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Can 'loss and damage' carry the load?

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Even assuming a heroic rush towards carbon reduction and adaptation, some regions of the world will be hammered hard by climate impacts. Thus, a global consensus now sees the need for a supplemental plan to deal with the kind of harms that cannot be avoided—what Parties call 'loss and damage'. For a loss-and-damage plan to work, it must be capable of carrying the load, the load being whatever minimal standards that morality and political consensus require. But if residual risk climbs too high, it will fall short of even the most basic expectations. The Paris Agreement calls for holding the rise in global average temperature to 'well below 2°C above pre-industrial levels', while working to limit the increase to 1.5°C. How much difference is in that half-degree? From the point of view of residual risk, quite a lot. According to a 2016 study published by the European Geosciences Union, a jump from 1.5°C to 2°C could produce outside impacts, particularly in tropical latitudes. That difference could mark the line between a plan that is politically and morally defensible and one that is not. At the very least, the difference is enough to inform the design and expectations of any future plan.

This article is part of the theme issue 'The Paris Agreement: understanding the physical and social challenges for a warming world of 1.5°C above pre-industrial levels'.

... the freight should be/Proportioned to
the groove.

— Emily Dickinson [1]

1. Introduction

Even assuming a heroic rush towards carbon reduction and adaptation, some regions of the world will be hammered hard by climate impacts. Thus, the global

community appears to have reached consensus on the need for a supplemental plan to deal with the kind of harms that cannot be avoided—what Parties to the Paris Agreement call ‘loss and damage’. While it is too soon to say what a concrete plan would look like, an eventual package could draw from a range of tools from insurance, to recovery assistance, to special compensation funds, to relocation assistance and even immigration privileges. What we *do* know is that the size and cost of this supplemental plan are inversely related to the performance of the original plan, built upon mitigation and adaptation. Put another way, the more harm we fail to avoid through carbon reduction and adaptation, the more harm we will have to address through a loss-and-damage plan.¹

Just as there are limits to what the original plan can realistically achieve, there are limits for a supplemental plan too. Insurance programmes, for instance, work best where risk is predictable and claims are spread out over time and extent of severity. When uncertainty soars and claims concentrate, insurance markets crash. There is also the issue of morality: at what point does after-the-fact aid become simply a mockery of justice, a way of ‘buying off’ people because the real work of harm prevention seemed too difficult or inconvenient at the time?

For a loss-and-damage plan to work, it must be capable of *carrying the load*, the load being whatever minimal standards of fairness and coverage that morality and political consensus require.² But if residual risk climbs too high, it will fall short of even the most basic expectations. For that reason, it is important to examine the projected load of residual risk under chosen climate scenarios. The Paris Agreement calls for holding the rise in global average temperature to ‘well below 2°C above pre-industrial levels’, while ‘pursuing efforts to limit the temperature increase to 1.5°C’. How much difference is in that half-degree? From the point of view of residual risk, quite a lot.

According to a 2016 study published by the European Geosciences Union, a jump from 1.5°C to 2°C could produce outsize impacts, particularly in tropical latitudes, where most of the world’s poor reside. For those concerned with loss-and-damage policy, this half-degree difference could mark the line between a supplemental plan that is politically and morally defensible and one that is not. At the very least, the difference is large enough to affect what the design and reasonable expectations of a loss-and-damage plan should look like.

Section 2 introduces the concept of ‘loss and damage’ and shows its relationship to mitigation and adaptation efforts. Section 3 surveys the international policy debate over the concept. It also examines the moral and practical justifications for addressing the residual risk of climate change. Section 4 examines the scientific literature to understand how climate impacts might differ between the 1.5°C and 2°C scenarios, paying attention to the goals of loss-and-damage policy. Based on the evidence, I conclude that holding global temperature increases to 1.5°C would produce *substantial benefits* for successful implementation when compared with the 2°C scenario. Section 5 suggests a set of principles to guide the development of loss-and-damage policy, emphasizing the need for incentives to minimize future warming. I use those principles to suggest recommendations for designing a global compensation fund and a climate displacement facility. Section 5 also suggests why attribution science and developments in climate litigation remain important to the loss-and-damage cause.

¹I use the terms ‘loss-and-damage plan’ and ‘loss-and-damage policy’ to describe the global policy response anticipated by the Warsaw International Mechanism, which speaks of enhanced ‘action and support’ to address climate-change impacts beyond what can be dealt with through adaptation. See discussion below in §3a. Because no full plan or policy has yet been agreed upon, the idea is a general one.

²These minimal standards cannot be defined solely through objective means. Rather, they will emerge from the perspectives and values held by those designing the plan and the nations operating within it. Because it is unlikely that victims of loss and damage can ever be made fully whole, we are inevitably talking about what sort of arrangement the global community would find minimally ‘acceptable’ or ‘just’ under these imperfect circumstances. My goal is not to propose such standards here, although I do suggest a line of moral reasoning in §3b that I think could help in developing such standards. Rather, I seek to show that *whatever* one thinks a supplemental plan should aim for, that target will likely be much harder to hit in a 2°C world, as compared to a 1.5°C world.

2. The meaning of loss and damage

The meaning of ‘loss and damage’ is not fixed and has evolved with the international negotiations surrounding it. For our purposes, we can say loss and damage refer to the residual impacts of climate change, that is, the negative effects of climate change that we have not been able to avoid through emissions reductions (mitigation) and ‘that people have not been able to cope with or adapt to’ [2].

Applying lawyerly precision, we can interpret ‘damage’ to mean harm to a place or thing that can be restored or rebuilt. ‘Loss’ can be seen as a harm that, while compensable in some way, is beyond exact replacement or complete repair [3]. The value of some losses, like a reduction in water availability or a season of withered crops, can be readily monetized. The value of other kinds of losses, like the forfeiture of homeland or the death of a religious rite, cannot be [3]. Loss and damage can result from sudden-impact events (storms, floods and wildfires), slow-onset processes (sea-level rise, thawing permafrost and desertification), or a combination of both (river floods caused by a dissolving glacier). In policy discussions, loss and damage usually refer to overwhelming, catastrophic events, suggesting an association with disaster risk reduction (DRR) and disaster recovery.

The literature quantifying the extent of potential loss and damage is slim. But the assessments we have are jaw-dropping. Martin Parry and his colleagues put the mean cost of residual loss between 2000 and 2200 at US\$275 trillion [4]. A report prepared for the UN Economic Commission for Africa found that loss and damage in Africa could reduce gross domestic product in many sectors between 1% and 5% (based on warming scenarios of 2 to more than 4°C) [5]. According to Parry, it is possible that loss and damage will account for two-thirds of all climate-change impacts [4].

Because loss and damage are defined by the limitations of mitigation and adaptation, one obvious way to address the problem—in lieu of after-the-fact repair or compensation—is to extend the effectiveness of mitigation and adaptation so as to avoid extensive harm before it happens [3]. This is why knowing the practical differences between a world with 1.5°C of warming and one with 2°C of warming is so important to understanding the practical effectiveness of the loss-and-damage project.

3. Loss-and-damage policy

(a) History and shape

The UN Framework Convention on Climate Change (UNFCCC) addresses loss and damage through the Warsaw International Mechanism for Loss and Damage, now incorporated into Article 8 of the Paris Agreement. Understanding the debate behind the Warsaw Mechanism helps us understand the special nature of catastrophic risk within the international climate conversation. Members of the global South—particularly small island nations—had long voiced concern over the residual risk of extreme events like heavy rains, drought and storm surge.³ Given the scale of the hazard, they argued that such risks deserved to be treated as a distinct category in climate policy. When financial commitments to adaptation funds softened, many in the global South were alarmed and began emphasizing again the special needs of disaster-prone areas. The solution was a proposed mechanism to address severe climate impacts that could not ‘be reduced by adaptation’ [6].

Developed nations, including the USA, and the European Union, argued that matters of climate-related disaster should be left to the Hyogo and Sendai frameworks on DRR [7,8]. Developing nations disagreed. They argued that loss and damage should be included in the UNFCCC as a topic separate from either mitigation or adaptation, a position that, as we will see, has gained purchase.

³See, for example, submission of Nauru on behalf of The Alliance of Small Island States. Views and information on elements to be included in the recommendations on loss and damage in accordance with decision, 1/CP.16 (28 September 2012).

The South's argument drew from two principles of international environmental law. The first, embodied in the 'no-harm rule' and in the 'polluter pays principle', holds that the party responsible for producing pollution should be responsible for preventing or remedying harm caused to another nation. Because wealthy countries have contributed more to climate change than poorer ones, it stood to reason that the wealthy should pay more to reduce risks in the South. Leaving residual risk to the frameworks of Hyogo and Sendai would ignore the North's special responsibility here. It would slant the discussion away from hard-headed *accountability* and instead towards soft-hearted *charity*.

The second principle, suggested in various human rights agreements, is that certain human deprivations, such as loss of life, livelihood and shelter, are more objectionable and urgent than others. Because these deprivations are so widespread during disaster, treating disaster risk as a special category of climate policy, with a distinct mechanism for funding, seemed to make sense.

With the Warsaw Mechanism, representatives of the North and South reached a temporary compromise. The mechanism offers a partial victory to developing nations by reserving a spot for disaster risk on the climate side of international law. Developing nations were unhappy that the mechanism was folded into the adaptation programme, rather than being allowed to stand on its own. But they were able to slip a sentence into the founding document's preamble that acknowledged—at least in 'some cases'—that loss and damage could involve more than 'that which can be reduced by adaptation' [9]. A new chunk of turf outside the fence line had been flagged.

The Warsaw Mechanism addresses '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' [9]. The mechanism promises development of enhanced 'risk management approaches' and stronger coordination among stakeholders; but the most significant commitment comes in the form of enhanced 'action and support, including finance, technology and capacity-building' [9].

A work plan approved in 2014 adds more detail [10]. For 'risk management approaches', it embraces everything from risk reduction (making things safer), to risk transfer (insuring or otherwise sharing a loss), to risk retention (basically accepting the loss) [10]. For descriptions of these strategies beyond my parentheticals, see [11]. 'Transformational approaches', suggesting deep shifts in individual and social behaviour, are also mentioned [10]. The plan calls for more research on many kinds of financial instruments, including catastrophe bonds, 'climate-themed bonds' and contingency finance [10]. It calls also for enhanced research on non-economic loss, a topic that has proved controversial in the past. Finally, special attention is given to the effects of climate change on 'patterns of migration, displacement and human mobility' [10].

A year later the Paris Agreement devoted an independent provision to loss and damage, cementing the South's claim to an agenda beyond adaptation. But, at the insistence of the USA, the provision specifically holds that it will not provide 'a basis for any liability or compensation' [12]. All policies regarding loss and damage under the Paris Agreement are vested in the Warsaw Mechanism.

(b) Moral grounding

Climate negotiations and the resulting policies are heavily influenced by moral arguments, though they are not often stated explicitly [13]. Assessing the moral grounding of climate policy helps us understand why Parties take the positions they do and what goals they hope to achieve. In the case of loss and damage, knowing the moral grounding allows us to imagine what a normatively successful programme would look like and in what climate-change scenarios it might be possible.

I have already mentioned that the desire for a loss-and-damage programme 'beyond adaptation' was based partly on the 'polluter pays principle' as well as the idea that catastrophic damage justifies special consideration. Both rationales are rooted in moral claims. While the 'polluter pays principle' is often treated as an economic rule of cost allocation, its holding that

those who cause damage should pay for it recalls Aristotle's description of corrective justice [14] and underlies the earliest theories of tort law in the West [15].

The special case for catastrophic damage derives from a large body of thought concerned with humanitarian aid. But it is captured well by Amartya Sen's theory of development and human capability, a concept he first introduced at Stanford University's Tanner Lecture on Human Values in 1979 [16]. Put simply, the capability is a measure of what people can actually do and what they can actually become. Following liberal thinkers before him, Sen posits personal freedom as society's 'basic building block' [17]. A nation's first goal, therefore, is to promote such freedom. But freedom without the resources to make real choices and to experience real consequences is an empty shell. True freedom, therefore, requires that all persons have the real-life capabilities to 'lead the kind of lives they value—and have reason to value' [17]. At the very least, that means, according to Sen, that all persons are entitled to such 'elementary capabilities' as 'being able to avoid such deprivations as starvation, undernourishment, escapable morbidity and premature mortality, as well as ... being literate and numerate, enjoying political participation and uncensored speech and so on' [17].

Reading social contract theory in global terms, advantaged societies bear some moral responsibility for promoting development and freedom in disadvantaged societies. As John Rawls argued in *The Law of Peoples*, rich nations have at least the duty to help their poorer neighbours 'manage their own affairs reasonably and rationally and eventually ... become members of the Society of well-ordered Peoples' [18,19]. Similar to Amartya Sen, Rawls also believed that the exercise of personal freedom required certain necessities, which he called 'primary goods'. Those goods include 'positions of authority', 'income and wealth' and the kind of social recognition that 'gives citizens a sense of self-worth and the confidence to carry out their plans'.

It should not matter that the link between carbon emissions and societal damage is hard to quantify. Injustice flows not only from *acts*, but also from *failures to act*. In her influential book, *The Faces of Injustice* [20], Judith Shklar shows how what some might see as hard-luck 'misfortunes' (she uses the example of earthquake damage) might properly be seen as 'injustices' once we take into account the victims' perspective and the possibility that privileged bystanders might have helped prevent or relieve the suffering. 'It is not the origin of the injury', writes Shklar, 'but the possibility of preventing and reducing costs, that allows us to judge whether there was or was not unjustified passivity in the face of disaster' [20]. The point applies equally to private and public parties. Indeed, the USA has raised this idea in loss-and-damage negotiations, arguing that political leaders in the South are obligated to reduce climate-based disaster risk within their own countries [21]. This is surely true. (And we should not forget that political leaders in the North owe their citizens the same duty.) What developing nations would add is that the injunction against 'unjustified passivity' applies not only within nations, but also among them.

With this back-pocket survey in mind, we might begin to list some characteristics that a morally grounded loss-and-damage package should have. It would relieve or repair damage reasonably attributable to the carbon emissions of third parties (the 'polluter pays principle'). It would enable the poorest countries to manage their affairs 'reasonably and rationally' in the face of climate change, while offering citizens the means to avoid 'escapable morbidity and premature mortality' (Sen's capability approach and Rawls' theory of global contract). And it would not accept difficulties in climate attribution as an excuse for inaction (the rule against 'unjustified passivity').

(c) Practical goals

In addition to serving significant moral responsibilities, action on loss and damage intends to meet a variety of practical goals as well. Peace and stability are high on the list. A body of literature links climate-induced disasters such as desertification and flood to mass migration, refugee crises, political instability and cross-border conflict. Loss-and-damage programmes may also be a necessary way of making sure that other global investments in development and aid are

not washed away in the next superstorm. (In this way, the loss-and-damage programme supports the goals of UN sustainability goals as well as DRR.) By working to relieve risk-based stressors that result in group-based discrimination, the loss-and-damage project might also serve to relieve various forms of discrimination, thus promoting the goals of the International Convention on the Elimination of All Forms of Racial Discrimination, the Convention on the Elimination of All Forms of Discrimination Against Women, and other similar agreements [22].

Action on loss and damage might also allow high-emissions countries and their resident corporations to minimize exposure to tort-based lawsuits or other efforts to hold them individually accountable [23]. As legal experts have shown, the no-harm rule under customary international law at least in theory exposes high-emissions countries to liability to loss and damage proximately caused by global warming [23]. The Paris Agreement does nothing to change this, instead insisting only that the 2015 accord should not create a *new* basis for liability [24]. In addition, traditional tort law continues to expose private corporations, from oil companies to electric utilities, to liability all over the world.

4. The half-degree difference

(a) What is at stake

Analysing a loss-and-damage programme in the context of a 1.5°C world brings challenges. As with other topics in this theme issue, we are blinkered by our own inexact understanding of what a world warmed by 1.5°C would actually look like. Long-term forecasts of precipitation patterns, ice-melt, drought and other impacts remain impressionistic. Maybe one reason we know so little about the 1.5°C scenario is because, from a real-politics perspective, it seems so unlikely. In fact, some researchers believe that ‘time has nearly run out’ for achieving the 2°C scenario [25]. (Even in the unlikely event that all Parties under the Paris Agreement completely met their goals, we might still be looking at 2.7°C of warming from pre-industrial levels [26].) That said, if there is some plausible chance of hitting the 1.5°C (or 2°C) mark, it would be a mistake not to assess the benefits and work towards them.

Add to this the fact that we still have only a vague idea of what a finalized loss-and-damage programme would be capable of. And while we might be able to know what the goals of such a programme *should* be (based on the moral grounding and on practical needs), we cannot say what the goals, once agreed upon, *will* be. Will the programme command sufficient funds? Will it address *both* risk reduction *and* after-the-fact recovery? Will the vexing ‘l-word’ (liability) be part of the equation? Questions like these are not climate-controlled the way a home is. That is, the answers will likely depend on how pronounced the impacts of climate change are estimated to be. A robust loss-and-damage package that looks ‘doable’ in a 1.5°C world might seem impossible in a 2°C world, leading decision-makers in the latter scenario to lower their expectations and choose something more modest. Like everything else touching climate change, public policy is swaddled in feedback loops.

But we are not completely adrift. There are some assumptions we can make about a loss-and-damage programme, just as there are some assumptions we might cautiously make about the difference between a 1.5°C world and a 2°C world. First, as a result of the Paris Agreement, we know that loss and damage represent something close to a freestanding pillar in the climate-policy forum. Its concerns are separate from mitigation, and it is ‘beyond adaptation’. Loss and damage focus on what is unavoidable, irreparable and perhaps even unimaginable. Second, loss and damage give special attention to slow-onset events like sea-level rise, glacial melt and crop loss. Third, loss and damage devote specific attention to the most geographically and socially vulnerable populations. Mitigation and adaptation also pay heed to the vulnerable; but the loss-and-damage project—driven by the existential threats faced by the world’s most fragile societies—spends most of its time in the climate crosshairs. Finally, some of the policy mechanisms that appear most likely to be incorporated in a loss-and-damage programme could very well require case-by-case evidence of climate attribution. (And this would be consistent with

the ‘polluter pays’ aspect of the moral argument.) A tort-like liability scheme is the most obvious example (though perhaps the least likely). But compensation funds and insurance programmes, depending on how they are conceived, could also require evidence of causality. The reliability of attribution analysis in a 1.5°C world or a 2°C world will, therefore, be key.

By including references to both 1.5°C and 2°C of warming, the Paris Agreement invites comparison between the two. The problem, as Linta Mathew and Sonia Akter point out, is that we have much more information about the costs (that is, the ‘economic constraints’) of achieving the lower goal than we do about the benefits (avoided harm) [27]. That is a crucial deficit because research shows that even experts are apt to unduly minimize policy benefits when comparing them to costs that are more certain and more quantifiable [28]. In terms of loss and damage, knowing the difference in avoided harm within this half-degree range would help us understand whether such a programme would be capable of minimizing risk or compensating victims at the level we should want. That is, it would help us know whether loss and damage can carry the load. Based on the limited scientific analysis now available, it would appear that the goals of a robust loss-and-damage programme would be *much easier* to achieve in a 1.5°C scenario.

(b) Potential advantages of a 1.5°C world over a 2°C world

There are not many studies addressing the differences in climate impact between the 1.5°C and 2°C scenarios. But in 2016, a study led by Carl-Friedrich Schleussner and published by the European Geosciences Union (hereinafter, the ‘Schleussner Study’) provided what may be the most detailed glimpse yet of the difference between those two warming levels [29]. Examining extreme-weather events, water availability, agricultural yields, sea-level rise and the risk of coral reef loss, the study finds ‘substantial difference in impacts between a 1.5°C and 2°C warming that are highly relevant for the assessment of dangerous anthropogenic interference with the climate system’ [29].

By 2100, the Schleussner Study estimates that the rate of sea-level rise will be 30% less in a 1.5°C scenario than in a 2°C scenario. For heat-related extremes, it reports that temperatures in a 1.5°C scenario would remain within ‘the upper level of present-day natural variability’, but that a 2°C scenario would launch a steamy ‘new climate regime’ for tropical regions (with parts of Africa, South America and South-East Asia taking the biggest hit). In a 1.5°C world, the study projects that, by 2100, up to 70% of tropical coral reefs will be at risk of severe degradation on account of temperature-induced bleaching. In a 2°C world, virtually all tropical corals would be so threatened.

When it comes to precipitation-related impacts, the study finds pronounced regional differences and distinct ‘hot spots of change’ [29]. In the Mediterranean (a region that includes southern Europe, North Africa and the Levant), reductions in median water availability would nearly double from 9% to 17% should warming jump from 1.5°C to 2°C, while regional dry spells, according to the models, would increase from 7% to 11%. (The study projects reductions of median water availability as high as 30% between the two scenarios in South Africa, Central America, the southern USA and South Australia.) The difference in crop loss in West Africa, South-East Asia, Central America and northern South America is projected to be substantial, particularly for wheat and maize. (For instance, in West Africa, a half-degree increase over 1.5°C would cause reductions in wheat yield to jump from 9% to 15%.) The planet’s sensitivity to temperature increase, according to this study, is remarkable—and frightening. But the silver lining is that tamping down on temperature increases even a little bit can make a big difference. Holding global warming to a half-degree below 2°C would dramatically abate water scarcity, slow sea-level rise, save the world’s tropical reefs from complete collapse, prevent sharp declines in crop production and reduce crippling heat waves.

(c) The implications for loss-and-damage policy

From the perspective of governance, the message here is that the relationship between temperature increase and the policy challenges is not linear. Thus, it would be a mistake to say

that a gradual climb in temperature beyond 1.5°C will result in a gradual climb in implementation difficulties for loss-and-damage programmes. Rather, a gradual climb in temperature beyond 1.5°C will more likely result in an *abrupt surge* of implementation difficulties for loss-and-damage programmes. Or to put it positively, holding global temperature increases to 1.5°C would produce *substantial benefits* for successful implementation when compared with the 2°C scenario. That is because the places and impacts most dramatically affected by the half-degree difference, according to the Schleussner Study, are among the places and impacts that the loss-and-damage project cares most about.

Let us take a look at three items especially important to loss-and-damage policy: vulnerable populations, ‘big ticket’ impacts and the insurance mechanisms. The loss-and-damage policy emphasizes the needs of impoverished populations. The plight of the disadvantaged is stressed in the policy’s historical development, its stated purpose and implementation strategies, and its moral grounding. And unfortunately, the Schleussner Study suggests that some of the largest disproportionate effects of a half-degree increase over the 1.5°C goal will hit places that already bear disproportionate economic and social challenges: North Africa and the Levant (water scarcity), West Africa (crop loss), South America and South-East Asia (intense heat), and many other coastal nations and island states (sea-level rise, loss of coral). (The list is not complete, but makes my point.) Overlapping challenges in these regions—which can include startling levels of poverty, illiteracy, disease, political corruption, religious and ethnic strife, and armed conflict—all conspire to make climate impacts of any degree much harder to avoid and more ruinous when they occur [30]. Thus, it is essential for loss-and-damage policy that surges of climate impacts in developing countries be kept to a minimum.

Many of the largest differences between the 1.5°C and 2°C scenarios involve what I call the ‘big ticket’ impacts—those with the potential to cause the greatest and most widespread social damage. Here, I refer to extreme and enduring heat in the tropics (a ‘new climate regime’); sharp reductions in the production of wheat and maize in West Africa, South-East Asia, Central America and northern South America; steep declines in water availability throughout the Mediterranean region, South Africa, Central America, the southern USA and South Australia; and an increase in the rate of sea-level rise. Impacts like these are devastating to communities because they affect basic human systems like habitation and food production, and because their baleful march forward seems so relentless and inevitable.

The UN Intergovernmental Panel on Climate Change (IPCC), for instance, links extreme-weather events to population displacement and planned migration from both rural and urban areas [30]. Human migration, which is a top concern of current loss-and-damage policy, might also be prompted by widespread crop loss, desertification, water scarcity or sea-level rise. The IPCC similarly expects climate change to influence national security policies around the world, as a result of sea-level rise, declining water resources and disputes over fish stocks (note that fisheries can be affected by damage to coral reefs) [30]. It also suggests that crop loss and other sources of food insecurity would send low-income populations hurtling into poverty as the price of food soars [30]. Meanwhile, submergence, coastal flooding and coastal erosion (all caused or amplified by sea-level rise) threaten to ‘increase significantly’ the burdens of coastal communities. Some low-lying nations or small island states, according to the IPCC, could see ‘associated damage and adaptation costs of several percentage points of GDP’ [30].

The IPCC also reports that climate change can ‘indirectly increase risks of violent conflicts in the form of civil war and inter-group violence’ [30]. A recent study of armed-conflict risk and climate impacts (also headed by Carl-Friedrich Schleussner) lends support to this thesis [31]. The analysis finds that climate-related disasters, including droughts and heat waves, enhanced the risk of armed conflicts occurring between 1980 and 2010 in ethnically fractionalized countries, ‘imply[ing] that disasters might act as a threat multiplier in several of the world’s most conflict-prone regions’ [31]. These regions—identified as North Africa, Central Africa, Central Asia—are all ‘exceptionally vulnerable’ to climate change [31]. But North Africa is noteworthy because it is located in a region (the Mediterranean) where the risk of water scarcity is expected to rise dramatically between the 1.5°C and 2°C scenarios [29]. The climate impacts singled out

in the Schleussner Study are exactly the kinds of impacts that should keep loss-and-damage analysts awake at night—the ones associated with mass migration, food insecurity, regional poverty, government instability, collapsing markets and armed conflict. These calamities, so many of them beyond the scale of traditional adaptation, are what loss-and-damage policy is supposed to address.

In addition to its effects on poor regions of the world and the emphasis on ‘big ticket’ impacts, the half-degree difference also has consequences for traditional insurance markets. This is because the types of impacts that are most sensitive to a half-degree increase according to the Schleussner Study are likely to be the most challenging for the insurance system. This is mostly because of speed, scope and scale. But problems with attribution might also cause trouble.

Most of the impacts emphasized in the Schleussner Study are slow-onset events: the harm mounts gradually and, for the most part, *predictably* over time. This ‘slow and steady’ pace challenges insurance providers who rely on randomness to diversify their risk [32]. If a higher loss *always* follows the next harvest, there is no opportunity for insurers to hedge their bets and build up reserves. It is like playing poker with everyone’s cards facing up. The potential scope of harm is also a barrier to diversifying risk [32]. An insurer can meet payouts when a subpopulation of a region’s residents registers claims; but probably not when everyone does. (On the other hand, to the extent that losses are irregular and tied to swings in historically rare extreme events, there could be enough variety in time and space to allow insurers to diversify their risks. So some insurance markets might do better than others.) In addition, some assets—a beach that supports tourism, a centuries-old historical district, a chasmal barrier reef—are just too valuable or unique to adequately insure: the scale is too large.

One way insurers might seek to contain risk and add randomness would be to narrow the universe of payable claims by insisting that claimants show evidence that their loss is fairly traceable to an impact caused by anthropogenic climate change. But in our situation, attribution might prove both too easy and too hard. In contrast to extreme-weather events like tornadoes or flash floods, researchers are reasonably good at identifying causative links between global warming and at least some slow-onset events (desertification and rising sea temperatures, for example). In fact, this is one reason why Schleussner and his colleagues can estimate declines in wheat yield and coral reefs as they do. But this predictability again cuts against an insurer’s need to diversify. Claimants would learn how to show the causal link in certain kinds of cases and would do so consistently. Insurers would be hung out to dry.

On the other hand, attributing a *social harm* to a climate-induced event is harder, but probably too hard. Assume you can show that climate change was substantially responsible for a severe reduction of regional water supplies over 5 years. How do you show it was substantially responsible for the economic slump in the fourth year? Or the border war that flared up after that? Or the ensuing cross-border migration? In fact, attributing economic or other social losses to climate change turns out to be very difficult [13]. In contrast to the previous scenario where insurers always lose, here the *claimants* would always lose, defeating the very purpose of a loss-and-damage policy. Unless this attribution problem is solved, the use of attribution in a traditional insurance model seems unlikely where ‘big ticket’ impacts are concerned. As the Munich Climate Insurance Initiative concluded in 2012, while ‘insurance options can support adaptation and risk resilience for extreme weather, [they] are not appropriate for many, usually slower-onset, climate-induced impacts’ [27] (quoting the Munich Climate Insurance Initiative).

(d) Summing up

After examining the structure and goals of loss-and-damage policy in tandem with the recent literature comparing the 1.5°C and 2°C scenarios, we can say this: The loss-and-damage project only gets harder as the mercury rises, and as the temperature approaches 2°C, it gets a lot harder.

The moral duty to make victims whole and to help struggling peoples cope with disaster and live freely was always a stretch. But in a 1.5°C world, as I will argue below, there is at least some

plausible, though imperfect, path forward. In a 2°C world, given the nonlinear accelerations in crop loss and other ills, doors that would be open in the first scenario might be closed in the second. The shame of having failed our moral responsibility would be coupled with a likely acceleration of social and economic catastrophes around the world, the brutal effects of which no nation, however rich or powerful, could avoid. We could see dramatic increases in drought, economic collapse, armed conflicts, refugee crises and more. Addressing these problems at the international level would be more difficult and more expensive. So much of what the global community has done to strengthen economies, improve health and sow democracy would be put at risk. International disputes would mushroom; and the lawsuits would too.

It should be emphasized that the scientific literature on the half-degree difference is preliminary and should be read cautiously. The vision forecast above, though plausible, is not certain. But given the stakes, a loss-and-damage policy demands a precautionary approach that encourages mitigation while addressing the substantial threats lying beyond adaptation. The next section suggests in broad strokes some things we might do to approach that goal.

5. The future of loss and damage

In this section, I show how we might address loss and damage in a world where we must strive for no more than 1.5°C of warming, but must be prepared for something worse. To do this, I will offer some principles that should guide us in designing loss-and-damage policies for an uncertain future. I will then point to two important areas where these principles could be applied—rehabilitation and displacement. Finally, I will tie up two loose ends that have been drifting through some of the discussion: attribution and litigation.

(a) Guiding principles

Addressing loss and damage will be challenging in a 1.5°C world and probably much more difficult in a 2°C world. There is reason to believe that the additional half-degree of warming could lead to dramatic increases in the most damaging kinds of impacts in some of the least resilient societies on Earth. Given this situation, future work on loss-and-damage policy should be guided by four principles: (i) reduce emissions; (ii) do not cannibalize resources; (iii) be flexible; and (iv) be fair.

Reducing carbon emissions cannot be stressed enough. Loss-and-damage policy cannot carry a limitless load. The level of warming must be capped lest the whole project become reduced to mockery—the world’s largest case study in ‘too little, too late’. Incentives to reduce carbon emissions must be incorporated into all aspects of the loss-and-damage policy. The second principle is related to this: adding resources to address loss and damage must not come at the expense of reducing resources meant for mitigation or adaption. We must increase overall investment in climate action, not simply redistribute it.

Third, because we do not know what warming scenario we will ultimately land, and because we know only a little about the practical differences between neighbouring scenarios, loss-and-damage policy should remain flexible. Thus, policy structures and standards must be stable enough for parties to rely on, but pliant enough when environmental conditions change or knowledge evolves. Indeed, geographical variability and uncertainty is a theme highlighted for policy-makers in the Schleussner Study [29]. One way to balance the interests of stability and flexibility is to create a transparent decision-making structure premised on science-based information and an inclusive process for making policy choices.

Finally, loss-and-damage policy must at the same time be fair. That means more than emphasizing the interests of those most vulnerable to, and least responsible for, global warming (although it surely does mean that). Fairness requires procedural means for members of vulnerable states to be meaningfully involved in the development of these policies at every stage. Like flexibility, it too depends on transparency.

(b) A 'planning and rehabilitation' fund

As noted in §3, the Warsaw Mechanism's 2014 work plan puts a range of 'risk management approaches' on the table. This is smart because loss and damage require a multi-faceted approach. Just as important, though, is to make sure that the array of overlapping tools does not cloud the lines of accountability or our ability to measure outcomes. Thus, we might consider a robust 'centrepiece' tool for loss and damage, around which other supplemental policies can be positioned. That centrepiece could be what I will call a 'planning and rehabilitation fund' (PRF). A PRF would provide resources for hazard-risk reduction in the planning process and also for rehabilitating communities when they have been severely harmed by climate-related impacts. The 'planning' part of the fund, which engages *before* loss or damage occurs, resembles approaches taken in the Hyogo and Sendai Frameworks, as well as hazard mitigation programmes within national governments, including the National Flood Insurance Program in the USA.⁴ The 'rehabilitation' part occurs *after* loss or damage occurs, and resembles the types of national and international compensation programmes that are sometimes put in place after natural disasters or armed conflict (for more information on compensation funds, see footnote 4 and [33]). As Maxine Burkett notes, two good examples from which to draw would be the compensation-and-rehabilitation portion of the 'Multi-Window Mechanism to Address Loss and Damage', proposed by the Alliance of Small Island States in 2008 and the UN Compensation Commission, created in 1991 to compensate for loss and damage resulting from Iraq's invasion and occupation of Kuwait in 1990–1991 [34]. Indeed, my recommendations here draw partly from Burkett's analysis on this topic.

Under a PRF, UNFCCC Parties would contribute in accordance with their 'common but differentiated responsibilities and respective capabilities'. Contributions could take the form of money, technology transfer, technical assistance or other in-kind payments. To underline the importance of keeping well below the 2°C mark, strong incentives for carbon reductions must be included. A contribution mechanism could be linked to a carbon tax intended to build the fund but also lower emissions. Contributors might offset some of their payments with national or multi-lateral efforts to expand the green economy.

Eligible claims would be limited to the kinds of slow-onset events generally connected to climate change that insurance mechanisms cannot effectively address. A specific environmental event's traceability to climate change would be relevant but not strictly so. In some cases, a presumptive indicator of a causal link based on geography or the crossing of a physical threshold (sea-level rise, ocean acidification) might be used. Claims could be based on either monetary or non-monetary harm.

The eligibility of claimants would have to be worked out and would no doubt be the subject of scrupulous negotiation. But the principle favouring vulnerable populations suggests that a PRF should focus on poorer countries facing the most dramatic threats (for instance, small island states or populous states in drought-prone regions). Availability of funds to subnational governments or tribal peoples within a state might also be considered. Private claimants associated with a member state (a struggling industry, a stateless person from a 'drowning' island) might also be given access to some part of the fund. As with emissions reductions, global progress on traditional adaptation goals is critical in keeping residual loss and damage to a more manageable level [30,35]. Nations also have a moral obligation to protect the lives, property, culture and natural assets of their people. For this reason, policy designers should consider ways to link eligibility—or at least the size of award—to a claimant's best efforts at reducing risk beforehand.

In addition, claimants would be required to do one more important thing: waive their rights to pursue liability claims against the largest carbon emitters (whether current or historical). Such a waiver might even be expanded to include some claims against private companies, if conditioned on adequate side contributions. Some concession of this kind, though probably essential to any grand bargain, should not be given up lightly. I will return to this point in §5d.

⁴For an introduction to the National Flood Insurance Program, see [22].

While this is not the place to speculate on the details of implementation, we must acknowledge that a centrepiece programme such as this would by necessity be very powerful and sometimes controversial. For this reason, the implementing body must put a premium on transparency and science-based evidence. And it is essential that it be undergirded by a best-in-class technical office that is adequately protected from political influence [34]. The implementing body would take jurisdiction over all claims under the PRF. It would define the standards for contributions and for claims, updating them as scientific knowledge evolves. It would coordinate assets and set budget priorities. It would process claims and provide mechanisms for appeal.

Critically, it would be tasked with planning the fund's assets for the long-term, *taking future warming scenarios into account*. The body's technical office would be charged with scrutinizing the developing literature on warming scenarios, making recommendations for managing the fund fairly and sustainably in a future where plausible futures include warming of 1.5°C, 2°C or higher. The technical office would also press for a better understanding of attribution analysis, not only to inform the claims-processing system, but to keep the global community informed of the harm caused by mounting emissions and the added stress that this puts on loss-and-damage policy.

(c) A mechanism for displacement, migration and relocation

In addition to managing risk, the Warsaw Mechanism's 2014 work plan gives special attention to the effects of climate change on 'patterns of migration, displacement and human mobility'. The issue is particularly important to our scenario comparison because many of the slow-onset impacts highlighted in the Schleussner Study are closely associated with human migration. Climate impacts of both the sudden-impact and slow-onset kind have already displaced an estimated 26 million people [36]. No one knows what future patterns of climate-induced migration will look like, and predictions on this topic are controversial. But by 2050, it is possible that the number of climate migrants could soar to as many as 200 million, leading to untold international conflicts and economic instability [37–39]. A proposal by developing nations for a 'displacement coordination facility' within the Paris Agreement was downgraded to a task force study [40].

The drivers behind human migration are difficult to untangle, but it is reasonable to project that, in a 2°C world, the rates of displacement and migration could jump substantially. The global community must act quickly to address that issue. First, they should begin developing rules by which states would accept displaced persons [40]. The standards should incorporate 'common but differentiated responsibilities and respective capabilities'. But in an effort to minimize future warming, it should also consider a nation's progress on carbon reduction.

Financial and technological assistance will also be essential. The stages from displacement to migration to relocation can require years of planning, negotiation and implementation [41]. A comprehensive mechanism for displacement should include a special fund in which financial resources, technical assistance and perhaps even real estate are made available to qualifying claimants. As with the PRF, contributions would be related to nations' efforts to reduce carbon pollution, while eligibility would be related to efforts at hazard mitigation. In addition, expanded aid could be linked to a nation's willingness to waive some or all legal claims to liability against large carbon emitters.

Finally, we are in need of an international accord recognizing the needs of climate refugees. Currently, refugee status extends only to persons fleeing 'persecution'.⁵ Those involuntarily displaced by climate-induced disaster have no protections of self-determination or special resources. A loss-and-damage programme on displacement should provide standards for recognizing 'climate refugees', integrate them into current asylum regimes, or at least provide them with a set of voluntary guidelines that protect their basic interests.

As with the PRF, the programme should be stable but remain flexible. The office charged with implementation should be guided by the best scientific information and able to change standards

⁵Burns [40, fn 91].

as objective circumstances change. Thus, standards of immigration or technical assistance might be modified upon the crossing of a physical threshold linked to the rate of sea-level rise, for instance, or the rate of desertification. The principle of fairness would insist that all decision-making processes be transparent and that they include ample participation from more vulnerable nations.

In addition, countries should be encouraged, whether through the Warsaw Mechanism or other instrument, to adopt protections and assistance programmes for *internal* displacement, because most migration will probably occur within national borders [42].

(d) Loose ends: attribution and litigation

The role of attribution analysis remains a controversial point in climate discussions. Some researchers like Mike Hulme question its usefulness [43]. As a scientific matter, assigning a causative link to a particular storm or drought is a tricky business, and scientists are far away from being able to deliver on advocates' most ambitious claims. Devoting scientific resources to other climate-related issues would be more beneficial. As a policy matter, the notion of causation is freighted with additional social meanings that must also be taken into account. Even if science concluded that 'but for' anthropogenic warming, a devastating cyclone would very likely not have occurred, that finding would not be enough to establish responsibility in a legal or moral sense. In addition to 'but for' causation, responsibility in this sense would require investigation into more subjective issues like foreseeability, the role of intervening factors, and the nature of the social harm as compared to the imposed risk. Why go down that rabbit hole?

Advocates of attribution analysis respond that attribution analysis helps science by spurring innovation and a promotes deeper understanding of the climate system [44]. On the policy side, attribution analysis can improve the justification, planning and implementation of regional adaptation efforts. It also helps call public attention to climate change [45]. And, of course, climate litigation strategies depend on the growing field of attribution techniques.

As one who studies law, policy and international affairs, I think attribution analysis has great value. The clearest case rests on its potential to promote and inform adaptation efforts. But there is also a compelling moral argument for attribution analysis. As participants in the largest environmental crisis in human history, we have an unavoidable moral duty *to know what's going on*. We must understand in specific ways the suffering our actions are causing around the globe—from Inuit villages to steam-baked favelas—and confront that suffering unflinchingly. Understanding the cause and effect of our actions and inactions are essential to recognizing what Shklar might call the 'face of injustice'. When well-intentioned nations are consistently made aware of their moral failings, there is the possibility of change. This is particularly true among countries with democratic traditions where public awareness can lead to moral and political accountability [17]. If a 1.5°C scenario is substantially better for the world and for loss-and-damage policy than a 2°C scenario, we need all the persuasive power available to make leaders responsible for the actions and inactions on climate change.

Part of the strategy for building accountability could involve establishing legal liability for loss or damage caused by carbon emissions. I favour that mission. Such litigation can take many forms, from claims made by one country against another, to claims made by a public entity against a private entity, to claims between private entities. Claims between national governments will involve international laws and forums. Others will probably involve laws and forums at a national or regional level. A recent report issued by the UN Environment Programme found that, as of March 2017, 'climate change cases had been led in 24 countries (25 if one counts the European Union), with 654 cases led in the United States and over 230 cases led in all other countries combined' [46]. (To review these cases, as well as others added after March 2017, visit the Sabin Center–Arnold & Porter Kaye Scholer Climate Change Litigation databases, available at <http://wordpress2.ei.columbia.edu/climate-change-litigation/>.) Only a portion of these cases involve 'claims that particular emissions are the proximate cause of particular adverse climate change impacts', but the trend is growing. No claim asserting liability for particular emissions

linked to a particular impact has yet succeeded; and many (perhaps all) that remain on the docket seem likely to fail for lack of jurisdiction or a causal link (for an analysis of the challenges plaintiffs face in such cases, see [47]). But no defendant can afford to ignore the risk of liability. As plaintiffs experiment with other theories of liability and as the effects of global warming become more dire, it seems only a matter of time before such a case succeeds, encouraging many other plaintiffs to follow suit.

I favour these litigation developments, but not because I see litigation as either a very efficient or fair way of addressing impacts from climate change. (In fact, it is neither.) Rather, the risk of liability—borne either by governments or private companies—could become a source of substantial leverage for those advocating for deeper emissions cuts and more generous loss-and-damage policies. Opportunities to trade legal claims for expanded aid are therefore included in the PRF and the displacement facility described above. But nations should be careful about trading away too much, too soon. Because future warming scenarios remain uncertain, it might be helpful to link the level of liability waived to the occurrence of certain physical impacts. Thus, small island states might agree to limit claims of liability to a certain sum as long as sea-level rise remains below a certain rate or as long as the amount of global warming remains at or below 1.5°C. To maximize the leverage that litigation provides, it is important that climate attribution remain a focus of the scientific community.

6. Conclusion

An effective approach to loss and damage—climate policy’s supplemental plan—is dependent on the strength of the *original* plan, the one built on mitigation and adaptation. If we cannot keep the residual risk of global warming at a manageable level, a loss-and-damage policy will not meet basic political and moral expectations. That is why it is so important to understand the progression of climate impacts in scenarios from 1.5°C and above. Because holding global temperature increases to 1.5°C above pre-industrial levels would appear to produce *substantial benefits* for successful implementation when compared with the 2°C scenario, it is imperative to keep emissions down. Loss-and-damage policy can create incentives to do this. But it must also be prepared for higher scenarios, which means maintaining flexibility in the system and emphasizing the needs of the most vulnerable. No matter what we are able to accomplish at this stage in the game, we will not be able to address all the suffering that is headed our way. But we must do our best to minimize that suffering and address the needs in fair and creative ways.

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