
1. Wishful thinking? The governance of climate change-related disasters in the Anthropocene

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INTRODUCTION

Reducing disaster risk is a global objective that features increasingly prominently on the international agenda. The issue earns multiple references in the 2030 Agenda for Sustainable Development and Sustainable Development Goals¹ and dedicated treatment in the Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework).² In concert with this sharpening national and international focus on disaster policy has been growing attention to the many legal issues associated with disaster preparedness, management, and response through a variety of measures from improved planning laws to liability and insurance schemes.³

This book is concerned with the legal challenges involved in addressing disasters that have a connection with human-induced climate change. Climate change is not only exacerbating a range of natural and man-made disasters, but also threatens disaster in its own right, and this carries major consequences for all societies, particularly in developing countries. In response to this risk Sustainable Development Goal 13 calls on states to “[s]trengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.”⁴ As Rawson and Whitmore note, “[c]limate change is two different types of disaster: one fast, one slow.”⁵ The “fast” disaster includes extreme weather events such as heat waves and severe storms. The “slow” disaster is the “long-term shifts in average climate conditions” and other gradual changes such as sea-level rise.⁶ In both senses, climate change-related disasters are therefore a subset of the damaging impacts of climate change that the international community is seeking to address through the climate regime founded on the 1992 United Nations Framework Convention on Climate Change (UNFCCC).⁷

There is debate as to whether “climate disasters” are in fact a discrete category of event or occurrence justifying dedicated treatment in policy or law. There are compelling

¹ G.A. Res. 70/1 (Oct. 15, 2015).

² Sendai Framework for Disaster Risk Reduction 2015–2030, Mar. 18, 2015, U.N. Doc. A/CONF.224/CRP.1 [hereinafter Sendai Framework].

³ Daniel A. Farber, *International Law and the Disaster Cycle*, in THE INTERNATIONAL LAW OF DISASTER RELIEF 7, 9 (David D. Caron, Michael J. Kelly & Anastasia Telesetsky eds., 2014).

⁴ *Supra* note 1.

⁵ JANE RAWSON & JAMES WHITMORE, THE HANDBOOK: SURVIVING AND LIVING WITH CLIMATE CHANGE 21 (2015). See also Daniel A. Farber, *Catastrophic Risk, Climate Change and Disaster Law*, 16 ASIA PAC. J. ENVTL L. 37, 39 (2013).

⁶ RAWSON & WHITMORE, *supra* note 5.

⁷ United Nations Framework Convention on Climate Change, May 9, 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 107.

reasons why disasters caused or made worse by climate change should be “mainstreamed” and addressed through the climate regime rather than as a sub-category of global disaster policy or as a standalone body of “climate disaster law.” Among these is the inherent tendency of disaster policy to treat all disasters as ethically equivalent, regardless of their underlying cause. This is understandable given the need to respond to the immediate needs of disaster victims. However, agnosticism as to the cause of disasters that have a climate change signature overlooks structural issues of distributive and corrective justice, allowing high-income and high-emitting states to avoid their responsibilities to minimize climate change and ameliorate its consequences, particularly for low-income countries. Furthermore, it serves to downplay the urgency of climate mitigation by creating the false impression that climate change is similar to other physical risk factors. In reality, the magnitude of climate change, and other Earth system changes occurring in the Anthropocene, may well overwhelm any disaster management or containment strategy. The first and most appropriate forum for addressing climate disasters is therefore the UNFCCC regime.

Developing a coherent response to climate change-induced disasters has been a relevant consideration in each of the three pillars of international climate law and policy: mitigation, adaptation and “loss and damage.”⁸ For mitigation policy, disasters are one of the risks that the international community is attempting to limit by controlling emissions of greenhouse gases. For adaptation policy, the central objective is to enhance social, economic, and environmental fortitude to climate change impacts, including building greater resilience to extreme weather events brought about by climate change. For “loss and damage,” the newest addition to international climate law, developing countries are seeking compensation for immediate and slow-onset disasters and losses that can neither be mitigated nor adapted to.⁹ Across these three elements of the climate regime there are many opportunities for improving the ways in which climate change-related disaster risk is addressed fairly and effectively.

CLIMATE CHANGE AND DISASTER RISK IN THE ANTHROPOCENE

I. Defining Climate-related Disasters

The Intergovernmental Panel on Climate Change (IPCC) in its special report *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* assessed the “climatic, environmental, and human factors that can lead to impacts and disasters” and identified “options for managing the risks posed by impacts and disasters.”¹⁰ The IPCC defines “disaster” as:

⁸ M.J. Mace & Roda Verheyen, *Loss and Damage and Responsibility after COP21: All Options Open for the Paris Agreement*, 25 REV. EUR. COM. AND INT’L ENVTL L. 197, 207 (2016) (noting that after the adoption of the Warsaw International Mechanism, “loss and damage” joins mitigation and adaptation as the third prong of climate policy and regulation).

⁹ E. Lees, *Responsibility and Liability for Climate Loss and Damage After Paris*, 17 CLIMATE POLICY 59 (2017).

¹⁰ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *MANAGING THE RISKS OF EXTREME EVENTS AND DISASTERS TO ADVANCE CLIMATE CHANGE ADAPTATION* 4 (2012).

Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.¹¹

The IPCC conceptualizes disaster risk as a function of extreme weather events (physical risk), vulnerability (propensity to be adversely affected) and exposure (presence of communities in places that could be vulnerable).¹² The physical risks are worsening as climate change is making extreme weather events more frequent and more severe, including heat waves, heavy precipitation events, and droughts.¹³ The IPCC estimates that the boundary for the transition from medium to high risk of such events is located at around a 1.6°C rise in global average temperatures (a boundary we are rapidly approaching).¹⁴

The IPCC's special report on extreme weather events makes clear that disasters are often complex incidents involving the interaction of many different factors. Just as important as the occurrence of a particular weather event will be societal decisions that exacerbate disaster risk, such as inadequate building standards for homes constructed in areas prone to wildfires. It has always been the case that "natural" disasters have human elements because of the presence of human settlements and infrastructure in changeable environments.¹⁵ There is therefore inevitably some degree of artificiality in the legal distinction between natural ("acts of God") and human ("man-made") disasters, which has influenced legal instruments from household insurance policies through to rules of public international law. Under the law of state responsibility, for instance, a state may be able to rely on a defense of *force majeure* in relation to a breach of international law if there was an "irresistible force" or "unforeseen event, beyond the control of the State" which made it "materially impossible in the circumstances to perform the obligation."¹⁶ Extreme weather conditions are often cited as examples in which *force majeure* may be available, such as when as a result of a storm an aircraft is forced to intrude into the airspace of another state without permission to do so.¹⁷

II. Implications of the Anthropocene for Conceptualizing Climate-related Disasters

Disentangling the various factors that cause or contribute to disasters is made even more challenging because of the advent of the Anthropocene,¹⁸ the current geological era

¹¹ *Id.* See also Int'l Law Comm'n, Draft Articles on the Protection of Persons in the Event of Disasters, U.N. Doc. A/CN.4/L.831, art. 3.

¹² See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 10, at 4.

¹³ *Id.* at 8–9.

¹⁴ Brian C. O'Neill et al., *IPCC Reasons for Concern Regarding Climate Change Risks*, 7 NATURE CLIMATE CHANGE 28 (2017).

¹⁵ ROBERT R.M. VERCHICK, *FACING CATASTROPHE: ENVIRONMENTAL ACTION FOR A POST-KATRINA WORLD 4* (2010).

¹⁶ Int'l Law Comm'n, Draft Articles on Responsibility of States for Internationally Wrongful Acts, art. 23, in Rep. of the Int'l Law Comm'n on the Work of Its Fifty-third Session, U.N. GAOR, 56th Sess., Supp. No. 10, at 43, U.N. Doc. A/56/10 (2001).

¹⁷ *Id.*

¹⁸ Although the Anthropocene has not yet been adopted by the International Commission on Stratigraphy as a geological unit in the International Geologic Time Scale, it is now used extensively

marked out by pervasive human influence upon multiple Earth systems, including climate change, biodiversity loss, land-system change, biochemical flows, stratospheric ozone depletion, and ocean acidification.¹⁹ In the Anthropocene “the natural and the human are mixed up, not merely added, and their influences cannot be neatly distinguished.”²⁰ As Hamilton observes, this global environmental transformation “is now telling us that the modern division of the world into a box marked ‘Nature’ and one marked ‘Human’ is no longer tenable.”²¹

If, in the Anthropocene, the natural and human causes of environmental change cannot be distinguished, and disasters will become more frequent and more severe, does this mean that efforts to ascribe responsibility for disasters must be abandoned and all disasters treated equivalently as catastrophes to be prepared for? There are several reasons why taking such a “neutral” approach to disasters would entail a fundamental category error.

First, we are only at the beginning of this new and uncertain period, and future disruptions from uncontrolled human impacts on the Earth are likely to be worse than anything experienced to date. While it is doubtful whether humanity will enjoy a “good” Anthropocene, it seems certain that a “bad” Anthropocene will be the outcome unless climate change and other threats are addressed.²² Indeed, it is specifically in response to such threats that Earth system scientists have developed the concept of “planetary boundaries” to demarcate a “safe operating space for humanity.”²³ This framework provides thresholds to be avoided in order to avert global disaster and also disasters at regional scales (e.g. changes to the South Asian Monsoon from aerosol loading). Moreover, as the IPCC’s work on extreme weather events has shown, climate change is exacerbating pre-existing disaster risk, causing new disasters in their own right, and taking communities beyond their adaptation limits. It therefore continues to be prudent policy to reduce human impacts on Earth systems to reduce the risk of harmful outcomes, including disasters.

Second, it is correct to say that identifying with precision the contribution of human activities to disaster risk is challenging. Yet the fact that it is generally difficult does not mean that it is always impossible. Some slow-onset disasters, such as sea-level rise, or the disappearance of glaciers upon which communities rely for freshwater supplies, can be traced directly to human-induced climate change.²⁴ For more immediate disasters, such as extreme weather events, quantifying the climate change influence is more complex.

to describe the current period in geological history. *See generally* THE ANTHROPOCENE AND THE GLOBAL ENVIRONMENTAL CRISIS (C. Hamilton, C. Bonneuil & F. Gemenne eds., 2015); JEREMY DAVIES, *THE BIRTH OF THE ANTHROPOCENE* (2016); Owen Gaffney & Will Steffen, *The Anthropocene Equation* 4 *THE ANTHROPOCENE REVIEW* 1 (2017).

¹⁹ W. Steffen et al., *Planetary Boundaries: Guiding Human Development on a Changing Planet*, 347(6223) *SCI.* 736 (2015).

²⁰ C. Hamilton, *Human Destiny in the Anthropocene*, in *THE ANTHROPOCENE AND THE GLOBAL ENVIRONMENTAL CRISIS* 32, 34 (C. Hamilton, C. Bonneuil & F. Gemenne eds., 2015).

²¹ *Id.*

²² Clive Hamilton, *The Theodicy of the “Good Anthropocene”*, 7 *ENVTL. HUMAN.* 233 (2015).

²³ Steffen et al., *supra* note 19.

²⁴ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *CLIMATE CHANGE 2014: SYNTHESIS REPORT. CONTRIBUTION OF WORKING GROUPS I, II AND III TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE* [CORE WRITING TEAM, R.K. PACHAURI & L.A. MEYER (EDS.)] 9 (2014).

Nonetheless, advances in attribution science mean that it is possible, at least in some cases, to determine if climate change affected the probability of an extreme weather event occurring.²⁵ There are now a large number of studies that have examined extreme events and identified a climate change fingerprint.²⁶ For instance, the severe heat wave in Australia in 2013, in which the annual average temperature exceeded the 1911–40 mean by 1.53°C, was found to be “virtually impossible” without global warming.²⁷ Another recent study identified a definitive climate signature in the “2003 European heat wave, the 2010 Pakistan flood and Russian heat wave, the 2011 Texas heat wave and recent floods in Europe.”²⁸ These climate change-connected disasters should be viewed in a qualitatively different way than disasters that are predominantly caused by natural events (such as major earthquakes).

Third, and relatedly, treating all disasters as equivalent and simply as crises to be endured fails to address fundamental issues of justice. There are strains of this neutral approach to disasters in the Sendai Framework,²⁹ which seeks to achieve “[t]he substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.”³⁰ The Sendai Framework does make a number of references to climate change. It recognizes that many disasters are exacerbated by climate change and are increasing in frequency and intensity³¹ and have particularly negative effects for Small Island Developing States.³² It also professes “respect” for the mandate of the UNFCCC to address climate change.³³ However, there is also a propensity to treat “climate change” and the more generic term “climate variability” as interchangeable, which serves to obscure the reality that changes in average weather conditions, and the occurrence of some extreme events, is only made possible by human interference with the climate system. There is obviously merit in enhancing disaster resilience generally. However, this goal should not be used as an excuse or a substitute for addressing the root causes of disaster risk. In the context of climate change, and other global environmental changes, it should not disguise the responsibilities of those industrialized states that have been most implicated in modifying the Earth system to reduce their impacts on the global environment and to assist low-income states that have contributed little to the problem but which will feel the worst of its impacts.³⁴

²⁵ Myles Allen, *Liability for Climate Change*, 421 NATURE 891 (2003). See also Myles Allen, *The Scientific Basis for Climate Change Liability*, in CLIMATE CHANGE LIABILITY: TRANSNATIONAL LAW AND PRACTICE 8 (Richard Lord et al. eds., 2012).

²⁶ Stephanie C. Herring et al., *Explaining Extreme Events of 2015 from a Climate Perspective*, 12 BULL. OF THE AM. METEOROLOGICAL SOC'Y S1-S145 (2016).

²⁷ S.C. Lewis & D.J. Karoly, *The Role of Anthropogenic Forcing in the Record 2013 Australia-Wide Annual and Spring Temperatures*, 95 BULL. OF THE AM. METEOROLOGICAL SOC'Y 531, 532 (2014).

²⁸ Michael E. Mann et al., *Influence of Anthropogenic Climate Change on Planetary Wave Resonance and Extreme Weather Events*, 7:45242 SCI. REP. (2017).

²⁹ Sendai Framework, *supra* note 2.

³⁰ *Id.*

³¹ *Id.* at [4].

³² *Id.* at [42].

³³ *Id.* at [13].

³⁴ Stephen M. Gardiner, *Climate Justice*, in THE OXFORD HANDBOOK OF CLIMATE CHANGE AND SOCIETY 309, 310 (John S. Dryzek, Richard B. Norgaard & David Schlosberg eds., 2011).

A fourth objection to treating all disasters, including those driven by climate change, in the same or similar way is that it involves a large element of wishful thinking. This is because it assumes that future disasters will be broadly within the boundaries of our lived experience. However, “our move into the Anthropocene, out of the relative stability of the Holocene, undermines this knowledge basis of management by snatching away the trust compass provided by the past.”³⁵ The Earth system changes unleashed in the Anthropocene that threaten rapid, non-linear, state changes to the planet makes the past a very unreliable guide to the future. The global environmental transformations under way carry the risk of disasters at all spatial scales that could severely disrupt the normal functioning of communities and societies. The Anthropocene, as Clark puts it, entails “the disaster to end all disasters” because of the “prospect of multiple, interconnected and cascading transformations in Earth systems whose current state human beings and other species have come to rely upon.”³⁶ Climate change towards the middle and upper levels of IPCC projections would entail “catastrophic changes that can neither be adapted to, nor endured.”³⁷ As Head has asked, “[h]ow are we to act if the total context may be essentially ungovernable?”³⁸ The accelerating pace of climate change,³⁹ means that the most rational risk management approach is to reduce greenhouse gas emissions, stabilize carbon concentrations in the atmosphere, and develop and deploy negative emissions technologies at scale.⁴⁰

In sum, in seeking to minimize disaster risk connected to climate change it remains imperative to address the human causes and not only the symptoms of our changing climate. This is not to argue that disaster risk management should be abandoned. To the contrary, as work by the International Law Commission in relation to humanitarian crises makes clear, states are under a due diligence obligation to safeguard their populations from the effects of disasters per se. To this end, the Commission’s Draft Articles on Protection of Persons in the Event of Disasters seek to “facilitate the adequate and effective response to disasters and reduction of the risk of disasters, so as to meet the essential needs of the persons concerned, with full respect for their rights.”⁴¹ Disaster risk reduction policy, as set out in the Sendai Framework, and being developed through the Global Platform for Disaster Risk Reduction,⁴² is an important way in which to

³⁵ JOHN S. DRYZEK, RICHARD B. NORGAARD & DAVID SCHLOSBERG, *CLIMATE-CHALLENGED SOCIETY* 79 (2013).

³⁶ N. Clark, *Geo-Politics and the Disaster of the Anthropocene*, 62 *SOCIOLOGICAL REV.* 19, 21 (2014).

³⁷ Gardiner, *supra* note 34, at 316.

³⁸ LESLEY HEAD, *HOPE AND GRIEF IN THE ANTHROPOCENE: RE-CONCEPTUALISING HUMAN-NATURE RELATIONS* 133 (2016). See further Oliver D. Bettis, Simon Dietz & Nick G. Silver, *The Risk of Climate Ruin*, 140 *CLIMATIC CHANGE* 109 (2017).

³⁹ Press Release, World Meteorological Organization, WMO Confirms 2016 as Hottest Year on Record (2017), <https://public.wmo.int/en/media/press-release/wmo-confirms-2016-hottest-year-record-about-11%C2%B0c-above-pre-industrial-era>. See also Justin Gillis, *Earth Sets a Temperature Record for the Third Straight Year*, *N.Y. TIMES*, Jan. 18, 2017.

⁴⁰ Daniel Farber, *Climate Change and Disaster Law*, in *THE OXFORD HANDBOOK OF INTERNATIONAL CLIMATE CHANGE LAW* 589, 592 (Kevin R Gray, Richard Tarasofsky & Cinnamon Carlarne eds., 2016).

⁴¹ U.N. Doc. A/CN.4/L.831 (2014), art. 2.

⁴² 2017 Global Platform for Disaster Risk Reduction (Apr. 4, 2017), <http://www.unisdr.org/conferences/2017/globalplatform/en>.

discharge this responsibility of protection. But it is not sufficient in and of itself, and what is required is complementary and mutually supportive climate mitigation and disaster risk management. With these considerations in mind the discussion now turns to assess the adequacy of international law's treatment of climate change-related disasters.

THE CLIMATE REGIME AND DISASTERS

The climate regime, built upon the UNFCCC, is the primary global legal vehicle through which governments are seeking to avoid dangerous climate change. The risk of climate change-induced disasters has been on the global agenda since the negotiation and adoption of the UNFCCC, and is relevant to the mitigation, adaptation, and the loss and damage elements of the regime. Furthermore, as a “fail safe option” the artificial engineering of global and regional climates is also being explored to prevent globally disastrous climate change, although to date it has not been the subject of detailed regulation within or outside of the UNFCCC and therefore cannot be characterized as an element of the regime.⁴³

I. Mitigation

The term “disaster” receives only one mention in the UNFCCC, in Article 4(8)(d), which requires parties in implementing their commitments to consider the specific needs and concerns of developing countries, especially “[c]ountries with areas prone to natural disasters.” Neither the 1997 Kyoto Protocol⁴⁴ nor the 2015 Paris Agreement⁴⁵ includes any direct mention of “disasters,” however the Paris Agreement does refer to “extreme weather events” in Article 8 in the context of the loss and damage mechanism (which is discussed further below).

Nonetheless, the climate regime does engage with disaster risk in several ways. It does so in the first instance by seeking to prevent disastrous climate change. The primary objective of the climate regime, as set out in Article 2 of the UNFCCC, is the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” What constitutes “dangerous” is undefined in the UNFCCC. However, it has now been given meaning by the Paris Agreement, which seeks to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.”⁴⁶ Implicit in these goals is an acceptance

⁴³ K.N. Scott, *International Law in the Anthropocene: Responding to the Geoengineering Challenge*, 34 MICH. J. INT'L L. 309 (2014).

⁴⁴ Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 2303 U.N.T.S. 162 [hereinafter Kyoto Protocol].

⁴⁵ Paris Agreement (Dec. 12, 2015), in UNFCCC, Report of the Conference of the Parties on its Twenty-First Session, Addendum, at 21, U.N. Doc. FCCC/CP/2015/10/Add.1 (Jan. 29, 2016) [hereinafter Paris Agreement].

⁴⁶ *Id.* at art. 2(1)(a).

that rises above these temperature thresholds would be dangerous. However, these are political goals and not scientific ones and it can be argued that the temperature rise of around 1°C already experienced is dangerous.⁴⁷ For example, recent research has shown that even if the 1.5°C or 2°C targets are met they would still result in conditions similar to the 2015 heat waves in Pakistan and India occurring every year.⁴⁸ It is now unlikely that the 1.5°C goal will be reached, although there remains some possibility that the 2°C goal is achievable.⁴⁹

The risk of disasters at global and smaller scales is clearly relevant to the formulation and implementation of emissions reduction targets, however to date there has been an inadequate response to these risks. Current government policies and emission pledges under the Paris Agreement would lead to warming of nearly 4°C,⁵⁰ a change in global average temperature that would likely be incompatible with the continued existence of global organized community.⁵¹ Therefore, as the Paris Agreement is implemented the risk of disasters should inform, far more directly, the achievement of the Agreement's objectives. In this respect, disasters can be seen not only as situations of tragedy, but also as moments of disruption in which it may become possible to mobilize government and civil society commitments to stronger mitigation policies.

Stevenson and Dryzek advance this argument in their research on deliberative and democratic institutional pathways for overcoming the paralysis that has gripped global climate governance.⁵² They argue that there are a number of potential disruptive forces that may induce agreement on “reflexive” and “deliberative” climate governance, including the increased occurrence of disasters. Stevenson and Dryzek observe that “[h]eightedened public attention to climate change as a result of particular disasters, be they cyclones, floods, droughts, or fires, may serve to re-energize public space” and that climate tipping points “may provide the disruption required to trigger reflexive capacity in the governance system” because they make necessary the taking of continual adaptive action.⁵³ This observation is consistent with the history of international environmental law generally, which has tended to undergo the most rapid and significant development in response to crises that have threatened human health or have caused major environmental harm.

There are multiple institutional points within the Paris Agreement and the UNFCCC more generally where this “reflexivity” could be introduced in response to heightened global awareness of climate change-related disaster risk. There are clearly opportunities for disaster risk to feature prominently in the ongoing work on the rule-book for the

⁴⁷ Reto Knutti et al., *A Scientific Critique of the Two-Degree Climate Change Target*, 9 NATURE GEOSCIENCE 13 (2016).

⁴⁸ Tom K.R. Matthews, Robert L. Wilby & Connor Murphy, *Communicating the Deadly Consequences of Global Warming for Human Heat Stress*, PROC. OF THE NAT'L ACAD. OF SCI., published online before print (Mar. 27, 2017) doi: 10.1073/pnas.1617526114.

⁴⁹ G.P. Peters, *Key Indicators to Track Current Progress and Future Ambition of the Paris Agreement*, 7 NATURE CLIMATE CHANGE 118 (2017).

⁵⁰ Climate Action Tracker, *Effect of Current Pledges and Policies on Global Temperature* (Apr. 4, 2017), <http://climateactiontracker.org/global.html>.

⁵¹ R. Garnaut, *Compounding Social and Economic Impacts: The Limits to Adaptation*, in *FOUR DEGREES OF GLOBAL WARMING: AUSTRALIA IN A HOT WORLD* (P. Christoff ed., 2014).

⁵² H. STEVENSON & J.S. DRYZEK, *DEMOCRATIZING GLOBAL CLIMATE GOVERNANCE* (2014).

⁵³ *Id.* at 214.

Paris Agreement, which is to take shape in 2018. The Paris Agreement expressly refers to the importance of the best available science informing the objective of reaching global peaking of emissions as soon as possible and to undertake rapid reductions thereafter to achieve carbon neutrality in the second half of this century.⁵⁴ Hence, studies that generate new knowledge or synthesize existing science on climate disaster risk provide an information base upon which more disaster-focused mitigation policy can be pursued.

Such knowledge is necessary but not sufficient, and more central to an enhanced capacity to develop mitigation commitments in anticipation of immediate and slow-onset disasters are the Paris Agreement's processes for pledging and reviewing emissions reduction promises. Under the Paris Agreement parties undertake to "prepare, communicate and maintain successive nationally determined contributions [NDC] that it intends to achieve"⁵⁵ on a five-yearly cycle, with each successive NDC to "represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition."⁵⁶ As these NDCs are submitted on a rolling basis their adequacy needs to be tested by reference to their capacity to avoid or minimize climate change risk, including their contributing to mitigating immediate and slow-onset disaster risk. Furthermore, the "global stocktake" procedure to commence in 2023, and to occur every five years thereafter, makes possible a global-level assessment of collective progress to avoid dangerous climate change. In this process it would be helpful for policy-makers to have an updated assessment from the IPCC on the links between extreme weather events and climate change, bearing in mind the developments in scientific knowledge since the IPCC issued its special report on the topic in 2012.

The Paris Agreement holds significant potential for mitigating climate change, not least because for the first time it brings together both developed and developing states under a single legal framework. Nonetheless there are many challenges that remain, including threatened United States defection from the regime (which could take place on 4 November 2020 if notice of withdrawal is given on the earliest possible date, 4 November 2019).⁵⁷ However the larger challenge in both the NDC and global stocktake processes will be translating scientific guidance on climate risks and emissions abatement pathways into global and national carbon budgets. Rockström et al. observe that there remain "alarming inconsistencies . . . between science-based targets and national commitments" and they argue for clearer policy heuristics to achieve the Paris Agreement goals, such as their proposed "carbon law," which would halve anthropogenic CO₂ emissions every decade until emissions reach zero by mid-century.⁵⁸ Just as important as policy shorthand concepts are heuristics that can simplify the connections between climate

⁵⁴ Paris Agreement, *supra* note 45, art. 4(1).

⁵⁵ Paris Agreement, *supra* note 45, art. 4(2).

⁵⁶ Paris Agreement, *supra* note 45, art. 4(3).

⁵⁷ Under art. 28 of the Paris Agreement at any time after three years from the date on which the agreement enters into force for a party that party may withdraw by giving written notification to the Depositary. Any such withdrawal shall then take effect on the expiry of one year from the date of receipt of the notification of withdrawal by the depositary. Paris Agreement, *supra* note 45, art 28.

⁵⁸ Johan Rockström et al., *A Roadmap for Rapid Decarbonization*, 355(6331) *Sci.* 1269, 1269 (2017).

change and disaster risk. Hansen and colleagues have noted that “the greatest barrier to public recognition of human-made climate change is probably the natural variability of local climate.”⁵⁹ One way to overcome this, they suggest, is through explaining how climate change involves “loading the dice” for disaster because of the systematic change in temperature anomalies.⁶⁰

II. Adaptation

Climate adaptation policy seeks to help societies prepare for and endure ongoing and future climatic changes. Climate change-related disasters are among the impacts that have been the subject of adaptation efforts. This has particularly been the case in the context of assisting adaptation in states that are especially vulnerable to the damaging impacts of climate change. The UNFCCC, Kyoto Protocol, Copenhagen Accord⁶¹ and Paris Agreement all refer to states that are “particularly vulnerable to the adverse effects of climate change” as requiring, among other things, greater assistance in adapting to climate change. Article 7(6) of the Paris Agreement provides that parties “recognize the importance of support for and international cooperation on adaptation efforts” and the importance of considering the “needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change.”

The climate regime now has an extensive sub-regime for addressing adaptation. One of the reasons why the adaptation sub-regime has been able to expand so significantly is because it is, like disaster risk management generally, less controversial than climate mitigation policy. Whereas mitigation inevitably directs attention to difficult issues of historic and contemporary responsibility for emissions, and involves policies that carry economy-wide implications, adaptation policy carries fewer political costs and can be pursued even by governments otherwise hostile to climate policy. Central to the adaptation pillar of the global climate regime is the 2010 Cancun Adaptation Framework (CAF),⁶² which seeks to enhance substantially global action on adaptation, and does so through attention to five areas: (1) implementation through adaptation planning, (2) support for developing countries by developed countries, (3) greater institutional support, including the establishment of an Adaptation Committee, (4) adoption of principles to guide adaptation efforts, and (5) greater engagement by all relevant stakeholders.

The CAF refers to “disasters” in the context of “enhanced action on adaptation” and “invites” all parties to improve their adaptation responses by, among other things, “[e]nhancing climate change related disaster risk reduction strategies, taking into consideration the Hyogo Framework for Action, where appropriate, early warning systems, risk assessment and management, and sharing and transfer mechanisms such as insurance, at the local, national, subregional and regional levels, as appropriate.”⁶³ The

⁵⁹ James Hansen, Makiko Sato & Reto Ruedy, *Perception of Climate Change*, 109 PROC. OF THE NAT'L ACAD. OF SCI. E2415 (2012).

⁶⁰ *Id.*

⁶¹ UNFCCC, Report of the Conference of the Parties on its Fifteenth Session, 15th Sess., Addendum, U.N. Doc. FCCC/CP/2009/L.7 (Mar. 30, 2010).

⁶² Decision 1/CP.16, U.N. Doc. FCCC/CP/2010/7/Add. 1 (Mar. 15, 2011).

⁶³ *Id.* at 14(e).

key to the delivery of climate adaptation policy has always been adequate financing to support adaptation programs and projects in developing countries that are particularly vulnerable to climate change impacts, including disasters. The main financing institutions under the UNFCCC are the Green Climate Fund, the Adaptation Fund, and the Least Developed Countries Fund. All have a role to play in supporting adaptation efforts that seek to address climate change-related disaster risk, although the level of funding they have garnered is substantially lower than the amount required.⁶⁴

III. Loss and Damage

A new addition to the climate regime is the concept of “loss and damage.” This notion recognizes that many climate impacts, including increased disaster risk, are now unavoidable, and that as a result mechanisms are needed to minimize and address the losses (irrevocable changes) and damages (potentially reparable impacts) that are being felt in particularly vulnerable countries. From the perspective of distributive justice, there are strong arguments that the climate regime should have regard to potential victims of disasters caused or made worse by climate change in both mitigation and adaptation policy. But when impacts have not been avoided, or cannot now be avoided, then a case can be made on the basis of principles of corrective justice that losses and damages should be compensated.

Recent research on the vulnerability of low-income countries in tropical regions to rising temperatures illustrates particularly clearly the need for the loss and damage mechanism to address climate change-induced disasters. Herold et al. find that “increases in the frequency of hot extremes in low income countries already out paces that of high income countries” and this trend is set to continue.⁶⁵ Most high-income countries are located in temperate zones and face moderate or low risk to temperature extremes in coming decades. In contrast many low-income countries are located in the tropics and are particularly exposed and highly vulnerable to extreme temperatures. Because of their already high temperatures, which are close to human endurance, and their narrower temperature range, a small increase in global average temperatures will result in these countries facing persistent extreme temperatures. Herold et al. conclude that these results “should increase pressure on ‘free rider’ countries — those that contribute disproportionately to greenhouse gas emissions but have limited exposure to its climatic effects — to support climate adaptation in low income countries” and, furthermore, provide support for “explicit loss and damage compensation” that can be informed by considering a country’s historical climate trends.⁶⁶

The 2007 Bali Action Plan adopted under the UNFCCC explicitly connected disaster reduction with loss and damage, calling on UNFCCC parties to enhance action on adaptation, including “[d]isaster reduction strategies and means to address loss and

⁶⁴ See A. Sharma, *Precaution and Post-Caution in the Paris Agreement: Adaptation, Loss and Damage and Finance* 17 CLIMATE POLICY 33 (2017); R. Lyster, *Climate Justice, Adaptation and the Paris Agreement: A Recipe for Disasters?* 26 ENVIRONMENTAL POLITICS 438 (2017); and A. ZAHAR, CLIMATE CHANGE FINANCE AND INTERNATIONAL LAW (2017).

⁶⁵ Nicholas Herold et al., *Greater Increases in Temperature Extremes in Low Versus High Income Countries*, 12 ENVTL. RES. LETTERS 034007 (2017).

⁶⁶ *Id.*

damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change.”⁶⁷ Following extensive debate at successive Conferences of the Parties (COPs), the Warsaw International Mechanism for Loss and Damage Associated with Climate Change Impacts (Warsaw Mechanism)⁶⁸ was adopted in 2013. The Warsaw Mechanism seeks “to address loss and damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change.”⁶⁹ The Warsaw Mechanism remains a work in progress, and there is uncertainty as to the meaning of loss and damage and how it relates to climate-induced disasters.

Some of this uncertainty is as a result of the Paris Agreement and the diplomatic decision accompanying its adoption. The Paris Agreement addresses loss and damage in some detail in Article 8. In Article 8(1) the parties “recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events.”⁷⁰ Subsequent paragraphs reference the Warsaw Mechanism as being subject to the authority and guidance of the Conference of the Parties (Article 8(2)), and require parties to “enhance understanding, action and support” with respect to loss and damage (Article 8(3)) in areas such as early warning systems, emergency preparedness, slow-onset events, events causing permanent damage, risk insurance, non-economic loss, and resilience of communities, livelihoods, and ecosystems (Article 8(4)).

However, Article 8 of the Paris Agreement needs to be read alongside Decision 1/CP.21 adopting the Paris Agreement (Paris Decision), which in paragraph 51 provides that the Conference of the Parties “*Agrees* that Article 8 of the Agreement does not involve or provide a basis for any liability or compensation.”⁷¹ The meaning and importance of this paragraph has been the subject of considerable controversy and debate.⁷² In particular, does it have an attenuating effect, preventing the Warsaw Mechanism from developing rules for liability and compensation? If this is what paragraph 51 achieves then it would significantly undermine the potential of the Warsaw Mechanism as a means for compensating state and individual victims of disasters brought about by climate change.

Mace and Verheyen argue that there are multiple reasons to doubt that paragraph 51 of the Paris Decision does in fact prevent the development of a liability regime under the Warsaw Mechanism, or the Paris Agreement more generally.⁷³ The Paris Decision is not legally binding and so cannot itself override the Paris Agreement. Furthermore, the Decision’s interpretive value in applying treaty interpretation principles under the Vienna

⁶⁷ UNFCCC, Report of the Conference of the Parties in its Thirteenth Session, 13th Sess., Addendum, U.N. Doc FCCC/CP/2007/6/Add.1 (Mar. 14, 2008), Decision 1/CP.13, 1(c)(iii).

⁶⁸ UNFCCC, Report of the Conference of the Parties on its Nineteenth Session, 19th Sess., U.N. Doc. FCCC/CP/2013/10/Add.1 (Jan. 31, 2014), Decision 2/CP.19.

⁶⁹ WARSAW INTERNATIONAL MECHANISM FOR LOSS AND DAMAGE ASSOCIATED WITH CLIMATE CHANGE IMPACTS, http://unfccc.int/adaptation/workstreams/loss_and_damage/items/8134.php.

⁷⁰ Paris Agreement, *supra* note 45, art. 8(1).

⁷¹ *Id.* at 51.

⁷² M.J. Mace & Roda Verheyen, *Loss, Damage and Responsibility after COP21: All Options Open for the Paris Agreement*, 25 REV. OF EUR. COMMUNITY AND INT’L ENVTL L. 197 (2016).

⁷³ *Id.* at 206.

Convention on the Law of Treaties⁷⁴ is also potentially limited because it was adopted by the parties to the UNFCCC not the Paris Agreement (which had not at that stage entered into force). In addition, even assuming it could affect the interpretation or operation of Article 8, paragraph 51 would not affect liabilities accruing before the entry into force of the Paris Agreement. And finally, in any event, paragraph 51 could be overturned by a future decision of the UNFCCC COP or the Paris Agreement CMA.

The ambiguous approach to loss and damage in the Paris Agreement and accompanying Paris Decision is a symptom of the broader failure of the climate regime to come to grips with the legal issues associated with the harm caused by climate change. Mayer points out that the primary organizing principle for the climate regime is “common but differentiated responsibility” and that “[t]he uprooting of climate governance from the no-harm principle has caused a lack of normative foundations which could serve as an objective touchstone for the reasonableness of national claims.”⁷⁵ The no-harm rule, requiring states to ensure that activities within their jurisdiction do not cause major transboundary harm, lies at the centre of international environmental law⁷⁶ and is a necessary implication of the sovereign equality of states.⁷⁷ However, the climate regime has avoided directly dealing with the issue, less as a consequence of the scientific difficulties in attributing damage to particular states and more because of the diplomatic controversies associated with any discussion of liability for past or future climate change damage. Shifting the focus back to the harm that climate change causes, including in worsening the risk of disasters, would provide clearer policy direction and concentrate attention on climate change as a present and not future challenge.

There remain political and technical challenges in devising a liability system within the climate regime that could provide fair recompense for loss or damage, including from climate-linked disasters. However, there are a cluster of state and civil liability regimes for environmental harm which could provide inspiration for a climate disaster liability system. These are generally built around the finding of fault (or its automatic imposition through strict liability). For instance, treaties dealing with oil pollution damage in the marine environment establish a system of liability under which the registered owners of a vessel may be the subject of civil proceedings in the courts of member states.⁷⁸ Moreover, the oil pollution liability regime also seeks to address liability “gaps” arising in a number of situations. Hence they have facilitated the establishment of international funds that may cover compensable damage that exceeds liability limits for shipowners, and can even allow victims recourse to a fund where oil spills result from natural disasters.⁷⁹

⁷⁴ Vienna Convention on the Law of Treaties, May 23, 1969, 1155 U.N.T.S. 331.

⁷⁵ Benoit Mayer, *The Relevance of the No-Harm Principle to Climate Law and Politics*, 19 ASIA PAC. J. OF ENVTL L. 75, 85 (2016).

⁷⁶ TIM STEPHENS, INTERNATIONAL COURTS AND ENVIRONMENTAL PROTECTION (2009), ch. 5.

⁷⁷ Mayer, *supra* note 75, at 103.

⁷⁸ See DONALD R. ROTHWELL & TIM STEPHENS, THE INTERNATIONAL LAW OF THE SEA (2nd edn., 2016) 394ff.

⁷⁹ *Id.* at 398. See further Rosemary Lyster, *A Fossil Fuel-Funded Climate Disaster Response Fund under the Warsaw International Mechanism for Loss and Damage Associated with Climate Change Impacts*, 4 TRANSNAT'L ENVTL L. 125 (2015).

Also illustrative is the developing international regime for liability for deep seabed mining activities in areas beyond national jurisdiction. In *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*,⁸⁰ the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea considered the rules supplied by the 1982 United Nations Convention on the Law of the Sea⁸¹ and the Mining Code authored by the International Seabed Authority, which regulate the responsibility and liability of states and contractors for damage to the marine environment from mining activities in the deep seabed. The general rule is that states and mining contractors must exercise due diligence in undertaking seabed mining, and they will be individually or jointly liable for resulting damage if they do not meet this standard. However, if they do take due care, and damage nonetheless still occurs, then there is an obvious lacuna in liability which results in unfairness for any victim of the damage, and can lead to marine environmental harm attracting no liability or responsibility on the part of the perpetrators. To address these liability gaps, the Chamber suggested that the International Seabed Authority consider the establishment of a trust fund to compensate for damage not covered by the liability regime.⁸²

In principle, there is no reason why similar approaches to the oil pollution and deep seabed mining regimes could not be taken in the climate context and implemented under the Warsaw Mechanism. Channeling liability to industrialized states, or individual enterprises, may be politically difficult, but the establishment of a fund that involves no admission of responsibility may be achievable. A major practical hurdle will be the raising of adequate funds to be distributed by such a mechanism, and to address this various proposals have been advanced such as the imposition of a levy on fossil fuel producers.⁸³ However, there remain many details to be resolved before such a liability regime is functioning and would provide effective compensation to those states and individuals suffering climate losses and damages. Such details would include arriving at a satisfactory definition of a climate disaster and setting a threshold of seriousness of damage which would enable a claim for compensation to be made.

The loss and damage negotiations within the climate regime are likely to take on ever-increasing significance if states are unable to curb greenhouse gas emissions or to provide adequate funding for vulnerable states to adapt to long-term changes and short-term shocks such as disasters. In turn, the failure to develop an effective loss and damage mechanism is likely to catalyze further interest in litigation in national and international forums as a means by which to pursue the responsibility and liability of states and non-state actors for loss and damage caused by climate change.⁸⁴ The law, like nature, abhors

⁸⁰ *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*, Case No. 17, Advisory Opinion of Feb. 1, 2011, ITLOS Rep. 10.

⁸¹ United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

⁸² *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*, *supra* note 80, at 205.

⁸³ Lyster, *supra* note 79.

⁸⁴ JACQUELINE PEEL & HARI M. OSOFSKY, *CLIMATE CHANGE LITIGATION: REGULATORY PATHWAYS TO CLEANER ENERGY* (2015); James Thornton & Howard Covington, *Climate Change Before the Court*, 9 *NATURE GEOSCIENCE* 3 (2016); Philippe Sands, *Climate Change and the Rule of Law: Adjudicating the Future in International Law*, 28 *J. OF ENVTL L.* 19 (2016).

a vacuum, and courts, both national and international, will increasingly be called upon to address questions of compensation.

CONCLUSION

The development of international environmental law has been significantly affected by disasters, with many of its norms and institutions emerging directly in response to crises such as the 1986 Chernobyl nuclear accident and 1989 *Exxon Valdez* oil spill.⁸⁵ Indeed, so dominant has been the influence of disasters in impelling legal change that it can be argued that international environmental law is a discipline of crisis.⁸⁶ International climate change law does not fit this model of reactive law-making in response to disaster, at least not yet. Although global warming can be linked to the increased occurrence of many extreme weather events, the legal response has not followed the familiar pattern seen in the aftermath of other environmental disasters. This is for the obvious (but unsatisfactory) reason that the climate change causes of disasters such as major storms and heat waves appear far too remote. Even more challenging is tracing the thread of accountability to identifiable actors such as states and corporations.

However, as the contributions to this book make clear, disasters are one of the most troubling aspects of climate change damage and they merit much closer consideration. It has been argued in this chapter that across the mitigation, adaptation, and loss and damage issue-areas of international climate change law there can and should be greater focus on immediate and slow-onset disasters. In the Anthropocene it is unsafe to assume that the Earth system will continue to function in the mostly predictable manner of the Holocene which supplied the “Goldilocks” conditions that have been essential for the emergence of human civilization. Instead there are real risks of abrupt, non-linear, climatic (and other Earth system) change that will result in disasters at scales not previously experienced in human history.⁸⁷ A turn to disaster risk reduction in response to this threat is no substitute for the difficult work of determining and implementing strict global and national carbon budgets to meet the objectives of the Paris Agreement. Instruments such as the Sendai Framework, as important as they are, can offer only wishful thinking when it comes to the governance of environmental disasters in the Anthropocene.

⁸⁵ Tim Stephens, *Disasters, International Environmental Law and the Anthropocene*, in RESEARCH HANDBOOK ON DISASTERS AND INTERNATIONAL LAW (Susan C. Breau & Katja L.H. Samuel eds., 2016).

⁸⁶ Karin Mickelson, *Between Crisis and Complacency: Seeking Commitment in International Environmental Law*, 44 NETHERLANDS Y.B. OF INT'L L. 139 (2013).

⁸⁷ RICHARD A. POSNER, *CATASTROPHE: RISK AND RESPONSE* (2004), 92–138.