.

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3. Compensability of Environmental Damage in the United Nations Compensation Commission

The compensability of pure environmental damage was also recognized by the *United Nations Security Council*. With respect to the substantial environmental damage caused by Iraq's 'unlawful invasion and occupation of Kuwait' in 1990 and 1991, the Security Council decided that Iraq was

> *'liable under international law for any direct loss, damage, including environmental damage and the depletion of natural resources […]'.*[116]

To implement Iraq's liability, the Security Council established the aforementioned *United Nations Claims Commission* (UNCC), which was mandated to evaluate claims and award compensation from a dedicated fund created from a fixed percentage of Iraq's oil export revenues.[117] The claims for compensation for environmental damage were assessed by a dedicated panel of Commissioners (commonly referred to as the 'environmental panel').[118]

With regard to the loss of environmental resources that are not 'traded in the market' and thus have no commercial value, Iraq had argued that such damage was not financially assessable and therefore not eligible for compensation.[119] Although the UNCC's environmental panel recognized the 'inherent difficulties in attempting to place a monetary value on dam-

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116 UNSC Resolution 687 (1991) (n. 49), para. 16.

117 UNSC, Resolution 692 (1991). Iraq-Kuwait (20 May 1991), UN Doc. S/RES/692(1991). For an overview of the UNCC and its handling of environmental claims, see *Gautier* (n. 20); *Payne* (n. 42); *Sands* et al. (n. 2), 755–760. The Commission concluded the processing of claims in 2005, and there is only one claim that has not been paid in full, which was for production and sales losses as a result of damages to Kuwait's oil-field assets, see UNCC, UNCC at a Glance, available at: https://uncc.ch/uncc-glance (last accessed 28 May 2022).

118 The UNCC's environmental panel is sometimes also referred to as the 'F4 panel', as environmental claims were assigned the category 'F4' in the UNCC's organization of work; see *Gautier* (n. 20), 187; *Payne* (n. 42), 727. Also see UNCC Governing Council Decision 7 (n. 20), para. 35, which provided a non-exclusive list of compensable losses and expenses resulting from environmental damage and the depletion of natural resources caused by Iraq's invasion and occupation of Kuwait. For a general account of the UNCC's work, see *Dražen Petrović*, Other Specific Regimes of Responsibility: The UN Compensation Commission, in: James Crawford/Alain Pellet/Simon Olleson (eds.), The Law of International Responsibility (2010) 849, 849–859.

119 UNCC Panel Report F4/5 (2005) (n. 101), para. 46.

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aged natural resources, particularly resources that are not traded on the market',[120] it held that

> '*[…] there is no justification for the contention that general international law precludes compensation for pure environmental damage.*'[121]

In the panel's view, the exclusion of compensation for pure environmental damage in the aforementioned civil liability conventions[122] did not justify the assertion that international law generally prohibits compensation for such damage, especially where the damage results from an internationally wrongful act.[123] The panel also held that compensation is not excluded when the impairment of the environment is only temporary, although the panel recognized that this might affect the *nature and quantum* of compensation.[124] However, the panel acknowledged that 'international law does not prescribe any specific and exclusive methods of measurement for awards of damages for internationally wrongful acts by states'.[125] Consequently, it held that international courts and tribunals were 'entitled and required' to rely on general principles when evaluating environmental damage and determining appropriate compensation.[126]

4. Compensation of Environmental Damage Before the International Court of Justice (Case of Costa Riva v. Nicaragua)

The matter of compensation for pure environmental damage was also addressed by the ICJ in its judgment on compensation in the *Certain Activities* case between Costa Rica and Nicaragua in 2018.[127] The case

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120 *Ibid.*, para. 81.
121 *Ibid.*, para. 58; see *Payne* (n. 42), 737.
122 See *supra* section B.I.1.
123 UNCC Panel Report F4/5 (2005) (n. 101), para. 58.
124 *Ibid.*, para. 56.
125 *Ibid.*, para. 80.
126 *Ibid.*
127 ICJ, Certain Activities (Compensation) (n. 13); 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; *Rudall* (n. 84); *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 entitled to 'compensation for the damage sustained as a result of the diversion of the Danube',

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concerned a territorial dispute between both states, in which Nicaragua had, *inter alia*, excavated three channels in the disputed wetland area.[128] In an earlier judgment on the merits, the ICJ had already ruled that Costa Rica had sovereignty over the disputed territory, that Nicaragua's activities in the territory were illegal and that Nicaragua was therefore obliged to compensate Costa Rica for material damages caused by those activities.[129] After both parties were unable to reach an agreement on the amount of compensation payable by Nicaragua, the ICJ was requested to settle the question of compensation in a separate judgment.[130]

Before considering the different heads of damage claimed in the case before it, the Court reiterated a number of principles on state responsibility it had already established in previous cases. In particular, it recalled the obligation to make full reparation for the damage caused by a wrongful act[131] and that reparation may be an appropriate form of reparation, especially where restitution is 'materially impossible or unduly burdensome'.[132] The Court also pointed out that in order to award compensation, it must be determined 'whether there is a sufficiently direct and certain causal nexus between the wrongful act […] and the injury suffered by the Applicant'.[133]

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although the Court did not specifically indicate that this included reparation for purely environmental damage, cf. ICJ, Gabčíkovo-Nagymaros Project (Hungary v. Slovakia), Judgment of 25 September 1997, ICJ Rep. 7, paras. 151–152; see *Sands* et al. (n. 2), 754.

128 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.

129 Cf. ICJ, Certain Activities/Construction of a Road (Merits) (n. 54), para. 229.

130 ICJ, Certain Activities (Compensation) (n. 13), para. 11.

131 *Ibid.*, paras. 29–30, quoting PCIJ, Factory at Chorzów (Germany v. Poland) (n. 28), 47 and citing, *inter alia*, ICJ, Ahmadou Sadio Diallo (Republic of Guinea v. Democratic Republic of the Congo), Merits Judgment of 30 November 2010, ICJ Rep. 639, para. 161 and ICJ, Gabčíkovo-Nagymaros (n. 127), para. 150.

132 ICJ, Certain Activities (Compensation) (n. 13), para. 31, citing ICJ, Pulp Mills on the River Uruguay (Argentina v. Uruguay), Judgment of 20 April 2010, ICJ Rep. 14, para. 273.

133 ICJ, Certain Activities (Compensation) (n. 13), para. 32 (ellipses in the original), quoting ICJ, Ahmadou Sadio Diallo (Republic of Guinea v. Democratic Republic of the Congo), Judgment on Compensation of 19 June 2012, ICJ Rep. 324, para. 14.

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Moreover, the Court pointed to the principle that 'it is for the party which alleges a particular fact in support of its claims to prove the existence of that fact', although 'this general rule may be applied flexibly in certain circumstances, where, for example, the respondent may be in a better position to establish certain facts'.[134]

The Court then addressed the application of these principles to cases of environmental damage. It first recognized the likely difficulties to prove the existence of damage and causation in these cases:

> *'In cases of alleged environmental damage, particular issues may arise with respect to the existence of damage and causation. The damage may be due to several concurrent causes, or the state of science regarding the causal link between the wrongful act and the damage may be uncertain. These are difficulties that must be addressed as and when they arise in light of the facts of the case at hand and the evidence presented to the Court.'*[135]

The Court then recalled that 'the absence of adequate evidence as to the extent of material damage will not, in all situations, preclude an award of compensation.'[136] It also pointed to the *Diallo* case, where it had relied on 'equitable considerations' to determine the amount of compensation,[137] and the *Trail Smelter* award, in which it was held that difficulties in ascertaining the amount of compensation for a certain injury with certainty should not preclude the compensability of such injury.[138]

The ICJ noted that it had not previously adjudicated a claim for compensation for environmental damage. However, it found that

> *'[…] it is consistent with the principles of international law governing the consequences of internationally wrongful acts, including the principle of full reparation, to hold that compensation is due for damage caused*

134 ICJ, Certain Activities (Compensation) (n. 13), para. 32, quoting ICJ, Diallo (Compensation) (n. 133), paras. 54–56.

135 ICJ, Certain Activities (Compensation) (n. 13), para. 34.

136 *Ibid.*, para. 35.

137 *Ibid.*, see ICJ, Diallo (Compensation) (n. 133), para. 33.

138 ICJ, Certain Activities (Compensation) (n. 13), para. 35; see Trail Smelter Case, Decision of 1941 (n. 60), 1920 quoting United States Supreme Court, Story Parchment Company v. Paterson Parchment Paper Company, 1931, 282 United States Rep. 555, 563, where it was held that: 'Where the tort itself is of such a nature as to preclude the ascertainment of the amount of damages with certainty, it would be a perversion of fundamental principles of justice to deny all relief to the injured person, and thereby relieve the wrongdoer from making any amend for his acts.'

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> *to the environment, in and of itself, in addition to the expenses incurred by an injured State as a consequence of such damage. […] The Court is therefore of the view that damage to the environment, and the consequent impairment or loss of the ability of the environment to provide goods and services, is compensable under international law. Such compensation may include indemnification for the impairment or loss of environmental goods and services in the period prior to recovery […].*'[139]

Hence, the Court clearly confirmed that damage to the environment *per se* is subject to compensation under the law of state responsibility.[140]

5. Conclusions

In 1996, *Lefeber* concluded that 'compensation of harm to the environment is not entirely unknown in international law, but is has certainly not become common practice'.[141] Given the more recent instances of international legal practice analysed above, it can be assumed that such a 'common practice' has now emerged and that the compensability of damage to the environment *per se* has become part of customary international law.[142] The only notable deviations from this principle can be found in a number of international conventions on the civil liability of operators

139 ICJ, Certain Activities (Compensation) (n. 13), paras. 41–42.

140 The Court also addressed the more controversial issue of valuation of environmental damage, i.e. how to express environmental damage in monetary terms. The Court's elaborations on these issues are assessed separately below, see *supra* section B.III.

141 *Lefeber* (n. 60), 138; citing *Andrea Bianchi*, Environmental Harm Resulting from the Use of Nuclear Power Sources in Outer Space: Some Remarks on State Responsibility and Liability, in: Francesco Francioni/Tullio Scovazzi (eds.), International Responsibility for Environmental Harm (1991) 231, 264; *Rudolf Dolzer*, Völkerrechtliche Verantwortlichkeit und Haftung für Umweltschäden, in: Rudolf Dolzer (ed.), Umweltschutz im Völkerrecht und Kollisionsrecht (1992) 195, 221. A similar stance was taken by *Scovazzi* (n. 101), 221.

142 Cf. Institut de Droit International, Responsibility and Liability Under International Law for Environmental Damage: Resolution Adopted on September 4, 1997, 37 ILM 1474, Article 25(1), noting that: 'The fact that environmental damage is irreparable or unquantifiable shall not result in exemption from compensation. An entity which causes environmental damage of an irreparable nature must not end up in a possibly more favorable condition than other entities causing damage that allows for quantification.' Also see *Schmitt* (n. 41), 395.

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engaged with hazardous activities or substances. However, most of these conventions – except those relating to oil pollution and nuclear damage – have never entered into force and thus are of limited value in documenting a relevant *opinio iuris* of states.[143] Nevertheless, as shown in the next section, there is still substantial disagreement about the means and methods to determine the 'nature and quantum' of compensation for damage to the environment *per se*.

II. Forms of Compensation for Damage to the Environment

In the previous section, it has been shown that damage to the environment *per* se is, in principle, compensable under international law. The question remains about how the amount of compensation for such damage shall be determined. As mentioned before, Article 36(2) ARSIWA provides that compensation shall cover 'any financially assessable damage'. Hence, compensation for environmental damage requires determining a monetary equivalent to such damage.

In international legal practice, two different approaches to this problem can be identified. The first approach relies on the costs of *compensatory restoration*, i.e. measures to offset the environmental injury by preserving or improving other elements of the environment (1.). Under the second approach, the value of the damage is established in monetary terms (2.). These approaches can be applied either singly or in combination, as required, to fully compensate for the injury.[144]

143 Of the instruments cited in section B.II.1 *supra*, only the 1992 Oil Pollution Convention (n. 19) and the Supplementary Protocol (n. 19) are in force. The other instruments, namely the Lugano Convention on Civil Liability (n. 4), the HNS Convention (n. 19), and the Basel Protocol on Liability for Hazardous Wastes (n. 6), have not yet entered into force and it seems unlikely that they will in the future; see *Jutta Brunnée*, Of Sense and Sensibility: Reflections on International Liability Regimes as Tools for Environmental Protection, 53 (2004) ICLQ 351.

144 See MacAlister Elliott and Partners Ltd/Economics for the Environment Consultancy Ltd, Study on the Valuation and Restoration of Damage to Natural Resources for the Purpose of Environmental Liability, Report for the European Commission, Directorate-General Environment, B4–3040/2000/265781/MAR/B3 (2001), 3.

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1. Compensatory Restoration

The most widely recognized approach to compensating temporary or permanent environmental damage is *compensatory restoration*.[145] Compensatory restoration must be distinguished from *primary restoration*, which refers to measures aimed at evaluating the damage, preventing further damage and restoring the impaired environment to its baseline condition.[146] In contrast, the purpose of compensatory restoration is to offset either the *temporary losses* that occur during the time until the environment has recovered or *permanent losses* in cases where the damage is irrecoverable and full restoration is impossible.[147] The idea behind compensatory restoration is to offset these losses by taking measures to preserve or improve other components of the environment capable of providing ecological services equivalent to those impaired or lost.[148] Ideally, these measures are adjusted to the type of environmental service lost or impaired and implemented as closely as possible to the site of the original injury.[149]

Usually, compensatory restoration projects are carried out by the injured state, while the responsible state must reimburse the related expenses as a form of compensation.[150] Hence, compensation for pure environmental damage is valued as the cost of environmental projects designed to offset the environmental loss suffered due to the internationally wrongful act.[151]

Compensatory restoration is recognized in many of the more recent international liability instruments. In the context of the present study, the most relevant example is the *Nagoya – Kuala Lumpur Supplementary Protocol*, which provides that when it is not possible to restore biological diversity to the condition that existed before the damage occurred (i.e., the *status quo ante*), the loss shall be compensated by

145 *Brans* (n. 100), 130–131; *Barboza* (n. 10), 139.
146 See *supra* section A.I.2.
147 MEP/eftec, Study on Valuation and Restoration (n. 144), 4.
148 See, e.g., EU Environmental Liability Directive (n. 5), Annex II; Oil Pollution Act, 15 C.cf. *Brans* (n. 100), 130; *Huguenin* et al. (n. 26), 78; also see *Sands/Stewart* (n. 86), 294.
149 *Huguenin* et al. (n. 26), 78.
150 See *supra* section A.I.2.
151 Cf. MEP/eftec, Study on Valuation and Restoration (n. 144), 47; *Payne* (n. 42), 737–738; *Sands* et al. (n. 2), 759.

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> *'replacing the loss of biological diversity with other components of biological diversity for the same, or for another type of use either at the same or, as appropriate, at an alternative location'.*[152]

Similarly, the *Environmental Liability Directive* of the European Union provides for 'complementary remediation' where the damaged natural resources or services cannot be restored to their baseline condition.[153] According to the Directive, complementary remediation shall provide a similar level of natural resources or services as would have been provided if the damaged site had been returned to its baseline condition.[154] When complementary remediation needs to be implemented at an alternative site, it should be geographically linked to the damaged site.[155] Compensatory restoration is also recognized in the environmental liability law of the United States, namely in the regulations on natural resource damage assessments under the *Comprehensive Environmental Response, Compensation, and Liability Act*[156] and the *Oil Pollution Act*.[157]

To determine appropriate projects capable of providing for compensatory restoration, methodologies such as *habitat equivalency analysis* (HEA) are frequently employed.[158] With HEA, the compensation is calculated by referring to the costs required to implement projects to establish or conserve habitats capable of providing ecological services similar to those lost.[159] Another approach is *resource equivalency analysis* (REA), which quantifies

152 Supplementary Protocol (n. 19), Article 2(2)(d)(ii)(b); see chapter 6, section C.I.
153 EU Environmental Liability Directive (n. 5), Annex II, para. 1.1.2.
154 *Ibid.*
155 *Ibid.*
156 Cf. United States Department of the Interior, Regulations on Natural Resource Damage Assessments Under CERCLA, 43 C.F.R. Part 11, §§ 11.14(a) and 11.83(c); see *Huguenin* et al. (n. 26), 71–72.
157 Cf. United States National Oceanic and Atmospheric Administration, Regulations on Natural Resource Damage Assessments Under the Oil Pollution Act, 15 C.F.R. Part 990, § 990.53(c)(2); see *Brans* (n. 100), 128–133; *Huguenin* et al. (n. 26), 72–73.
158 Cf. *Brans* (n. 100), 134–136; *Huguenin* et al. (n. 26), 78; *Sands* et al. (n. 2), 758; on the characteristics of equivalency analysis methods in an *ex post* context, see *Thomas C. Paul*, Substitution Costs, in: Patricia A. Champ/Kevin J. Boyle/Thomas C. Brown (eds.), A Primer on Nonmarket Valuation (2nd ed. 2017) 347, 370–376.
159 *Brans* (n. 100), 134–136.

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the injury by referring not to the affected habitat but to individual resources such as 'bird years' or the annual production of fish biomass.[160]

The HEA approach was accepted by the UNCC's environmental panel as an appropriate method for determining the nature and extent of compensatory restoration measures required to offset environmental damage.[161] While the panel acknowledged the difficulties inherent in using these valuation methodologies, it held these difficulties were no sufficient reason for 'a wholesale rejection of these methodologies, or for concluding that their use is contrary to international law principles'.[162] Subsequently, it awarded payments for several compensatory projects, including a cooperative management program for damaged rangeland reserves[163] and the establishment of marine and coastal preserves to compensate for coastal damage caused by oil spills.[164] At the same time, the panel held that merely hypothetical projects that were not actually feasible did not provide a reasonable basis for estimating monetary compensation.[165]

2. Monetary Valuation of Environmental Damage

Another approach to determining the amount of compensation for damage to the environment *per se* is to assign a monetary value to those elements of the environment that have been impaired or destroyed. The framework commonly used for describing the different types of economic value ascribed to natural resources is known as *Total Economic Value* (TEV).[166] TEV is based on the assumption that the total value of the envi-

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160 *Huguenin* et al. (n. 26), 78; see MEP/eftec, Study on Valuation and Restoration (n. 144), 42–43.

161 Cf. UNCC Panel Report F4/5 (2005) (n. 101), para. 73.

162 *Ibid.*, para. 81.

163 *Ibid.*, para. 363; cf. *Payne* (n. 42), 738.

164 See, e.g., UNCC Panel Report F4/5 (2005) (n. 101), paras. 446–455 and 630–635; see *Payne* (n. 42), 739; *Gautier* (n. 20), 199–200.

165 Cf. Cf. UNCC Panel Report F4/5 (2005) (n. 101), para. 362; in contrast, see UNCC Panel Report F4/5 (2005) (n. 101), para. 632 where the proposes compensatory project was held to be 'feasible, cost-effective and [to] pose a low risk of adverse impacts'. Also see *Huguenin* et al. (n. 26), 88.

166 See CBD Secretariat, An Exploration of Tools and Methodologies for Valuation of Biodiversity and Biodiversity Resources and Functions, CBD Technical Series No. 28 (2007), 11–12; *Kathleen Segerson*, Valuing Environmental Goods and Services: An Economic Perspective, in: Patricia A. Champ/Kevin J. Boyle/Thomas C. Brown (eds.), A Primer on Nonmarket Valuation (2nd ed. 2017) 1, 10–11;

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ronment is comprised of *use values* and *non-use values*. The term 'use value' denotes the human-derived value from direct or indirect use, interaction with, or reliance on, environmental resources and services. In contrast, a 'non-use value' attaches to the mere existence of a natural resource that is not used by humans.

To determine the value of the environment and the damage to it, economists have developed a wide range of different approaches.[167] These approaches can generally be categorized into market-based methods (a)) and non-market-based methods (b)). Where such valuation studies are not possible, existing values determined in comparable situations can be transferred to the present situation (c)). Another possible approach is to rely on the hypothetical costs of response measures that should have been undertaken (d)).

a) Valuation Based on Market Prices

The monetary value of environmental damage can be inferred from market prices if the injury directly or indirectly affects the commercial use of a natural resource. This may be the case where a natural resource is reduced in quality or quantity, or where the injury induces changes in the market price of the resource.[168] Moreover, impairment of environmental quality may also cause an increase in costs for using a natural resource or a reduction in yields.[169] For instance, the UNCC's environmental panel awarded compensation for reduced yields of agricultural crops based on the 'local

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DEFRA, An Introductory Guide to Valuing Ecosystem Services (2007), 29–35; *Unai Pascual* et al., The Economics of Valuing Ecosystem Services and Biodiversity, in: Pushpam Kumar (ed.), The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations (2010) 183, 192–196.

167 See *Nick Hanley*, The Economic Value of Environmental Damage, in: Michael Bowman/Alan E. Boyle (eds.), Environmental Damage in International and Comparative Law (2002) 27; *Pascual* et al. (n. 166); *Barry C. Field/Martha K. Field*, Environmental Economics (7th ed. 2017), 130–152; *Bartosz Bartkowski*, Economic Valuation of Biodiversity: An Interdisciplinary Conceptual Perspective (2017). Also see ISO, Monetary Valuation of Environmental Impacts and Related Environmental Aspects, ISO 14008:2019 (E) (2019).

168 CBD Secretariat (n. 166), 15; *Huguenin* et al. (n. 26), 79; *Sylvia Schwermer*, Annex A: Economic Valuation Methods, in: UBA (ed.), Economic Valuation of Environmental Damage (2012), 6–7; *Rudall* (n. 1), 97–98.

169 *Hanley* (n. 167), 29; CBD Secretariat (n. 166), 15; *Schwermer* (n. 168), 6–7.

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producer prices' determined by the *Food and Agriculture Organization of the United Nations*.[170]

Another approach refers to the costs incurred in replacing environmental goods and services (so-called 'replacement cost' approach).[171] Following this approach, the UNCC's environmental panel estimated the value of damaged rangelands based on the market price of fodder required to substitute the use of the rangeland for grazing during the relevant periods.[172] In addition, replacement costs may also be incurred in taking technical measures to replace lost environmental functions, such as the construction of dams where the environment has lost its natural capability to prevent flooding.[173] The *compensatory restoration* approach discussed above could be seen as a practical implementation of the replacement cost approach.[174]

With regard to genetic resources, it has been argued that the increasing use of these resources in pharmaceutical and agricultural research may allow us to determine their value by referring to economic valuation methods.[175] According to a different view, there are usually no comparable market values for the information contained in the wild gene pool, which has allegedly caused the global stock of genetic capital to be 'consistently undervalued'.[176]

b) Non-Market-Based Valuation Techniques

For many environmental goods and services, it is not possible to derive a monetary value directly or indirectly from market prices. In these situations, non-market-based valuation techniques must be used. Most of these techniques seek to determine the monetary value of a particular environment, or of particular goods or services provided by the environment, by referring to the prices that individuals are willing to pay to use or preserve them. Generally, these approaches are divided into *stated preference* and *revealed preference* methods.[177]

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170 Cf. UNCC Panel Report F4/5 (2005) (n. 101), paras. 114–115.
171 DEFRA (n. 166), 35.
172 Cf. UNCC Panel Report F4/5 (2005) (n. 101), para. 178; see *Gautier* (n. 20), 208.
173 Cf. CBD Secretariat (n. 166), 16–17; *Paul* (n. 158), 365–367.
174 *Paul* (n. 158), 368–370; see *supra* section B.II.1.
175 *Förster* (n. 98), 355.
176 *Field/Field* (n. 167), 380.
177 *Huguenin* et al. (n. 26), 79; *Rudall* (n. 1), 97–100.

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Revealed preference methods infer values from the actual behaviour of consumers in relation to an environmental good or amenity.[178] For instance, the *travel costs* approach assumes that the recreational value of a natural site or landscape (for instance, a beach or a nature park) is at least as high as the expenses that individuals make to enjoy that site (travel costs to the site, and admission cost, where applicable).[179] The impairment of a site or landscape is valued by the consequential reduction of these expenses, i.e. the money visitors would spend if they continued to visit the site.[180] An advanced version of the travel costs approach called *random utility modelling* also takes into account that individuals may switch to substitute sites when environmental damage occurs.[181]

Another revealed preference method is *hedonic pricing*, which seeks to identify statistical relationships between environmental quality levels and the price of marketed goods, especially in the housing market.[182] The underlying assumption is that the environmental quality in the area surrounding a real estate (e.g. air and water quality, noise, landscape quality, or biodiversity) is a pricing factor and that changes in the environmental quality will influence the market price of the real estate.[183] The value of environmental damage can thus be inferred from the consequential decrease in the price of goods which has a statistical relationship to environmental factors.[184]

Stated preference methods seek to establish the value that individuals ascribe to a particular natural resource or environmental resource.[185] The most common of these methods is *contingent valuation*,[186] which is based on surveys asking individuals about their maximum willingness to pay for preserving a particular environmental quality (such as biodiversity) or

178 *Segerson* (n. 166), 21; *Huguenin* et al. (n. 26), 79; *Rudall* (n. 1), 99.
179 See *George R. Parsons*, Travel Cost Models, in: Patricia A. Champ/Kevin J. Boyle/Thomas C. Brown (eds.), A Primer on Nonmarket Valuation (2nd ed. 2017) 187; *Rudall* (n. 1), 99.
180 *Schwermer* (n. 168), 12; *Hanley* (n. 167), 32.
181 *Hanley* (n. 167), 32; see *Parsons* (n. 179), 196–203.
182 *Hanley* (n. 167), 32; *Rudall* (n. 1), 100; see *Laura O. Taylor*, Hedonics, in: Patricia A. Champ/Kevin J. Boyle/Thomas C. Brown (eds.), A Primer on Nonmarket Valuation (2nd ed. 2017) 235.
183 Cf. *Hanley* (n. 167), 32–33; *Taylor* (n. 182), 236.
184 *Schwermer* (n. 168), 11.
185 *Huguenin* et al. (n. 26), 80.
186 See *Kevin J. Boyle*, Contingent Valuation in Practice, in: Patricia A. Champ/Kevin J. Boyle/Thomas C. Brown (eds.), A Primer on Nonmarket Valuation (2nd ed. 2017) 83.

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the minimum compensation they would accept for the loss of a particular environmental quality.[187] The reliability of contingent valuation studies is controversial, as they cannot reflect multidimensional changes in environmental quality related to the interdependence of different species and the complexity of ecosystems.[188] Moreover, spiritual and emotional factors can significantly influence the resulting values, which may lead to differing valuations depending on whether the value of an environmental good is assessed in an industrialized society or a local indigenous society.[189] A technique closely related to contingent valuation that seeks to mitigate these weaknesses is the *choice experiment* or *conjoint analysis* method. According to this method, environmental goods are valued by comparing specified alternatives which the respondents are asked to sort in their order of preference.[190]

Although non-market valuation techniques are frequently employed in environmental economics, they have only rarely been relied upon in legal practice on compensation for environmental damage.[191] In the claims procedure following Iraq's invasion and occupation of Kuwait in 1990, the UNCC rejected the use of non-market valuation approaches on several occasions. Concerning the lost recreational use of beaches, the UNCC's environmental panel refused to award funding for travel costs surveys, arguing that they were 'unlikely to produce reliable data', especially since more than ten years had already elapsed since Iraq's invasion of Kuwait.[192] Subsequently, the panel rejected a claim for compensation based on contingent valuation surveys because it found that the claimant's data did not provide 'a sufficiently reliable basis for estimating the value of any lost recreational opportunities'.[193]

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187 *Hanley* (n. 167), 31.

188 Cf. *Bergkamp* (n. 101), 339–342; *Förster* (n. 98), 357; CBD Secretariat (n. 166), 18; *Schwermer* (n. 168), 16; *Boyle* (n. 186), 119–120.

189 *Förster* (n. 98), 358.

190 *Schwermer* (n. 168), 17; *Thomas P. Holmes* et al., Choice Experiments, in: Patricia A. Champ/Kevin J. Boyle/Thomas C. Brown (eds.), A Primer on Nonmarket Valuation (2nd ed. 2017) 133.

191 See *Brian D. Israel* et al., Legal Obstacles for Contingent Valuation Methods in Environmental Litigation, in: Kenneth Train/Daniel McFadden (eds.), Contingent Valuation of Environmental Goods: A Comprehensive Critique (2017) 292, 296–303.

192 UNCC Panel Report F4/1 (2001) (n. 42), paras. 444–450, 584–587.

193 UNCC Panel Report F4/5 (2005) (n. 101), paras. 457–465; see *Sand* (n. 42), 247.

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c) Benefit (Or Value) Transfer Method

When primary valuation studies are not possible or feasible in a specific situation, the *benefit transfer* (or *value transfer)* approach may be used.[194] This refers to using pre-existing valuation data gathered elsewhere and adjusting them to accord with the situation under investigation.[195] A prerequisite for performing a benefit transfer is that primary studies are available that value a sufficiently comparable environmental asset.[196] A number of online databases contain numerous valuation studies that could be used as sources for benefit transfers.[197]

Critically, the accuracy and reliability of benefit transfers depend on the similarity of the environmental and economic context of the original research.[198] Moreover, the transfer must be capable of adapting the available data to the local conditions. There are various methods that differ both in the input needed for transferring the data as well as regarding their theoretical plausibility.[199] While the benefit transfer method is comparatively quick and easy to apply, there are also considerable disadvantages concerning the validity and reliability of the results.[200] Errors may result from both the original measurement and the transfer process.[201]

d) Costs for 'Hypothetical' Response Measures

Finally, a special valuation technique could be seen in relying on the hypothetical costs of response measures that were not undertaken but should have been. As noted above, this approach is followed by the *Antarctic*

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194 See *Randall S. Rosenberger/John B. Loomis*, Benefit Transfer, in: Patricia A. Champ/Kevin J. Boyle/Thomas C. Brown (eds.), A Primer on Nonmarket Valuation (2nd ed. 2017) 431; *Rudall* (n. 1), 100–101.

195 *Huguenin* et al. (n. 26), 80; *Schwermer* (n. 168), 19; *Hanley* (n. 167), 34; DEFRA (n. 166), 38–39.

196 *Schwermer* (n. 168), 19; *Huguenin* et al. (n. 26), 80.

197 *Schwermer* (n. 168), 21. See, for instance, Environment and Climate Change Canada, Environmental Valuation Reference Inventory, available at: https://www.evri.ca/en (last accessed 28 May 2022), which contains over 4,000 summaries of valuation studies.

198 *Huguenin* et al. (n. 26), 80.

199 *Schwermer* (n. 168), 19–20.

200 *Ibid.*, 19–21; *Hanley* (n. 167), 36–37.

201 *Rosenberger/Loomis* (n. 194), 454.

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Liability Annex.[202] Similar schemes seem to exist in a few national jurisdictions such as Argentina and Mexico.[203]

This approach is particularly valuable in cases of damage to 'global commons' such as global biodiversity or the environment in areas beyond national jurisdiction. In these situations, neither compensatory restoration nor monetary valuation according to any of the techniques above may be feasible. However, if it is possible to identify response measures that could have effectively mitigated the damage had they been implemented in time,[204] it seems justifiable to rely on the hypothetical costs of such measures. In the absence of an injured party, such payments could be directed to relevant international institutions, such as the CBD's *Global Environmental Facility*.[205]

3. Conclusions

The preceding sections have shown that there are numerous approaches to determining the monetary value of damage to the environment and its components. While some of these have already been referred to in international legal practice, international law so far does neither seem to prescribe any particular technique nor contain general rules on which rule to apply in which circumstances.[206]

It should, however, be noted that the aforementioned approaches also have significant shortcomings. The most significant difficulty relates to the interdependence of ecosystems and the services they provide. Due to this interdependence, injury to one ecosystem component (such as a species or habitat) may well affect other components or services. However, valuation approaches necessarily look at the environment from pre-defined angles and are mostly focused on specific components of the environment. For this reason, a monetary valuation may not easily reflect damage to other

202 Cf. Antarctic Liability Annex (n. 6), Article VI(2); see *supra* section B.I.1.

203 Cf. Synthesis Report on Article 14(2) CBD (n. 86), paras. 66–67.

204 On the potential challenges on establishing the costs of hypothetical response action, see *Silja Vöneky*, The Liability Annex to the Protocol on Environmental Protection to the Antarctic Treaty, in: Doris König/Peter-Tobias Stoll et al. (eds.), International Law Today: New Challenges and the Need for Reform? (2008) 165, 185–186.

205 See chapter 9, section C.I.2.b).

206 UNCC Panel Report F4/5 (2005) (n. 101), para. 80; ICJ, Certain Activities (Compensation) (n. 13), para. 52.

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ecosystem components or services that are not in the focus of the particular approach employed.[207] Moreover, non-market valuation techniques are criticized for being anthropocentric. As laid out above, most of these techniques attempt to determine the value of an environmental asset by assessing the stated or revealed willingness of a target group to pay for this asset. It has been argued that by focusing on human satisfaction, these approaches underestimate the economic value of the ecosystem, especially concerning systemic features that have no direct value but are still essential to maintain the overall functioning of an ecosystem.[208] On the other hand, non-anthropocentric values of nature do not easily fit into economic models and are thus impossible to estimate in monetary terms (e.g. the mere fact of the loss of an extinct species).[209]

In any event, it is important to see that the monetary valuation of environmental damage is independent of the costs for clean-up or restoration measures incurred after an incident. While the monetary value of environmental damage is based on market prices (for environmental goods traded on the market) or on replacement costs or public preferences (for goods and services that have no commercial value), the costs of response measures are primarily based on the technical options available. For this reason, the cost of restoration may well be greater than the value of the damage.[210] In these instances, it could be argued that claims for the restorations costs are excessive and that monetary compensation should prevail over reinstatement.[211] However, as can be seen from the work of the UNCC, the ILC, and pertinent international treaties, the current international legal practice appears to prefer primary and compensatory restoration over mere monetary compensation. Thus, there is no clear indication that claims for restoration measures are generally rejected if they exceed the market and non-market values of the affected environment.

207 DEFRA (n. 166), 41.
208 *Hanley* (n. 167), 33.
209 *Ibid.*
210 MEP/eftec, Study on Valuation and Restoration (n. 144), 3.
211 *Ibid.*, 47.

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III. Case Study: Valuation of Environmental Damage in the 'Certain Activities' Case Before the ICJ

In its judgment on compensation in the *Certain Activities* case between Costa Rica and Nicaragua, the ICJ addressed the issue of compensation for environmental damage in-depth for the first time.[212] As mentioned above, the Court confirmed that the law of state responsibility provides for compensation for damage to the environment 'in and of itself'.[213] In principle, this view was shared by the parties to the dispute.[214] However, the parties substantially disagreed on which method should be used to value the damage and thus quantify the amount of compensation payable by Nicaragua. Costa Rica, for its part, submitted an 'eco-system services approach' (1.). On the other hand, Nicaragua invoked a 'replacement costs approach' (2.) and, in the alternative, presented a 'corrected analysis' based on Costa Rica's proposal (3.). The Court eventually developed its own method, which it called 'overall assessment' (4.).

1. Costa Rica's 'Ecosystem Services Approach'

Costa Rica submitted that the damage should be valued according to principles of environmental economics.[215] To this end, Costa Rica identified six categories of 'ecosystem goods and services' provided by the affected environment prior to Nicaragua's actions.[216] With regard to the value of standing timber, it applied available market prices.[217] For the other goods and services, Costa Rica proposed determining the monetary value by applying the *value transfer approach*, i.e. by referring to studies determin-

212 ICJ, Certain Activities (Compensation) (n. 13).
213 *Ibid.*, para. 41; see *supra* section B.I.4.
214 *Ibid.*
215 Memorial of Costa Rica on Compensation (n. 32), 32–36. The memorial largely relies on a study by *Fundación Neotrópica*, a Costa Rican environmental NGO, which can be found in Annex 1 to Costa Rica's memorial.
216 *Ibid.*, 32. The ecosystem goods and services which Costa Rica referred to in its valuation were standing timber, other raw materials (namely, fibre and energy), gas regulation, natural hazards mitigation, soil formation and erosion control, and biodiversity, in terms of habitat and nursery, see ICJ, Certain Activities (Compensation) (n. 13), para. 55. For the Court's assessment of these heads of damage, see ICJ, Certain Activities (Compensation) (n. 13), paras. 60–71.
217 Memorial of Costa Rica on Compensation (n. 32), 134, see *supra* section B.II.2.a).

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ing the value of such services in purportedly comparable ecosystems and adjusting these values to the present situation.[218] In its submission, Costa Rica assumed that the affected area would require at least 50 years to recover[219] and claimed a total compensation for environmental damage of approximately USD 2.88 million.[220]

2. Nicaragua's 'Replacement Costs Approach'

Nicaragua strictly rejected the valuation approach used by Costa Rica, arguing that it was 'not consistent with accepted practice in the field of natural resource damage assessment'.[221] Moreover, it invoked that the UNCC had declined to accept this approach.[222] Instead, Nicaragua submitted a 'replacement costs approach', under which the amount of compensation should correspond to the (hypothetical) costs to preserve an equivalent area until the environmental services provided by the impacted area had recovered.[223] To determine this price, Nicaragua referred to the amounts which Costa Rica pays to landowners and communities for conserving habitats under its domestic environmental conservation scheme.[224] Based on this amount (adjusted to 2017 prices), specifically USD 309 per hectare per year, and assuming that the period until full recovery of the affected area would be 20 to 30 years, Nicaragua concluded that the replacement costs would be a maximum of approximately USD 35,000.[225] Notably, Nicaragua did not suggest that the funds should actually be used to preserve equivalent areas but proposed its approach as a mere valuation

218 *Ibid.*, 32; see supra section B.II.2.c).
219 *Ibid.*, 33.
220 *Ibid.*, 34.
221 ICJ, Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica V. Nicaragua): Counter-Memorial of the Republic of Nicaragua on Compensation (2017), 43.
222 ICJ, Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica V. Nicaragua): Rejoinder of the Republic of Nicaragua on Compensation (2017), 10.
223 The exact amount claimed was USD 2,880,745.82, cf. ICJ, Certain Activities (Compensation) (n. 13), para. 49.
224 Counter-Memorial of Nicaragua on Compensation (n. 221), 61–62.
225 The exact maximum amount Nicaragua was willing to pay was USD 34,987, cf. *ibid.*

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technique. Hence, the approach resembles the aforementioned approach of referring to the costs of 'hypothetical' restoration measures.[226]

3. Nicaragua's 'Corrected Analysis'

Besides proposing its own valuation method, Nicaragua also alleged that Costa Rica had applied the ecosystem services approach incorrectly and in a way that led to a 'dramatic overvaluation' of the damage.[227] In the event that the Court nevertheless considered the approach to be appropriate, Nicaragua presented a 'corrected analysis' that made significant adjustments to Costa Rica's calculation, in particular by recognizing only four instead of six heads of damage (namely timber, other raw material, gas regulation, and biodiversity).[228] Under Nicaragua's corrected analysis, the monetary value of the damage, if calculated according to Costa Rica's approach, amounted to approximately USD 85,000,[229] which is less than 3 % of the amount claimed by Costa Rica.

4. The Court's Judgment: 'Overall Assessment' of Environmental Damage

In its judgment, the ICJ acknowledged that the valuation methods proposed by both parties are 'sometimes used for environmental damage valuation in the practice of national and international bodies'.[230] However, the Court saw no need to choose between these methods or use one of them exclusively. In its view,

> *'international law does not prescribe any specific method of valuation for the purposes of compensation for environmental damage'.*[231]

Instead, the Court stressed the need to take account of the specific circumstances and characteristics of each case, which it saw best catered for by referring to certain elements of either method where they would provide a reasonable basis for valuation.[232]

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226 See *supra* section B.II.2.d).
227 Counter-Memorial of Nicaragua on Compensation (n. 221), 47.
228 *Ibid.*, 125–135.
229 The exact amount was USD 83,296; cf. *ibid.*, 135.
230 ICJ, Certain Activities (Compensation) (n. 13), para. 52.
231 *Ibid.*
232 *Ibid.*

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Before assigning a monetary value to the damage caused by Nicaragua, the Court first assessed the existence of damage. In doing so, it found that two of the categories of environmental goods and services submitted by Costa Rica (namely, damage to natural hazards mitigation as well as soil formation and erosion control) were not sufficiently supported by the evidence before the Court.[233] Moreover, the Court expressed doubts regarding the reliability of certain aspects of Costa Rica's valuation methodology.[234] On the other hand, it also rejected Nicaragua's 'replacement costs approach', as compensation for environmental damage could not be based on the general incentive paid to particular individuals or groups to manage a habitat.[235]

According to the ICJ, the valuation of environmental damage must be approached 'from the perspective of the ecosystem as a whole' rather than by attributing valuations to specific categories of environmental goods and services with different recovery periods each.[236] The Court found these needs to be best catered for in an 'overall valuation' of the damage.[237] In its view, an overall valuation could best account for the correlation between the removal of trees in the area concerned – which the Court found to be the most significant damage – and the harm caused to other environmental goods and services.[238] Secondly, the Court held that an overall valuation was required because the affected area was a protected wetland where various environmental services were closely interlinked.[239] Thirdly, the Court believed that an overall valuation allowed it to take into account both the area's 'high capability for natural regeneration'[240] and the fact that, in the view of the Court, a single recovery period could not be established for all of the affected environmental goods and services.[241]

For the purposes of its overall evaluation, the ICJ essentially adopted Nicaragua's 'corrected analysis'.[242] Although the Court found that this analysis had underestimated the value of certain categories,[243] it held that

233 *Ibid.*, paras. 74–75.
234 *Ibid.*, para. 76.
235 *Ibid.*, para. 77.
236 *Ibid.*, para. 78.
237 *Ibid.*
238 *Ibid.*, para. 79.
239 *Ibid.*, para. 80.
240 *Ibid.*, para. 81.
241 *Ibid.*, para. 82.
242 Cf. *ibid.*, para. 85; see *Rudall* (n. 1), 28.
243 ICJ, Certain Activities (Compensation) (n. 13), para. 85.

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these shortcomings could be accounted for by making an adjustment to the overall sum.[244] Without giving further explanations on the nature or calculation of these adjustments, the Court then concluded that Costa Rica was entitled to a total of USD 120,000 for the impairment of the environment in the period prior to recovery.[245]

5. Assessment

The judgment is notable because it explicitly recognizes the compensability of damage to the environment itself, in terms of the ability of the environment to provide 'environmental goods and services', regardless of any loss suffered by a particular person or community.[246] Moreover, the Court's statement that international law does not prescribe any specific valuation method for environmental damage[247] can be seen as an important clarification of the state of development of international law in this context.

Nevertheless, the judgment has also attracted criticism, including for its focus on monetary compensation as the only applicable form of reparation.[248] In fact, restitution was only very briefly addressed at the beginning of the judgment's text, and only to clarify that compensation 'may be an appropriate form of reparation, particularly in those cases where restitution is materially impossible or unduly burdensome'.[249] However, whether restitution was indeed unviable was not further assessed by the Court. It seems like this narrow approach was already predetermined by the Court's merits judgment of 2015,[250] in which it had ruled that 'Costa Rica is entitled to receive *compensation* for the material damage' caused by Nicaragua's actions.[251] Nevertheless, judge *Cançado Trindade* argued in his separate opinion to the judgment on compensation that the Court's outlook should

244 *Ibid.*, para. 86.
245 *Ibid.*, para. 87.
246 *Young* (n. 127), 40; *Rudall* (n. 84), 291.
247 ICJ, Certain Activities (Compensation) (n. 13), para. 52.
248 Cf. *ibid.*, Separate Opinion of Judge Cançado Trindade; *Kévine Kindji/Michael G. Faure*, Assessing Reparation of Environmental Damage by the ICJ: A Lost Opportunity?, 57 (2019) QIL 5, 24–25.
249 ICJ, Certain Activities (Compensation) (n. 13), para. 31.
250 *Kindji/Faure* (n. 248), 24.
251 Cf. ICJ, Certain Activities/Construction of a Road (Merits) (n. 54), paras. 142 and 229(5)(a) (emphasis added).

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have been much wider, also encompassing the consideration of restoration measures and different forms of reparation besides compensation.[252] In his view, any compensation awarded for environmental damage should be used for restoration measures.[253] However, the Court did not make any statement that Costa Rica would be bound to use the compensation for any specific purposes, leaving Costa Rica at liberty to use the funds as it deemed fit.

Even assuming that compensation was the appropriate form of reparation in the case at hand, the ICJ's determination of the amount of compensation is highly questionable. By awarding USD 120,000, the Court granted about 40 % more than what Nicaragua had proposed in its 'corrected analysis' but only 4 % of what Costa Rica had claimed in its original calculation. This shows the enormous discrepancy between the valuations presented by the parties to the dispute. Nevertheless, the Court gave no detailed explanation or justification on how it reached the amount of USD 120,000.[254] In other words, the Court went more or less straight from declaring that it would undertake an overall assessment to announcing its result.[255]

On closer inspection, the Court's reasoning with regard to the 'overall approach' appears contradictory. At first, the Court justified its adoption of an overall assessment with the need to consider the ecosystem as a whole, rather than attributing values to specific categories of environmental goods and services, and estimating recovery periods for each of them.[256] In the next step, however, the Court did just that by basing its further assessment on Nicaragua's itemized 'corrected analysis', which proposed to evaluate the overall damage by referring to only four categories of environmental goods and services.[257] Thus, although the Court claimed to look at the bigger picture, it was in fact only watching some of the brush strokes.[258]

Subsequently, the Court then explained in detail why it found that the corrected analysis underestimated the value of three out of the four cat-

252 ICJ, Certain Activities (Compensation) (n. 13), Separate Opinion of Judge Cançado Trindade, para. 2.
253 *Ibid.*, Separate opinion of Judge Cançado Trindade, para. 55.
254 *Kindji/Faure* (n. 248), 26–27.
255 *Sendut* (n. 127), 22.
256 Cf. ICJ, Certain Activities (Compensation) (n. 13), para. 78.
257 Cf. *ibid.*, para. 84.
258 This view is shared, *inter alia*, by *ibid.*, Dissenting Opinion of Judge ad hoc Dugard, para. 15.

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egories of goods and services.[259] It had already indicated that it considered the removal of trees to be the most significant damage out of the four categories.[260] All of this suggested that the Court would explain how the values assigned to the individual categories of goods and services would need to be adjusted in order to reflect the actual damage.[261] But the Court just went straight to announcing the final sum without giving any further explanation.[262] The Court's reasoning in this respect is rather opaque.

After all, it may be questioned whether the Courts 'overall approach' is an evidence-based valuation method or rather an exercise of judicial discretion. Tellingly, to justify its result on the amount of compensation, the Court stated that

> *'the absence of certainty as to the extent of damage does not necessarily preclude it from awarding an amount that it considers approximately to reflect the value of the impairment or loss of environmental goods and services.'*[263]

The first part of this sentence refers to the *Trail Smelter* award already quoted earlier in the judgment,[264] in which the tribunal concluded that uncertainty in the ascertainment of the amount of damages should not preclude the compensability of injury.[265] It also refers indirectly to the ICJ's judgment on compensation in the *Diallo* case. In that case, the Court had awarded, *inter alia*, compensation for the loss of personal property.[266] As the value of the lost items could no longer be established, the Court had relied on 'equitable considerations' to determine the amount of compensation, arguing that other courts, including the *European Court of Human Rights* and the *Inter-American Court of Human Rights*, had followed the same approach where warranted.[267]

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259 Cf. *ibid.*, para. 85.
260 *Ibid.*, para. 79.
261 *Rudall* (n. 84), 292–293.
262 Cf. ICJ, Certain Activities (Compensation) (n. 13), para. 86.
263 *Ibid.*
264 Cf. *ibid.*, para. 35.
265 Cf. Trail Smelter Case, Decision of 1941 (n. 60), 1920; see *supra* n. 138 and accompanying text.
266 Cf. ICJ, Diallo (Compensation) (n. 133), para. 29.
267 *Ibid.*, para. 33 quoting ECtHR, Lupsa v. Romania, Judgment of 08 June 2006, Application no. 10337/04, paras. 70–72; and IACtHR, Chaparro Álvarez and Lapo Íñiguez v. Ecuador, Judgment of 21 November 2007, IACtHR Ser. C, No. 170, paras. 240 and 242.

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It appears that the ICJ has, although without admitting it, relied on considerations of equity to determine the amount of compensation.[268] It could even be argued that by referring to the *Diallo* case, the ICJ has transferred a principle originating in international human rights law[269] to the field of international environmental responsibility: Where compensation is due but cannot be quantified by relying on facts, judges may rely on 'equitable considerations', i.e. determine the amount of compensation at their own discretion.[270] Interestingly, this development was already anticipated in 1997 by the *Institut de Droit International*, which declared that 'equitable assessment and other criteria developed under international conventions and by decisions of tribunals should also be considered' in the development of regimes on environmental responsibility and liability.[271] Nevertheless, it remains unclear why the ICJ 'did not clearly state that it reached its decision on quantum based on equitable considerations'.[272] At the same time, the reliance on equitable considerations doubtlessly engages normative principles.[273] For instance, in the human rights context, compensation is determined by referring to the seriousness of the violation, the applicant's position (such as age, social status or contributory

268 ICJ, Certain Activities (Compensation) (n. 13), Dissenting Opinion of Judge ad hoc Dugard, para. 29.

269 On the use of equity in determining compensation for human rights violations by international human rights bodies, see *Szilvia Altwicker-Hámori* et al., Measuring Violations of Human Rights, 76 (2016) ZaöRV 1, 15–21; International Commission of Jurists, The Right to a Remedy and Reparation for Gross Human Rights Violations: A Practitioners' Guide, Revised Edition (2018), 181–189.

270 See ICJ, Certain Activities (Compensation) (n. 13), Dissenting Opinion of Judge ad hoc Dugard, para. 20.

271 IDI, Resolution on Responsibility and Liability for Environmental Damage (n. 142), Article 24. Also see *Sands/Stewart* (n. 86), 294, who suggested that instead of relying on economic methodologies to determine the loss caused by environmental injury in particular cases, 'judges or members of an administrative tribunal could use their best judgment to assign a monetary value to environmental damage on a case-by-case basis'.

272 ICJ, Certain Activities (Compensation) (n. 13), Separate Opinion of Judge Bhandari, para. 11, who argued that the Court 'could have been more explicit concerning its approach to determining the quantum of compensation, with particular regard to equitable considerations in cases in which the available evidence is not adequate as to the exact amount to be awarded to an injured State' (*ibid.*, para. 12); a similar view was taken by Judge Cançado Trindade (*ibid.*, para. 47), who argued that the Court was 'far more assertive as to the considerations of equity' in the Diallo case and 'could and should have been as forward-looking' in the present case.

273 *Sendut* (n. 127), 24.

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negligence) and the overall context in which the breach occurred (such as the local economic circumstances).[274] Therefore, the reference to equitable considerations should not be used to 'mask judicial decisions untethered to any attempt at objective quantification of damage'.[275]

After all, the Court's refusal to justify how its overall approach led to the adoption of the (rather limited) amount of USD 120,000, and its reference to equitable considerations, may lead to important components of environmental losses being overlooked when the overall approach is applied in future disputes.[276] In sum, it is therefore doubtful whether the ICJ's judgment can serve as a precedent in future cases on the question of how compensation for damage to the environment shall be quantified.[277] While it is to be welcomed that the ICJ has not committed itself to any particular valuation method (as it depends on the circumstances of each case which method is appropriate), it is regrettable that the Court failed to give any explanation on how it reached its result. For this reason, it has rightfully been pointed out that the judgment provides 'no authoritative touchstone for other international courts or tribunals dealing with similar issues'.[278]

C. *Summary*

It is now generally accepted that damage to the environment constitutes a category of damage for which reparation must be served under international law. This includes at least the costs incurred by the injured state in assessing the damage, preventing further injury and restoring the environment to its *status quo ante*,[279] provided that the measures taken are appropriate and reasonable in light of the circumstances of the case and the state of science.[280] Compensation is generally served by reimbursing the affected state for the expenses incurred in implementing these measures.[281] These

274 See, with references to the jurisprudence of the European Court of Human Rights, *Altwicker-Hámori* et al. (n. 269), 15–21.
275 *Sendut* (n. 127), 24.
276 Cf. *Kindji/Faure* (n. 248), 27.
277 Cf. *Rudall* (n. 84), 292.
278 *Ibid.*; see *Rudall* (n. 1), 30.
279 See *supra* section A.I.
280 See *supra* section A.II.
281 See *supra* section A.I.2.

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principles apply to all types of environmental damage, including potential transboundary damage caused by products of biotechnology.

Compensation must also be made for 'damage to the environment *per se*', i.e. temporary or permanent impairments of the environment. While international law appears to favour restoration over the mere payment of monetary compensation,[282] payment of financial compensation is an accepted remedy for damage that cannot be restored.[283]

The impairment of environmental goods and services that are commercial assets, such as timber or agricultural productivity, is usually compensated according to the market value of those assets.[284] While it is generally recognized that reparation must also be served for injury to elements of the environment that have no (clear) economic value, it is controversial how the type and quantum of such reparation shall be determined. One approach is *compensatory restoration*, which refers to measures aimed at preserving or improving elements of the environment equivalent to those injured.[285] Other approaches seek to establish a monetary value of the impaired environmental goods and services by referring to *non-market valuation techniques*.[286] However, these techniques are being criticized as anthropocentric and unable to capture complex ecosystem interdependencies and long-term effects.[287] These difficulties become greater the more complex and widespread the damage is.

After all, international practice has not yet yielded a generally accepted technique for determining the form and quantum of compensation for environmental damage. Thus, cases of transboundary damage caused by self-spreading biotechnology will not only entail difficult legal and evidentiary questions about causation but also concerning the proof and valuation of the damage. The ICJ's first judgment on the issue has provided little clarity because its 'overall valuation' approach appears to be mainly based on judicial discretion.[288] Thus, there is currently no clear way to quantify compensation for damage caused by the application of self-spreading biotechnology, especially when damage is caused to common goods and values such as global biodiversity.

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282 *Kindji/Faure* (n. 248), 16; Synthesis Report on Article 14(2) CBD (n. 86), para. 59.
283 See *supra* section B.I.
284 See *supra* section B.II.2.a).
285 See *supra* section B.II.1.
286 See *supra* section B.II.2.b).
287 *Hanley* (n. 167), 33; see *supra* section B.II.3.
288 See *supra* section B.III.5.

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