Part II:

Legal basis for climate change responsibility and liability

A. International aspects

Climate change responsibility and liability in international law

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Abstract

With its widespread and varied impacts, climate change is one of the most significant and increasingly pressing concerns of the international community in the 21st century. Despite being an acute global issue, the inherent political and economic implications mean there has been little progress towards effectively addressing it at the international level. The reluctance of many source states to meaningfully cut their greenhouse gas emissions is out of step with the dire reality of climate change-induced extreme weather events and slow onset events. This global failure raises questions regarding the international responsibility and liability of source states, with the answers, unfortunately, being complex and riddled by legal uncertainty. With its transnational, intergenerational and cumulative dimensions, climate change poses unique challenges when being addressed using the traditional rules associated with international responsibility and liability.

1 Introduction

An innumerable number of biogenic organisms produce greenhouse gas emissions and thereby contribute to climate change.[1] However, human beings have become particularly problematic in this regard as our growing population coupled with activities such as burning fossil fuels, increased meat consumption and changing natural landscapes into human landscapes, has greatly accelerated climate change. The advent of the Industrial Revolution opened the door for certain legal persons to make the emission of greenhouse gases a source of profit. These 'Carbon Majors', the most prominent of which are fossil fuel corporations such as Chevron, ExxonMobil, Saudi Aramco, British Petroleum, Gazprom, Royal Dutch Shell and the National Iranian Oil Company, have together produced almost one-fifth (18.7%) of all carbon dioxide with an industrial origin that has been released into the atmosphere since the dawn of the Industrial Revolution in the 18th century.[2] Regarding the historical contribution

1 Natural systems such as forest fires, oceans, wetlands, permafrost, volcanoes, mud volcanoes and earthquakes generate greenhouse gas emissions, see Xi-Liu Yue and Qing-Xian Gao, 'Contributions of natural systems and human activity to greenhouse gas emissions' (2018) 9 Advances in Climate Change Research 243.

2 Richard Heede, 'Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854-2010' (2014) 122 Climatic Change 229, 237.

to the current climate crisis, the largest national contributors are the United States of America (25%), the member states of the European Union taken together (22%), China (12.7%), Russia (6%) and Japan (4%).[3] However, none of these leading emitters is solely responsible for climate change. Rather, the cumulative emission of man-made greenhouse gases from every country around the globe over the last 270 years has inexorably led to the warming of the planet's climate, which is resulting in increasingly severe extreme weather events ranging from heatwaves, droughts and wildfires through to heavy rain with its associated flooding and erosion as well as slow onset events such as rising sea levels and desertification.[4] Many of the countries and populations that are most vulnerable to climate change are also the ones who have historically contributed very little to the increased concentration of greenhouse gases in the earth's atmosphere. Clearly, the multitude of actors, the diversity in the scope and type of emissions that have little regard for national borders and the multi-generational period involved all pose exceptional challenges for traditional international law to effectively address and combat the highly complex climate change issue.

The legal status of the atmosphere is that of an international resource that all states can legitimately use, but that cannot be appropriated by any individual state.[5] The fact that the atmosphere is open for legitimate use by all states is what has led to its gradual pollution and degradation. For almost 270 years, states have been able and allowed to introduce substances into the atmosphere that alter its composition, especially by actively promoting, or even subsidising, the unrestrained production and consumption of fossil fuels. Given the far-reaching political and economic interests attached to the emission of greenhouse gases, it has proven difficult to impose binding legal obligations on states to reduce anthropogenic emissions from their territories in order to avert the looming climate change catastrophe. However, states can no longer claim that greenhouse gas emissions are a purely domestic concern since climate change and its adverse effects have been recognised as 'a common concern

3 Our World in Data, 'Who has contributed most to global CO_2 emissions? Cumulative carbon dioxide emissions over the period from 1751 to 2017' <https://ourworldindata.org/uploads/2019/10/Cumulative-CO2-treemap.png> accessed 7 January 2022.

4 Ove Hoegh-Guldberg et al., 'Impacts of 1.5ºC global warming on natural and human systems' in Valérie Masson-Delmotte et al. (eds), *Global warming of 1.5ºC. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* (IPCC 2019) 175, 254.

5 ILC, 'First report on the protection of the atmosphere' (5 May to 6 June and 7 July to 8 August 2014) UN Doc A/CN.4/667, para 86, 90; the atmosphere as an air mass has to be distinguished from the airspace above a state's territory which falls under the sovereign jurisdiction and control of the given state.

of humankind'[6]. When a state largely disregards this common concern and instead places its national interests above all else, it becomes necessary to assign responsibility and liability for such a state's contribution to climate change. Even though the adverse effects of climate change are already causing significant and irreversible damage, states have proven unwilling to assign responsibility or liability against each other because, as the saying goes, 'birds of a feather stick together'.[7]

2 The relevance of an effective responsibility and liability regime for environmental protection

While responsibility and liability primarily aim at compensating victims for damage that has already occurred, they are also said to have a preventive function by deterring actors from causing environmental degradation in the first place.[8] This function is based on an economic analysis of law in the sense that when a potential polluter is confronted with the costs of its actions in the form of responsibility or liability claims, it will exercise a certain level of care to reduce or avoid environmental damage.[9] However, the capacity of liability to incentivise environmentally-sound behaviour is not undisputed, especially for environmental damage to a global commons such as the atmosphere. Some authors contest the meaningful existence of such an incentive since they have found no empirical evidence on the international level to

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6 Preamble, first paragraph, of the United Nations Framework Convention on Climate Change (adopted 9 May 1992, entered into force 21 March 1994) 1771 UNTS 107 (UNFCCC); repeated in the preamble, eleventh paragraph, of the Paris Agreement to the UNFCCC (adopted 12 December 2015, entered into force 4 November 2016) TIAS No 16-1104; for the concept of the common concern of humankind see amongst many Frank Biermann, 'Common concern of humankind: The emergence of a new concept of environmental law' (1996) 34 Archiv des Völkerrechts 426-481; Dinah Shelton, 'Common concern of humanity' (2009) 1 Iustum Aequum Salutare 33-40; Friedrich Soltau, 'Common concern of humankind' in Kevin R. Gray, Richard Tarasofsky and Cinnamon Carlarne (eds), *Oxford Handbook of international climate change law* (Oxford University Press 2016) 202-212.

7 One of the few outliers is Tuvalu whose then Prime Minister Koloa Talake threatened to bring a claim for compensation against several industrialised countries, including the United States and Australia, before international courts in 2002. However, such a claim was never brought, see Hannah Stallard, 'Turning up the heat on Tuvalu: An assessment of potential compensation for climate change damage in accordance with states responsibility under international law' (2009) 15 Canterbury Law Review 163.

8 For the deterring effect of reparations see Dinah Shelton, 'Righting wrongs: Reparations in the articles on state responsibility' (2002) 96 American Journal of International Law 833, 844; on liability see Michael G. Faure and Andre Nollkaemper, 'International liability as an instrument to prevent and compensate for climate change' (2007) 43 Stanford Journal of International Law 123, 139-142.

9 The classic work on this subject is by Steven Shavell, *Economic analysis of accident law* (Harvard University Press 1987).

substantiate the claim that liability regimes have a deterring or preventive function.[10] Settling the above issue may come down to one key factor, namely, that for responsibility and liability to have an effective deterrent effect requires them to be underpinned by supportive judgments. The International Court of Justice (ICJ) took a step in that direction in the *Certain Activities* case by recognising for the first time that compensation is due for damage caused to the environment. The ICJ ruled that the impairment or loss of the ability of the environment to provide goods and services is compensable under international law[11] and, therefore, the ICJ awarded Costa Rica US$120,000 for damage caused by Nicaragua's wrongful activities.[12] However, while international law recognising that compensation is due for ecological damage is welcome, the value of the environment in the *Certain Activities* case seems to have been significantly underestimated. Thus, the deterrent effect of the judgment can be called into question.

3 Some remarks on terminology: responsibility and liability

Considerable ambiguity exists in connection with the two legal terms 'responsibility' and 'liability' with the topic occupying scholars for many years and resulting in a considerable body of literature.[13] The distinction between responsibility and liability in international law commonly used today can be traced back to the International Law Commission (ILC) and its work on the codification of the principles of international law governing state responsibility. This effort culminated in the Articles on the Responsibility of States for Internationally Wrongful Acts (ASR), which represent customary international law in large part. According to this work of the ILC, responsibility traditionally arises for internationally wrongful acts and involves the obligation to make amends for such wrongful acts, for example, in the form of financial

10 Rüdiger Wolfrum, 'Means of ensuring compliance with and enforcement of international and environmental law' (1998) 272 Recueil des Cours de l'Académie de Droit International 78; Robin R. Churchill, 'Facilitating (transnational) civil liability litigation for environmental damage by means of treaties: Progress, problems, and prospects' (2001) Yearbook of International Environmental Law 3, 39; Jutta Brunnée, 'Of sense and sensibility: Reflections on international liability regimes as tools for environmental protection' (2004) 53 The International and Comparative Law Quarterly 351, 366.

11 ICJ, *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v Nicaragua)* (Compensation owed by the Republic of Nicaragua to the Republic of Costa Rica) (2018) ICJ Rep 15, paras 41 and 42 (hereinafter *Certain Activities*).

12 ICJ, *Certain Activities*, para 86.

13 The two fundamental works on this topic are by Pierre-Marie Dupuy, *La responsabilité internationale des États pour les dommages d'origine technologique et industrielle* (Editions A. Pedone 1977) and Rene Lefeber, *Transboundary environmental interference and the origin of state liability* (Kluwer Law International 1997).

reparation.[14] Liability, on the other hand, denotes a duty to pay monetary compensation for damage resulting from activities not necessarily prohibited by international law.[15] This international law understanding should be borne in mind as in domestic law 'liability' is often regarded as a synonym for 'responsibility'.[16] The conceptual distinction between responsibility and liability introduced by the ILC, while still facing some valid criticism in academia[17], has gradually been espoused in the international sphere. The two terms overlap insofar as they both cover an obligation to make financial reparation and monetary compensation respectively, illustrating that a strict conceptual distinction between responsibility and liability is not only open to challenge with respect to the general usage of both terms in domestic law, it also wrongly conveys the impression of a clear boundary between state responsibility and state liability.

In this chapter, and in conformity with international usage, the denomination 'responsibility' is used to denote the legal consequences of an internationally wrongful act, which consists, *inter alia*, of the obligation to redress any damage incurred (Article 36 ASR). For all other situations concerning the duty to make a monetary reparation, this contribution uses the term 'liability'.

4 International responsibility for contributions to climate change

Any consideration on the international responsibility of states for their contribution to climate change necessarily starts with the search for an international obligation not to contribute to climate change. If such an international obligation exists, its breach will trigger – as a rule – the international responsibility of the wrongdoer (Article 1 ASR). The legal consequence of this responsibility is, first and foremost, the duty to cease the internationally wrongful activity (Article 30 ASR),[18] which would be a

14 See Arts 1 and 28ff ASR; ILC, 'Report of the International Law Commission on the work of its 53rd Session' (23 April to 1 June and 2 July to 10 August 2001) UN Doc A/56/10, 25.

15 ILC, 'Report of the International Law Commission on the Work of its 21st session' (2 June to 8 August 1969) UN Doc A/7610/Rev1, para 83.

16 ILC, 'Preliminary Report of SR Quentin-Baxter on international liability for injurious consequences arising out of acts not prohibited by international law' (1990) UN Doc A/CN.334, para 12.

17 Ian Brownlie, *System of the law of nations, state responsibility, Part I* (Clarendon Press 1983) 50; Michael B. Akehurst, 'International liability for injurious consequences arising out of acts not prohibited by international law' (1985) 16 Netherlands Yearbook of International Law 3, 8; Alan E. Boyle, 'State responsibility and international liability for injuries consequences of acts not prohibited by international law: A necessary distinction' (1990) 39 International and Comparative Law Quarterly 1; Louise de la Fayette, 'The ILC and international liability: A commentary' (1997) 6 Review of European, Comparative and International Environmental Law 322, 323.

18 UNGA Res 56/83 (12 December 2001) UN Doc A/RES/56/83, Annex.

major step towards the goal of curbing greenhouse gas emissions. That said, the issue of state responsibility and climate change is a difficult pairing with no straightforward arguments and clear-cut solutions.[19]

4.1 State responsibility for the breach of the no-harm rule

One of the few universally accepted environmental obligations under customary international law is the no-harm rule. The origins of this rule can be traced back to the 1941 *Trail Smelter* award[20], a landmark decision that highlighted for the first time the limits of a state's sovereign rights to allow any form of environmentally significant activities with cross-border impacts on its territory. It is this one sentence in the 90-page award that fundamentally changed the legal landscape of international environmental law:

> (U)nder the principles of international law (…) no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.[21]

Subsequent to this award, the no-harm rule has been incorporated into various policy documents, the most important of which are Principle 21 of the 1972 Stockholm Declaration[22] and Principle 2 of the 1992 Rio Declaration[23], as well as in a number of key multilateral environmental treaties, such as the preamble of the UNFCCC in the 8th recital. Today, it is widely recognised that states are duty-bound to prevent, reduce and control the risk of environmental harm to other states and – according to the ICJ[24] – to areas beyond national jurisdiction (i.e., global commons).[25] This general rule readily applies to greenhouse gas emissions as they do not deviate much from the traditional concept of transboundary pollution, such as the toxic fumes caused by the Canadian smelter near the border to the United States in the *Trail Smelter* case.

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19 Malgosia Fitzmaurice, 'Responsibility and climate change' (2010) 53 German Yearbook of International Law 89.

20 *Trail Smelter Case (US v Canada)* (1938 and 1941) 3 RIAA 1905-1982; amongst the wealth of academic writing see John E. Read, 'The Trail Smelter dispute' (1963) 1 Canadian Yearbook of International Law 213; Karin Mickelson, 'Rereading Trail Smelter' (1993) 31 Canadian Yearbook of International Law 219; Rebecca M. Bratspies and Russell A. Miller (eds), *Transboundary harm in international law: Lessons from the Trail Smelter arbitration* (Cambridge University Press 2006).

21 *Trail Smelter* Case, 1965.

22 'Stockholm Declaration' United Nations Conference on the Human Environment (Stockholm 5-16 June 1972) UN Doc A/CONF.48/14/Rev1.

23 'Rio Declaration' United Nations Conference on Environment and Development (Rio de Janeiro 3-14 June 1992) UN Doc A/CONF.151/26 (Vol.1).

24 ICJ, *Legality of the Use of Nuclear Weapons* (Advisory Opinion) (1996) ICJ Rep 226, para 29.

25 Alan Boyle and Catherine Redgwell, *Birnie, Boyle & Redgwell's International law and the environment* (4th edn, Oxford University Press 2021) 159-170.

Leaving issues such as proportionate causation aside at this point, there is no doubt that the aggregated result of greenhouse gas emissions has, does and will continue to inflict harm on the global commons (e.g., ocean acidification) and all state territories to a greater or lesser extent. Although perhaps not immediately apparent in the *Trail Smelter* case because of its specifics, it is important to note that the geographical distance between the emitting state and the affected territory or common good is of no consequence under the no-harm rule. In the day and age of global spaces, it is well accepted that the concept of 'transboundary' harm can encompass any case where environmentally harmful behaviour has effects outside the source state's jurisdiction, including further afield than geographic neighbours.[26]

The state's preventive environmental obligation consists of two subcomponents, i.e., procedural obligations (e.g., notification duties) and substantive obligations (e.g., prohibiting emissions), only the latter will be discussed here.[27] The obligations imposed on source states require such states to act with due diligence at all times, which means that its authorities have to exercise the appropriate amount of care to assuage any risks of transboundary harm and take action when necessary. The ICJ does not treat due diligence as a one-size-fits-all standard under international law but applies a primary-rule specific due diligence standard.[28] Consequently, the environmentally focused ICJ cases provide unique insights into the understanding of the international standard of care under the environmental preventative duty. In *Pulp Mills*, the ICJ noted that particular care is required when implementing obligations in the field of environmental protection due to the irreversibility of some environmental harm, i.e., the due diligence standard becomes more demanding in relation to the scale and permanence of the expected harm.[29] This customised approach is further highlighted by the fact that a source state is required to use 'all means at its disposal', which underlines that the standard of care required is context-specific concerning both the transboundary environmental risk and the actual capacities of the state concerned. If a source state acted diligently, it is not responsible for any transboundary environmental harm as its obligation under the prevention principle is based on conduct rather than result. However, a source state can only be deemed to have been negli-

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26 ILC, 'Report of the International Law Commission on the work of its 53rd session (23 April-1 June and 2 July-10 August 2001) UN Doc A/56/10, Article 2 (c).

27 On the content of procedural obligations and the consequences of their breach see Jutta Brunée, 'International environmental law and community interests, procedural aspects' in Eyal Benvenisti and Georg Nolte (eds), *Community interest across international law* (Oxford University Press 2018) 151; idem, 'Harm prevention' in Lavanya Rajamani and Jacqueline Peel (eds), *The Oxford handbook of international environmental law* (2nd edn, Oxford University Press 2021) 269, 275-276.

28 Neil MacDonald, 'The role of due diligence in international law' (2019) 68 International & Comparative Law Quarterly 1041, 1045.

29 ICJ, *Pulp Mills on the River Uruguay* (Argentina v Uruguay) (2010) ICJ Rep 14, paras 185-187 (hereinafter *Pulp Mills*).

gent regarding the substantive dimension of the preventive obligation[30] if environmental harm outside of its territory has occurred. Consequently, a source state is not internationally responsible for any flagrant lack of environmental action if no environmental harm outside of its territory can be causally connected to this inaction.[31]

There is little doubt that each and every source state has the necessary knowledge base to be aware of the harmful consequences of its greenhouse gas emissions, even though it has no definitive knowledge of its exact contribution to any specific environmental harm linked to its emissions. If one takes the view that such definitive knowledge is both unattainable and not required, which is what the ICJ judgment in *Corfu Channel*[32] suggests,[33] the limited capacities of many states remain the key variable in the context of due diligence.[34] That said, both industrialised and industrialising source states, patently the largest greenhouse gas emitters, to a greater or lesser extent, have the capacity to replace fossil-fuel-based technologies and force changes upon climate-damaging industries to adopt sustainable alternatives. However, what remains a major obstacle to establishing a breach of the no-harm rule is the causal link between the unfettered emission of greenhouse gases and transboundary environmental harm. In this context, the environmental harm under consideration is not climate change *per se* but rather the environmental damage caused by climate change-related extreme weather or slow onset events. This means that climate change-induced environmental harm is 'indirect damage', i.e., it does not result directly and immediately from a specific instance or source of greenhouse gas emissions but rather is the remote consequence of combined emissions. Another issue is that the environmental harm is caused by the (in)activity of multiple source states and the greenhouse gas emissions of each source state individually are not sufficient for the specific environmental harm to occur (*conditio sine qua non,* what is at times referred to as the 'but-for' test).[35] Assigning responsibility under such circumstances

30 Note that responsibility for the violation of procedural obligations under the no-harm rule does not require the occurrence of environmental harm, see ICJ, *Pulp Mills*, paras 78-79.

31 ICJ, *Pulp Mills*, para 265; *Certain Activities*, para 217; *Application of the Convention on the Prevention and Punishment of the Crime of Genocide* (Bosnia and Herzegovina v Serbia and Montenegro) (2007) ICJ Rep 43, para 431 (hereinafter Bosnian Genocide).

32 ICJ, *Corfu Channel Case (UK v Albania)* (Merits) (1949) ICJ Rep 4, at 18.

33 See Christina Voigt, 'State responsibility for climate change damages' (2008) 77 Nordic Journal of International Law 1, 12.

34 On the differentiation between states based on their capabilities in regard to climate change see Christina Voigt and Felipe Ferreira, '"Dynamic differentiation": The principles of CBDR-RC, progression and highest possible ambition in the Paris Agreement' (2016) 5 Transnational Environmental Law 285-303.

35 The test asks, 'but for the existence of X, would Y have occurred?'. The issue here is *causation in fact*, because the no-harm rule requires the occurrence of transboundary environmental damage that can be linked to the source state's failure to diligently act ('but-for'). A separate issue is the *causation in law*, which links the breach of the no-harm rule to the injury for the purpose of reparation or compensation, see Ilias Plakokefalos, 'Causation in the law of state

is even further complicated under international law as rules of causation that provide a satisfactory answer to multiple non-linear causes contributing to environmental harm have yet to be developed. Academic writing attempts to fill this void by suggesting, *inter alia,* that causation only requires a *pro rata* contribution by the source states to the environmental harm (a so-called necessary element of a sufficient-set test).[36] It is difficult to foresee whether the ICJ will embrace this approach. If one looks beyond the climate change paradigm for a moment, a prediction on the ICJ's future course may be made based on the *Bosnian Genocide* case. In this case, the Court had to decide whether Serbia had breached its duty to prevent the genocide in Srebrenica, which is in at least one aspect comparable to the no-harm rule – it is an obligation of conduct. The Court found that 'responsibility is however incurred if the State manifestly failed to take all measures to prevent genocide which were within its power, *and which might have contributed to preventing the genocide.*'[37] Translating this stance to climate-induced environmental damage, a source state cannot argue that it does not have to act in light of the assumption that even an immediate halt to its greenhouse gas emissions would in any conceivable way stop or slow down the harmful effects of climate change. If the Court's stance mirrors that taken regarding genocide, then it will likely deem that cutting greenhouse gas emissions contributes to global efforts to prevent climate change and source states are obliged to act. Even if climate change has gone beyond the tipping point for the damage-limitation goals already set irrespective of where global emission levels are, each individual source state's efforts regarding emission reduction will nevertheless contribute to mitigating further harm. Despite this rather optimistic possibility, the fact that no state affected by climate change has currently instituted legal proceedings before the ICJ or any other international tribunal says a lot about the procedural[38] and substantive obstacles that stand in the way of the no-harm rule being upheld in an international courtroom.[39]

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responsibility and the problem of overdetermination: In search of clarity' (2015) 26 European Journal of International Law 471, 478.

36 Ilias Plakokefalos, 'Causation in the law of state responsibility and the problem of overdetermination: In search of clarity' (2015) 26 European Journal of International Law 471, 477.

37 ICJ, *Bosnian Genocide*, para 430 (emphasis here).

38 Under the Monetary Gold principle, the ICJ will deem a case between two disputant states as inadmissible if the legal interests of an absent third state (i.e., all other emitting states) would form 'the very subject-matter' of a merits decision, see Jefferi Hamzah Sendut, 'Inter-state climate change litigation and the monetary gold principle' (*Opinio Juris*, 5 January 2021) <https://opiniojuris.org/2021/01/05/inter-state-climate-change-litigation-and-the-monetary-gold-principle/> accessed 7 January 2022.

39 For an analysis of the possibility of proceedings before the ICJ see Margaretha Wewerinke-Singh, Julian Aguon and Julie Hunter, 'Bringing climate change before the International Court of Justice: Prospects for contentious cases and advisory opinions' in Ivano Alogna, Christine Bakker and Jean-Pierre Gauci (eds), *Climate change litigation: Global perspectives* (Brill 2021) 393-414.

4.2 State responsibility for non-compliance with obligations under the Paris Agreement

In view of the legal problems outlined above, it appears more promising to hold source states internationally responsible for their failure to achieve the greenhouse gas targets set in multinational environmental treaties. Naturally, this draws attention to the Paris Agreement to the UNFCCC that entered into force in 2016. Currently, 191 states have ratified the treaty, which makes the Paris Agreement one of the few virtually universal environmental agreements legally binding upon all its state parties. That said, the Paris Agreement is composed of both legally binding obligations and non-binding commitments. Under Article 4.2, the state parties are obligated to prepare, communicate and implement successive plans to achieve their nationally determined contribution to cutting greenhouse gas emissions. Whereas the actual *achievement* by a state party to reach its nationally determined goal is not compulsory, the duty of each state party to pursue domestic mitigation measures with the aim of achieving the promised goal is (second sentence of Article 4.2: 'shall').[40] Consequently, the failure of a state party to sufficiently cut its greenhouse gas emissions as promised does not trigger its international responsibility *vis-a-vis* the other state parties to the Paris Agreement.[41] If, however, a state party does not adopt any meaningful national mitigation measures or refuses to act, it is (arguably) in breach of the Paris Agreement. The uncertainty here is created by the views of some state parties regarding Article 4.2. However, a growing number of commentators maintain that this article in the Paris Agreement does indeed establish a legally binding obligation of conduct, irrespective of the eventual result.[42]

The question that needs answering then is whether the Paris Agreement is a so-called self-contained regime[43] that categorically precludes the application of the general rules of state responsibility in cases where state parties breach their obligation of conduct under the agreement. The answer to this question lies in the Paris Agreement itself, the interpretation of which must reveal the intention of state parties to not allow recourse to general responsibility rules outside of the agreement. The

40 Daniel Bodansky, 'The legal character of the Paris Agreement' (2016) 25 Review of European, Comparative and International Environmental Law 142, 146.

41 Peter Lawrence and Daryl Wong, 'Soft law in the Paris Climate Agreement: Strength or weakness?' (2016) 26 Review of European, Comparative and International Environmental Law 276; James Crawford, 'The current political discourse concerning international law' (2018) 81 Modern Law Review 1, 21.

42 Christina Voigt, 'The Paris Agreement: What Is the standard of conduct for parties?' (2016) 26 Questions of International Law 17; Benoit Mayer, 'Obligations of conduct in the international law on climate change: A defence' (2018) 27 Review of European, Comparative and International Environmental Law 130, 135.

43 Bruno Simma, 'Self-contained regimes' (1985) 16 Netherlands Yearbook of International Law 111, 117.

conclusion reached here is that this intent cannot be established: The mere fact that the Paris Agreement sets up an Implementation and Compliance Committee, which has been operative since June 2020, says nothing about the state parties' attitude towards general rules of responsibility. Even though the Committee was formed to enhance the effectiveness of the treaty, it is neither a dispute settlement mechanism nor tasked with enforcing the legally binding provisions of the Paris Agreement (Article 15.2: facilitative, transparent, non-adversarial, non-punitive). Central to the debate on the Paris Agreement's self-containment is Article 8, in which the parties recognise the importance of addressing loss and damage from the effects of climate change. This provision is qualified by paragraph 51 of the UNFCCC Conference of the Parties' Decision 1/CP.21 on the adoption of the Paris Agreement. According to paragraph 51, state parties have agreed that Article 8 of the Paris Agreement 'does not involve or provide any basis for any liability or compensation.'[44] There is no denying that the definitive language of paragraph 51 of Decision 1/CP.21 impacts the interpretation of Article 8 Paris Agreement because it is a relevant context within the meaning of Article 31 para 2 lit a Vienna Convention on the Law of Treaties[45] (VCLT). However, if one accepts that Article 8 of the Paris Agreement does not provide a proper legal basis for compensation claims, then one has to accept that neither paragraph 51 nor Article 8 say anything about claims based on a separate legal basis, i.e., general rules on state responsibility.[46] It follows that states affected by climate change (e.g., small, low-lying island states) can hold source states responsible for non-compliance with their obligations of conduct under Article 4.2 of the Paris Agreement and expose their pro-climate lip-service. It is an entirely different issue, though, whether any negligent source state is then obligated to compensate for climate-induced damage suffered by any claimant (Article 36 ASR). This brings us back to the causation issue discussed above: the obligation to compensate requires that the damage was *caused* by the internationally wrongful conduct. The *Bosnian Genocide* case illustrates that the ICJ applies two different causation standards depending on the issue at hand. The causation standard for establishing a breach of an obligation is less strict: a contribution to the injury suffered (i.e., genocide) suffices.[47]

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44 Decision 1/CP.21, Report of the Parties on its 21st session, Paris, 30 November to 11 December 2015, UN Doc. FCCC/CP/2015/10/Add.1 ('Adoption of the Paris Agreement'), 29 January 2016, para 51.

45 Vienna Convention on the Law of Treaties (adopted 22 May 1969, entered into force 27 January 1980) 1155 UNTS 331.

46 Linda Siegele, 'Loss and damage (Article 8)' in Daniel Klein et al. (eds), *The Paris Agreement on Climate Change: Analysis and commentary* (Oxford University Press 2017) 224, 232-233; Christina Voigt, 'International environmental responsibility and liability' in Lavanya Rajamani and Jacqueline Peel (eds), *Oxford Handbook of international environmental law* (2nd edn, Oxford University Press 2021) 1003, 1010; Elisa Calliari et al., 'Article 8 loss and damage' in Geert Van Calster and Leonie Reins (eds), *The Paris Agreement on Climate Change: A commentary* (Edward Elgar 2021) MN 8.28.

47 ICJ, *Bosnian Genocide*, para 430.

The causation standard concerning the obligation to make reparation is more demanding though.[48] In order to establish this causal link, the ICJ in *Bosnian Genocide* requires that the respondent's use of the means at its disposal would have sufficed to achieve the desired result, that is, no genocide would have occurred ('but-for' test).[49] In *Certain Activities*, which also concerned reparation, the ICJ was less strict and simply asked for 'a sufficient causal nexus between the wrongful act and the injury suffered'.[50] Even temporarily putting aside what 'sufficient' means in climate change cases, it is not a trivial matter to link a breach of obligations under the Paris Agreement, e.g., the persistent non-enforcement of domestic climate laws in a source state, with climate-induced damage, e.g., the destruction of an injured state's coastline by rising sea levels.

4.3 State responsibility for a breach of environmental human rights

International human rights law is a possibly more promising path towards establishing the international responsibility of a source state for its failure to reduce its greenhouse gas emissions sufficiently. By way of example, in 2005, a group of Inuits petitioned the Inter-American Commission of Human Rights alleging that the United States was in breach of its obligations under the American Declaration on the Rights and Duties of Man (1948). The petition cited the failure of the US to regulate its greenhouse gas emissions which, they claimed, were causing detrimental changes to their living conditions.[51] The petition was ultimately rejected[52], but it was successful in shifting the international focus to human rights litigation against source states. As such, in all likelihood, international human rights and their enforcement mechanisms will be increasingly used to force source states into making policy changes to address climate change.

There is no denying that climate change seriously impacts the enjoyment of human rights, not only for future generations but also for the present one.[53] With the

48 Ibid para 462.
49 Ibid.
50 Ibid para 34.
51 Inuit, Petition to the Inter-American Commission on Human Rights, Seeking Relief from Violations Resulting from Global Warming Caused by Acts and Omissions of the United States (7 December 2005) 103-4 <www.ciel.org/Publications/ICC_Petition_7Dec05.pdf> accessed 7 January 2022.
52 The IAHRCom decided that 'the information provided does not enable [the Commission] to determine whether the alleged facts would tend to characterise a violation of rights protected by the American Declaration [on the Rights and Duties of Man]' see Octavio Quirico, 'Climate change and state responsibility for human rights violations: Causation and imputation' (2018) 65 Netherlands International Law Review 185, 190.
53 On this issue see UNEP, *Climate change and human rights* (UNON Publishing Services Section 2015) 2-8.

effects of climate change becoming increasingly apparent, it is no longer a fanciful dystopian scenario that many areas of the world will experience diminished living conditions or become uninhabitable. Nevertheless, some climate change-related human rights complaints, such as the one initiated in 2020 by a group of Portuguese children and young adults against 33 state parties to the European Convention on Human Rights (ECHR), remain distinctively abstract in nature as they concern future health risks caused by accelerated climate change.[54] These anticipatory complaints face particular problems due to their reliance on far-reaching causal chains as well as factual and scientific uncertainties.[55] Other complaints focus on the here and now, submitting that human rights to life, privacy, family, food, water, health and housing are already affected by the negative impacts of climate change on livelihoods and living environments.[56] In this respect, it is well established that all states are obliged to respect these human rights and to guarantee them to all individuals under their jurisdiction, including a duty to protect them against violations by third parties. Environmental human rights obligations have been relatively well-defined and established by numerous decisions, judgments and communications of international human rights bodies.[57] Nevertheless, establishing a source state's international responsibility for climate-induced human rights violations faces challenges. Again, one of them is the issue of causation, which requires linking the political failure to sufficiently reduce greenhouse gas emissions to specific human rights aggrievances. The required multistage causal chain must connect (1) greenhouse gas emissions to climate change, (2) climate change to certain natural events (extreme weather events or slow onset events) and (3) this natural event to the individual human rights impairment. The second causation step poses the most significant problems when, for example, one tries to link a human-rights violation concerning the right to life to an extreme weather event such as a hurricane. In contrast, slow onset events such as rising sea

54 *Duarte Agostinho and Others v Portugal and Others* App no 39371/20, the application form is available at <https://youth4climatejustice.org/wp-content/uploads/2020/12/Application-form-annex.pdf> accessed 7 January 2022; at the European Court of Human Rights there are currently three climate change cases pending: the Portuguese children, a complaint submitted by Swiss seniors and a complaint submitted by an Austrian suffering from multiple sclerosis.

55 Ingrid Leijten, 'Human rights v insufficient climate action: The Urgenda case' (2019) 37 Netherlands Quarterly of Human Rights 112, 114.

56 See OHCHR, 'Report of the Office of the United Nations High Commissioner for Human Rights on the Relationship Between Climate Change and Human Rights' (2009) UN Doc A/HRC/10/61.

57 Thoroughly discussed in: Linda Hajjar Leib, *Human rights and the environment: Philosophical, theoretical, and legal perspective* (Martinus Nijhoff 2011); John Knox and Ramin Pejan (eds), *The human right to a healthy environment* (Cambridge University Press 2018); Sumuda Atappattu and Andrea Schapper, *Human rights and the environment: Key issues* (Routledge 2019).

levels[58], desertification[59] and glacial melting[60] are less difficult to scientifically link to climate change. Nevertheless, the multitude of cumulative contributing factors remains one of the major problems for individuals to overcome in order to link their aggrievance to a source state's climate change mitigation shortcomings. What is required is that international human rights bodies and courts embrace the concept of proportionate responsibilities of individual source states for the global failure to achieve the agreed-upon goals to mitigate climate change. Even if human rights courts accept each state's share in greenhouse gases as being partially causal to a specific human rights aggrievance, which would be in line with the Dutch *Urgenda* judgment[61], one crucial question remains: Will the international human rights body or court oblige the respondent source state to reduce its greenhouse gases by a certain percentage in a certain period of time? While answering in the positive seems inconceivable, the *Urgenda* case illustrates that this is not completely outside the realm of possibility. However, applicants before the European Court of Human Rights (ECtHR) should be prepared for the Court to shy away from too many specifics regarding the required climate action under human rights law. In *Fadeyeva v Russia*, the ECtHR conceded that 'in today's society the protection of the environment is an increasingly important consideration'[62]. Nevertheless, the Court noted that because of the complexity involved, state parties have a broad margin of appreciation regarding the discharge of their obligation to protect individuals under their jurisdiction from environmental harm.[63] Even though it remains possible for the ECtHR to determine that there has been a manifest error by a national authority, it is difficult to see the ECtHR considering itself as the enforcer of the nationally determined contributions under the Paris Agreement. On the other hand, a ruling that a respondent state has to reduce its greenhouse gas emissions in accordance with its own policy goals does not necessarily tantamount to judicial overreach as it leaves the political

58 Michael Oppenheimer et al., 'Sea level rise and implications for low-lying islands, coasts and communities' in Hans-Otto Pörtner et al. (eds), *The Ocean and cryosphere in a changing climate. A special report of the Intergovernmental Panel on Climate Change* (IPCC 2019) 321.

59 Alisher Mirzabaev et al., 'Desertification' in Valérie Masson-Delmotte et al. (eds), *Climate change and land. An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems* (IPCC 2019) 249.

60 Andrew Bliss, Regine Hock and Valentina Radić, 'Global response of glacier runoff to twenty-first century climate change' (2014) 119 Journal of Geophysical Research: Earth Surface 717-730.

61 In *Urgenda*, the Hague District Court decided in light of the assessment reports of the Intergovernmental Panel on Climate Change (IPCC), that the fact that 'Dutch emissions only constitute a minor contribution to global emissions does not alter the State's obligation to exercise care towards third parties', Hague District Court, *Urgenda Foundation v The State of The Netherlands*, Case C/09/456689/HA ZA 13-1396, 24 June 2015, ECLI:NL:RBDHA:2015:7145 (in Dutch), ECLI:NL:RBDHA:2015:7196 (English translation) para 4.79.

62 *Fadeyeva v Russia* App no 55723/00 (ECtHR, 30 November 2005) para 103.

63 Ibid.

decision of how to achieve the climate goals to the political discretion of the state.[64] Given that this legal development is still in its embryonic stage, it suffices here to note that human rights bodies and courts are capable of adapting their human rights approaches to evolving pressing societal climate issues as they have in the past.

5 International liability for damage caused by climate change

From an international law perspective, liability for the emission of greenhouse gases that contribute to climate change can exist under norms of national law (public law or tort law) if it is prescribed by international law or under norms of international law. Due to space constraints, only the latter will be analysed in the present chapter. National climate change litigation, including climate change-related lawsuits brought against both governments[65] and corporations,[66] before national courts, is on the rise across the globe, as attested by more than 1,800 climate change litigation cases currently in the database of the Sabin Center for Climate Change Law.[67] While the oldest case in the US litigation database dates back to 1986, almost 50% of cases have been filed in the last five years. The oldest case in the non-US litigation database was filed in 1994; more than 60% of cases have arisen in the last five years. The objective of climate-based lawsuits against governments essentially is to pressure states into developing and implementing effective climate change protection, adaptive measures and policies. In contrast, climate lawsuits against corporations seek to change corporate policy but also to receive compensation for climate change-related damage and reimbursement of expenses arising from the need to adapt to climate change. While the legal basis for these lawsuits is national law, courts use international environmental law as a means of interpretation or guidance in regard to the state's climate

64 Ingrid Leijten, 'Human rights v insufficient climate action: The *Urgenda* case' (2019) 37 Netherlands Quarterly of Human Rights 112, 117.

65 Most famously Supreme Court of the Netherlands, *Urgenda Foundation v The State of the Netherlands*, Case 19/00135, 20 December 2019, ECLI:NL:HR:2019:2006 (in Dutch); most recently Administrative Court of Paris, *Notre Affaire à Tous and Others v France*, Case N°1904967, 1904968, 1904972, 1904976/4-1, 3 February 2021 (the Administrative Court ruled that France can be held liable for failing to meet its commitments to reduce greenhouse gas emissions under national and European Union law).

66 Hague District Court, *Milieudefensie et al. v Royal Dutch Shell plc*, Case C/09/571932 / HA ZA 19-37926, May 2021, ECLI:NL:RBDHA:2021:5337 (in Dutch) (a multinational corporation was held liable for its greenhouse gas emissions and the accompanying detrimental effects on the global climate for the first time); Higher Regional Court Hamm, *Saúl Luciano Lliuya v RWE AG*, Case No 2 O 285/15, 30 November 2017 (in this ongoing case a Peruvian farmer is suing RWE for reimbursement of a portion of the costs incurred to establish flood protection).

67 For details see Sabin Center for Climate Change Law, Climate Change Litigation Databases <http://climatecasechart.com/climate-change-litigation/> accessed 7 January 2022.

change mitigation obligations.[68] By way of example, the court in *Urgenda* extensively relied on international climate goals to determine the legal obligations of the Netherlands under Article 2 (the right to life) and Article 8 (the right to family life) of the ECHR regarding the reduction of greenhouse gas emissions.[69] Increasingly and as mentioned above, claims are also being brought before regional human rights courts as well as communications and complaints before various human rights committees and other international quasi-judicial bodies.[70]

5.1 State liability for damage caused by climate change under customary international law

A question that arises is whether a rule exists under customary international law stipulating that if one state causes damage to another state, for example, by allowing the excessive introduction of chlorofluorocarbons into the atmosphere that leads to ozone depletion above the latter state's territory, compensation has to be paid irrespective of whether the activity causing the damage was lawful or unlawful. Such a rule would require not only the general practice of states stemming from domestic jurisprudence or international treaties but also states' acceptance that this is required under international law (*opinio juris*).[71] As previously mentioned, the *Trail Smelter* award concerned the international responsibility of Canada rather than its liability for transboundary environmental damage to private property in the United States. This responsibility was triggered by Canada's breach of its primary obligation under international law not to cause transboundary harm and to take measures to prevent actors under its jurisdiction from doing so.[72] Similarly, international treaty law does not support the existence of a rule of state liability for lawful acts that cause damage. If a plethora of liability instruments were in existence that could serve as sufficient state practice and *opinio juris*, an argument could indeed be made for the existence of

68 Lennart Wegener, 'Can the Paris Agreement help climate change litigation and vice versa?' (2020) 9 Transnational Environmental Law 17, 25.

69 *Hague Court of Appeal, Urgenda Foundation v The State of the Netherlands*, Case C/09/456689/ HA ZA 13-1396, 9 October 2018, ECLI:NL:GHDHA:2018:2591 (in Dutch), ECLI:NL:GHDHA:2018:2610 (unofficial English translation) paras 46-53; Supreme Court of the Netherlands, *Urgenda Foundation v The State of the Netherlands*, paras 7.1-7.6.2.

70 For example, 16 children filed a communication to the United Nations Committee on the Rights of the Child, alleging that the failure of states to tackle the climate crisis constitutes a violation of their rights. The Committee declared the communication inadmissible due to the non-exhausting of domestic remedies, *Chiara Sacchi et al. v Argentina, Brazil, France, Germany and Turkey*, UN Doc CRC/C/88/D/104/2019, 8 October 2021.

71 Article 38 para 1 lit b Statute of the International Court of Justice (adopted 26 June 1945, entered into force 24 October 1945): 'international custom, as evidence of a general practice accepted as law'.

72 *Trail Smelter Case*, 1965.

such a rule under customary international law; however, this is not the case. Amongst the thousands of international environmental treaties currently in force,[73] there is only one that explicitly imposes liability on states for damage caused by lawful activities under their jurisdiction or control, namely the Convention on International Liability for Damage Caused by Space Objects (Space Liability Convention)[74]. Additionally, Article 7 para 2 of the Convention on the Law of the Non-navigational Uses of International Watercourses[75] arguably contains elements of liability by stipulating an obligation of lawfully acting states to 'discuss' compensation if significant harm occurs. A handful of other agreements establish the civil liability of a private operator for certain ultra-hazardous activities that can have a transboundary effect, most notably involving nuclear energy and the maritime transport of oil.[76] Given that the Space Liability Convention only regulates the highly specialised area of outer space and the fact that it is not predominantly environmentally orientated, does not allow sweeping conclusions to be drawn as to the existence of a general liability rule for transboundary environmental damage under customary international law.[77] Consequently, one can confidently claim that there is no state practice, no *opinio juris* and therefore no rule on state liability under customary international law. This makes a special agreement such as the Paris Agreement (part II.) or the Space Liability Convention (part III.) vital for the possible imposition of liability.

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73 The International Environmental Agreements (IEA) Database Project currently includes over 1,300 MEAs, over 2,200 BEAs and 250 other environmental agreements. For detailed figures see <https://iea.uoregon.edu/> accessed 7 January 2022.

74 Convention on International Liability for Damage Caused by Space Objects (adopted 29 March 1972, entered into force 1 September 1972) 961 UNTS 13810.

75 Convention on the Law of the Non-navigational Uses of International Watercourses (adopted 21 May 1997, entered into force 17 August 2014) 2999 UNTS 77.

76 Anne Daniel, 'Civil liability regimes as a complement to multilateral environmental agreements: Sound international policy or false comfort?' (2003) 12 Review of European, Comparative and International Environmental Law 225.

77 Similarly Günther Handl, 'State liability for accidental transnational environmental damage by private persons' (1980) 74 American Journal of International Law 525, 535-540; Michel Montjoie, 'The concept of liability in the absence of an internationally wrongful act' in James Crawford et al. (eds), *The law of international responsibility* (Oxford University Press 2010) 503, 507; Rüdiger Wolfrum, 'Environmental liability in international law' in Wolfgang Kahl and Marc-Philippe Weller (eds), *Climate change litigation: A handbook* (C.H. Beck, Hart, Nomos 2021) MN 37-39.

5.2 State liability for damage caused by climate change under the Paris Agreement

It should be noted at the outset that the UNFCCC, the Kyoto Protocol[78] and the Paris Agreement do not individually or collectively establish a full-fledged international state liability regime for damage caused by climate change. The reason is that industrialised states have thus far refused to consider anything that could even remotely be interpreted as an admission of liability or financial responsibility for the impacts of global climate change, an issue that has come to be recognised as one of the taboos of climate change negotiations.[79]

The point of departure for considerations on state liability within the international climate change treaty regime is Article 8 para 1 of the Paris Agreement and the now infamous paragraph 51 of Decision 1/CP.21, which was discussed above (part D. II). Paragraph 51 states that 'Article 8 of the Agreement does not involve or provide a basis for any liability or compensation'[80] and thus explicitly addresses liability. Contrary to what was said regarding states' duties to compensate for injuries caused by a breach of the Paris Agreement, namely that Article 8 does not preclude the application of general rules on state responsibility, the liability issue is quite a different matter. The wording of paragraph 51 makes it clear that the Paris Agreement did not intend to create a new conventional liability regime where customary liability rules on which states have traditionally relied do not exist (see part E. I).

A number of arguments have been brought forward to support the view that Decision 1/CP.21 does not prevent the development of a future liability regime, either by the states parties to the Paris Agreement or under the 'Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts' (WIM) established at the Warsaw COP19 in 2013.[81] In this context it is significant that the exclusion of a new liability and compensation regime is contained in the decision that adopted the Paris Agreement and not in the Agreement itself.[82] While the legal status of decisions by international institutions, such as the Conference of the Parties to the Convention (COP), is still disputed, most scholars agree that they are not legally

78 Kyoto Protocol to the UNFCCC (adopted 11 December 1997, entered into force 16 February 2005) 2303 UNTS 162.

79 Benito Müller et al., *Framing future commitments: A pilot study on the evolution of the UNFCCC greenhouse gas mitigation regime* (Oxford Institute for Energy Studies 2003) 5-1.

80 Decision 1/CP.21, Report of the Parties on its 21st session, Paris, 30 November to 11 December 2015, UN Doc. FCCC/CP/2015/10/Add.1 ('Adoption of the Paris Agreement'), 29 January 2016, para 51.

81 Established by COP Decision 2/CP.19, Report of the Conference of the Parties on its nineteenth session, held in Warsaw from 11 to 23 November 2013, UN Doc. FCCC/CP/2013/10/Add.1, 31 January 2014, para 1.

82 MJ Mace and Roda Verheyen, 'Loss, damage and responsibility after COP21: All options open for the Paris Agreement' (2016) Review of European, Comparative and International Environmental Law 197, 205.

binding unless their governing instrument provides for such.[83] This means that the states parties acting in consensus can override any earlier interpretation of the treaty and the Conference of the Parties, which serves as the meeting of the Parties to the Paris Agreement (CMA), can adopt a decision that supersedes the exclusion of a liability and compensation regime. Considering that paragraph 51 only interprets Article 8 Paris Agreement and does not preclude the claiming of a breach of general international law, other provisions of the Agreement could provide a legal basis and path forward for liability or compensation claims.[84] Most prominently in this regard is Article 4.2 Paris Agreement, which enshrines a legally-binding procedural obligation for state parties to submit nationally determined contributions. As elaborated above, states parties that fail to comply with this procedural obligation under the Paris Agreement may still incur responsibility.[85]

5.3 State liability for damage caused by climate engineering under the Space Liability Convention

Geoengineering, also referred to as 'climate engineering', is defined as 'the deliberate large-scale manipulation of the planetary environment to counteract anthropogenic climate change'[86] and seeks to either remove carbon dioxide from the atmosphere or to reduce the incoming solar radiation. While such efforts are intended to mitigate climate change, they could potentially interfere with the natural systems on earth in an unforeseen and irreversible manner, thereby exasperating climate change even further. As geoengineering is still in its infancy and partially relies on technology that has not been developed yet, the full gamut of possible consequences for the global climate is not entirely foreseeable.[87] One example of geoengineering is the envisioned use of technology such as reflective mirrors in outer space to reduce incoming solar radiation.[88] Such appliances could cool the planet but negatively affect the

83 Daniel Bodansky, 'Legally binding versus non-legally binding instruments' in Scott Barrett et al. (eds), *Towards a workable and effective climate regime* (CEPR Press and Ferdi 2015) 155, 157; in favour of bindingness Jutta Brunnée, 'Coping with consent: Law-making under multilateral environmental agreements' (2002) 15 Leiden Journal of International Law 1.

84 Mace and Verheyen (n 82) 206.

85 Morten Broberg, 'Interpreting the UNFCCC's provisions on 'mitigation' and 'adaptation' in light of the Paris Agreement's provision on loss and damage' (2020) Climate Policy <https://doi.org/10.1080/14693062.2020.1745744> accessed 7 January 2022.

86 Royal Society, *Geoengineering the climate: Science, governance and uncertainty* (The Royal Society 2009) 1.

87 Takanobu Kosugi, 'Role of sunshades in space as a climate control option' (2010) 67 Acta Astronautica 241, 243.

88 For more details see Daniel J Lunt et al., '"Sunshade World": A fully coupled GCM evaluation of the climatic impacts of geoengineering' (2008) 35 Geophysical Research Letters

earth's hydrologic cycle, the El Niño-Southern Oscillation climate pattern and the North Atlantic Deep Water cycle and therefore impact not only the global climate[89] but multitudes of individual ecosystems and biodiversity as a whole[90]. Nevertheless, space-based climate engineering research continues apace, albeit in labs rather than in orbit for the time being. The following analysis will explore whether climate engineering activities undertaken in outer space give rise to state liability under the Space Liability Convention. It should be noted that space-based climate engineering is just one particular aspect of climate engineering, the majority of climate engineering activities are unlikely to take place in space and will therefore fall outside the scope of the Space Liability Convention.

There are two immediately relevant sections in the convention applicable here. Firstly, Article I lit a of the Space Liability Convention only covers damage to persons and property, meaning that environmental damage is excluded. However, if changes to the global climate brought about by climate engineering caused droughts, floods or the like, that resultant damage could be classified as damage to public or private property and incur clean-up, mitigation and restoration costs that are covered by the Space Liability Convention.[91] Secondly, the applicability of the Space Liability Convention to any given case will depend upon the interpretation of the phrase 'damage caused by a space object' (Article II Space Liability Convention).[92] Any judicial review based on these articles will need to establish causal links, and this will raise similar issues to those discussed regarding the no-harm rule (part D. I.). For example, a state launches a reflective mirror into outer space that has specific negative effects on the global climate, which, in turn, leads to extreme weather events that damage common goods or private property. Attributing a specific extreme weather event, which could occur at a much later date and on the opposite end of the globe, to the reflective mirror would be challenging in light of the plethora of stressors that currently affect and damage the environment. Moreover, the occurrence of a natural

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L12710, <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2008gl033674> accessed 7 January 2022.

89 Wilfried Rickels et al., *Large-scale intentional interventions into the climate system? Assessing the climate engineering debate* (Kiel Earth Institute 2011) 40.

90 Royal Society, *Geoengineering the climate: Science, governance and uncertainty* (The Royal Society 2009) 34.

91 Carl Q Christol, 'International liability for damage caused by space objects' (1980) 74 American Journal of International Law 346, 362; Peter Stubbe, *State accountability for space debris: A legal study of responsibility for polluting the space environment and liability for damage caused by space debris* (Brill 2018) 371-372.

92 While the Space Liability Convention does not define causation or lay down the conditions that must be met in order for causation to be fulfilled, a causal link is central to any compensation claim, in the sense that the victim must demonstrate that the damage suffered was caused by the space object, see Lesley J Smith and Armel Kerrest, 'Article II (Absolute Liability)' in Stephan Hobe et al. (eds), *Cologne commentary on space law Volume II* (Carl Heymanns 2013) 410-477.

climate phenomenon could have been the cause of the damage. However, a multi-stage causal chain is not necessarily problematic under the Space Liability Convention. While commentators argue that damage caused through a chain of events initiated by a space object does not hamper the applicability of the Space Liability Convention,[93] there is no state practice on which to base any recourse regarding causation given that the only invocation of the Space Liability Convention to date was resolved by diplomatic means.[94]

A substantial issue regarding assigning climate engineering a place in a causal chain is the scientific uncertainty. Given that climate engineering is still only theoretically possible and has a multitude of forms it could take, the unknown properties, scale and form of climate engineering present a challenge. Additionally, attributing specific extreme weather events such as droughts or floods to climate engineering would be extremely difficult if not impossible given the complexity, variability and unpredictability of the global climate system.[95] To overcome this attribution problem, novel methods for proving the existence of a causal link between climate engineering activities and personal or property damage in light of scientific uncertainties and a lack of reliable scientific data have been suggested. One notable method uses probabilistic event attribution whereby causal explanations are based on probability distributions.[96] This leads to cautious optimism that at least some of the foreseeable challenges in attributing liability for climate engineering activities can indeed be overcome in the future.

6 Summary and conclusion

Anthropogenic climate change is arguably the greatest threat to the environment since the impact of an asteroid that caused the extinction of the dinosaurs 66 million years ago and represents an existential threat to humankind. As the foregoing elaborations have demonstrated, a myriad of conceptual uncertainties and hurdles in inter-

93 Ibid.

94 'Canada: Claim against the Union of Soviet Socialist Republics for damage caused by Soviet Cosmos 954' (1979) 18 International Legal Materials 907ff; the final settlement is reproduced in (1981) 20 International Legal Materials 689.

95 Stephen H Schneider, 'Geoengineering: Could – or should – we do it?' (1996) 33 Climatic Change 291, 294; Jason J Blackstock and Jane CS Long, 'The politics of geoengineering' (2010) 327 Science 527; Alan Robock et al., 'A test for geoengineering?' (2010) 327 Science 530, 531; Toby Svoboda and Peter Irvine, 'Ethical and technical challenges in compensating for harm due to solar radiation management geoengineering' (2014) 17 Ethics, Policy & Environment 157, 161-162.

96 Myles Allen et al., 'Scientific challenges in the attribution of harm to human influence on climate' (2007) 155 University of Pennsylvania Law Review 1353; Joshua B Horton et al., 'Liability for solar geoengineering: Historical precedents, contemporary innovations, and governance possibilities' (2015) 22 N.Y.U. Environmental Law Journal 225, 261-264.

national law remain open and undecided and currently prevent state responsibility and state liability from being viable options for effectively remedying the adverse effects of climate change. Recurring issues, such as the necessity of establishing a causal link between the activity and the harm, present hurdles to all three legal bases for state responsibility discussed here, i.e., the no-harm rule, the Paris Agreement and human rights. Additionally, determining the exact role of the multitude of emitters, including nature itself, needs to be resolved for progress to be made. An analysis of state liability for climate change damage has led down a legal *cul de sac*, given that states have been very reticent to adopt any international regime on environmental state liability, leading many to argue that they are figuratively fiddling while Rome burns. The only meaningful state liability regime in existence has little bearing on climate change as it concerns the highly specialised area of outer space, and even then, it does not cover environmental damage.

However, the foregoing elaborations nevertheless show that there are approaches for the substantiation of prevention and compensation claims under international law for those adversely affected by climate change. Novel methods for navigating the causation quagmire and possible future developments with regard to the Paris Agreement could pave the way for responsibility and liability claims.

In the end, successfully tackling climate change requires a concerted international effort, implemented by those causing the problem who need to be willing to change and hold themselves accountable via international climate protection obligations to effectively reduce emissions and recompense for irreparable damage.

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pacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (Intergovernmental Panel on Climate Change 2019).

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