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How New Climate Science and Policy Can Help Climate Refugees

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Abstract

This paper examines potential responses to emerging 'climate refugee' justice issues. 'Climate refugee' describes migrants forced to flee their homeland due to losses and damages brought about by events linked to global climate change. These include losses and damages due to extreme weather events, severe droughts and floods, sea-level rise, and an array of pollutant contamination issues. A paradigm case of climate refugeedom is seen in the influx of Peruvian immigrants into various North American cities; seeking asylum after losing access to water and agricultural resources after heavy metals were released through rapid glacial melting and contaminated these necessities in recent years.

The main discussion begins with a sketch of the scientific picture of the causal genesis of the apparently worsening "climate refugee crisis" and a concise discussion of new climate science research methods, Probabilistic Event Attribution studies (PEAs), that many agree can be used to determine the liability of certain countries for particular extreme events due to climate change (§1). Against that background, and after providing clarifications regarding the distinction between 'climate refugee' and 'environmental refugee' (§2), I then discuss key ethical and political issues that are unique to climate refugee cases (§3). Subsequently, I critically assess options for helping climate refugees through existing institutions (§4). I endorse pursuing responses to the most pressing climate refugee problems through the provisions for addressing climate change "losses and damages" in the 2016 UN Framework Convention on Climate Change, "Paris Agreement"; which outlines "risk sharing" protocol that I contend can be used to help climate refugees who are not currently subject to existing UN policies designed to help other types of refugees (e.g. those fleeing from persecution or war). I conclude by outlining a number of ways that PEAs may aid in effectively implementing those losses and damages provisions.

Keywords

Climate Refugees, Climate Adaptation, Refugee Justice, Weather Event Attribution

Introduction

This paper examines ethical and practical concerns about 'climate refugee' justice issues and potential responses to them. 'Climate refugee' describes migrants who have fled their homeland and need asylum due to losses and damages brought about by events linked to global climate change. To date, these have included losses and damages from extreme weather events, severe droughts and floods, sea-level rise, and an array of pollutant contamination issues. A paradigm case of climate refugeedom is seen in the influx of Peruvian immigrants to various cities (e.g. in North America);

seeking asylum after losing access to water and agricultural resources due to heavy metals being released through rapid glacial melting and contaminating these necessities in recent years.

The discussion below begins with a sketch of the scientific picture of the causal genesis of the apparently worsening "climate refugee crisis," followed by a concise discussion of new climate science research methods, Probabilistic Event Attribution studies (PEAs), which many agree can be used to determine the liability of certain countries for particular extreme events due to climate change (§1). Against that background, and after providing some clarifications regarding the distinction between 'climate refugee' and 'environmental refugee' (§2), I then discuss key ethical and political issues that are unique to climate refugee cases (§3). Subsequently, I critically assess options for helping climate refugees through existing institutions (§4). I endorse pursuing responses to the most pressing climate refugee problems through the provisions for addressing climate change losses and damages in the 2016 UN Framework Convention on Climate Change—the UNFCCC "Paris Agreement" Losses and Damages section—which contains policy mechanisms and outlines "risk sharing" protocol that I contend can be used to help climate refugees who are not currently subject to existing UN policy designed to help other types of refugees (e.g. those fleeing from persecution or war). I further argue that PEA methods can aid in effectively implementing those losses and damages provisions, and outline two main ways in which they may be crucially useful for these purposes.

1. The Causal Picture that Informs Responses to the Climate Refugee Crisis

Some will question whether there is really a climate refugee crisis at all. In important senses, I think *there is* beyond doubt. For quite a while now, even popular sources have documented peoples who have been forced to migrate and not return to their homelands due to events linked to climate change (see, e.g., Climate Refugee). Leading advisory organizations have also accepted that data suggests that the number of climate refugee cases will inevitably continue to grow in the near future (see, e.g., Climate Change and Disasters). Among many other historically unprecedented changes, Earth systems science tells us that, if not somehow mitigated, now unavoidable global temperature increases will cause: shortages in food crops around the world; more intense and severely damaging weather and weather patterns; and sea level rise that will cause myriad issues in coastal cities and altogether swallow up small island nations

(cf. Christensen 2017; Risse 2009; USGCRP 2017). These things I think collectively show that, yes, the climate refugee crisis is real and worsening before our eyes.

The practically significant questions to answer are then who should be legally responsible for helping climate refugees and how to help those facing such refugeedom most effectively. Here the scientific understanding of climate change—what we know about its causes and impacts—provides a foothold for beginning to formulate answers to these questions.

The basic causal picture of *anthropogenic* climate change—the picture of why one should conclude that climate change effects are outcomes of human activities—is one that is now familiar. Numerous chemical byproducts of human activities erode layers of the Earth's atmosphere that serve as a buffer to light and heat from the sun. The textbook example is the impact of CO₂ aerosols on our ozone layer, leading to ozone holes which let in much more UV waves than is typical historically; which in turn leads to an overall net rise in the temperature of Earth's atmosphere—what we call "global warming." We know that modern activities of humans produce massive amounts of byproducts such as CO₂ aerosols. It is clear that leading developed nations like China and the US produce massive amounts of erosive aerosols from industrial emissions (see Friedrich et al 2017). Large-scale livestock operations also produce huge amounts of methane, another "greenhouse gas" which is upwards of twenty times more erosive to our atmosphere than CO₂ (cf. IPCC 2014). And, of course, the wide spread use of gasoline vehicles and coal and gas driven energy production produce huge, and historically unprecedented, amounts of CO₂ emissions. That global warming is anthropogenically driven is just a clear and well established fact—or at least there is no other causal picture that explains the changes we are seeing and their correlation to more and more regular extreme events that are causing untold losses and damages (USGCRP 2017).

Accordingly, many agree that we have entered the Anthropocene; the geologic epoch marked by massive human disruption of the global patterns characteristic of the previous, more stable, Holocene epoch. Major climate change effects are progressing faster than previously expected, and their dangers can no longer be viewed as mere potential threats to future generations increasingly as we are seeing people around the world suffering losses and damages due to climate change. Even if we focus only what's happening in North America where things are comparatively good, it is easy to find a lot of people who need help right now due to events linked to climate change.

Wildfires cause tremendous damage to municipal and private properties with increasing frequency, every year now. More extreme fluctuations in seasonal temperatures and problems with more severe erosion and public space degradations (for example deteriorating roads and water systems). And, on the coasts, sea-level rise is causing unprecedented flooding which is now requiring massive engineering efforts to save large parts of cities (for example in parts of Florida).

Many North American cities are also already seeing an influx of refugees due to climate change impacts. For instance, I have already mentioned the many Peruvian peoples who have sought asylum after losing access to water and agricultural resources, as heavy metals released from glacial melting has contaminated these basic necessities. Their story alone is proof that climate change impacts have been happening, that they have wide reaching international impacts, and demand novel international and regional responses now.

One big reason they require novel responses is that previous climate change policies and management strategy responses, which focused mostly on mitigating climate change impacts, are now recognized as insufficient.¹ The scientific community, leading advisory organizations, and government entities around the world have fully accepted that we must devise and begin implementing *adaptive* responses at all levels to adequately address emerging and now unavoidable climate change challenges. One place this is explicit, is in the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement drafted at COP21; the policy track that has been increasingly negotiated with an explicit focus on emerging issues and the very real need to adapt to climate change now. 195 parties initially signed that legal "Agreement," thereby committing to contribute to the realization of substantive international "climate action plans." At the time I am writing this, 168 parties to the agreement have ratified; officially beginning steps to collectively reduce the Earth's current net emissions by 87% (Paris Agreement Ratification Tracker).

The only parties who pulled out are small countries that would have no significant impact and the United States under the Trump presidency; though all of the U.S. states that can make an appreciable difference doubled down on their commitments to the agreement in the hours and days directly following Trump's decision (see Bennett et al; Plumer 2017). More to the point, the Paris agreement lays a foundation for massive institutional responses to Anthropogenic climate change, and shows that

1. Conventional approaches to refugee issues are also insufficient to deal with many mounting problems; in addition to the discussion below see Culbertson 2016.

the international community has come to broad consensus that interconnections between human institutions, the changing dynamics of Earth systems, and climate change impacts must be accounted for in taking steps necessary to respond to climate change in effective and ethical ways. The agreement and policy track leading to it also emphasize the role that state of the art scientific findings and methods in Earth Systems Sciences should play in providing guidance in such decision-making (Articles 4; 7; and 17).

In line with this sentiment, scientists and ethicists argue that new climate event research methods, Probabilistic Event Attribution studies (PEAs), provide valuable resources for decision-making about climate justice issues (see Donhauser 2017; Otto et al 2017; Thompson & Otto 2015). PEAs use super-ensemble atmospheric data models and statistical analyses to attribute the occurrence of extreme weather events to human drivers of climate change. For example, some PEA studies argue that particular droughts and floods were caused by net emissions significantly contributed to by certain country's emissions (like US emissions) (see Allen, 2003; Stott et al 2004; Pall et al., 2011; Otto et al 2012; Bindoff et al., 2013; Stone et al., 2013).

Researchers found conclusions that a climate driver, like US emissions, caused a particular extreme event by comparing data model simulations in which that event occurs with *possible* scenario simulations, in which the selected climate drivers are removed, and that event does not occur. More specifically, PEA researchers use models with massive amounts of data and variables and parameters, and adjust those variables, until they accurately simulate a weather event that actually happened (Donhauser 2017). Then, once they are sure they have assembled the data in the right way to simulate a past weather event accurately, they remove select variables (like US emissions or China's emissions in a certain range of years) until the weather event does not occur in simulations with the same basic model. Through such data simulation comparisons they show the probability of occurrence would have been substantially lower, and that the event would not have occurred, had the relevant climate drivers been absent.

So, by doing these sorts of comparisons with models researchers might provide justification for the claim that droughts in say Russia or Syria or floods in Peru or Puerto Rico would have been improbable had U.S. emissions been a certain degree lower. It is thus arguable that such studies provide an unbiased and objective means of assigning liability for extreme events—and so provide grounds for holding major emitters, like the US and China, legally responsible for persons in nations experiencing the impacts of

extreme weather. This is why these methods are relevant to considerations of climate justice and, thus, climate refugee issues.

PEA studies are particularly valuable for informing debates about such climate justice issues, because they not only provide systematic means of establishing liability, but because they at once provide means of deflating underdetermination defenses that are often used to deflect charges of such liability. Defenses to the effect that it is not possible to establish liability because particular events are caused by net impacts on global climate can be deflated with PEA studies.² This is because researchers can, and do, run many counterfactual scenarios using these data models to show which nations apparently played the statistically most significant roles in bringing about any particular extreme event and its impacts. So, although I do *not* think it is possible to reasonably assign singular liability for any particular event due to climate change, PEAs can be used to establish which nations played statistically larger or smaller roles in bringing about particular events. They therefore provide a basis for essentially "slicing up the liability pie" when considering how to effectively and justly respond to climate justice issues.³

I will below contend that this use of PEAs is something that is now potentially crucially useful, since, under the Paris Agreement, parties to the agreement, enter into a risk sharing agreement that will require contributing to a prorated relief pool for losses and damages due to events linked to climate change. Accordingly, I argue that PEAs and the Paris Agreement collectively provide valuable resources for addressing mounting climate refugee issues that are not adequately addressed currently. To underscore the value of PEAs and the Paris agreement for addressing emerging climate refugee justice issues, I will now: highlight what is unique about climate refugee cases (§2-3); discuss current proposals for addressing these unique issues (§4.1); and then discuss how utilizing the provisions of the Paris Agreement along with guidance from PEAs provides promising avenues for effectively addressing climate refugee problems (§4.2).

2. 'Climate Refugee' and 'Environmental Refugee' are Not Synonyms

Naturally, one may just assume that climate refugees are a subset of environmental refugees (as Lister 2014 contends). However, in the interest of clarifying distinctions that

2. Biber 2008 reviews some such arguments.

3. This phrase is due to Andrew Light during an informal conversation.

can significantly impact the course of legal protections and relief responses, I submit that it is more realistic and unambiguous to see 'climate refugee' and 'environmental refugee' as class designations that overlap but have outlier cases on either side. In other words, many climate refugees are such in virtue of being environmental refugees due to events linked to climate change, but there can be climate refugees who are not environmental refugees; as well as environmental refugees who are not climate refugees (as in Figure 1).

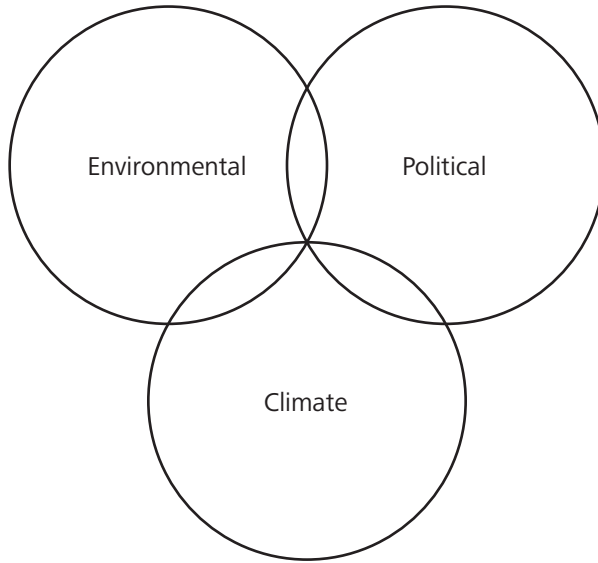


Figure 1: Types of refugees and their overlap

In my view, environmental refugees are those peoples who have been forced to flee their homeland and are unable to return due to environmental factors. The abovementioned case of Peruvian refugees is an example, as floods and crop and potable water contamination have forced them to flee Peru without being able to return and live in minimally suitable conditions. Such refugees are at once climate refugees as the relevant flooding and contamination issues are due to rapid glacial melt due to global warming spikes hastened by practices by the world's leading emitter nations. Peoples from island nations are another clear example of environmental climate refugees (Risse 2009). Yet, there can also be climate refugees who are forced to flee their homelands due to losses and damages from events linked to climate change that are not direct environmental damages.

For example, if some peoples are forced to migrate due to drought and forcefully take over and inhabit another place, the original inhabitants of that place may be forced into refugeedom due to war and lacking appropriate protections of their state. Situations like his has been happening in many areas of East Africa (see, e.g., van Baalen & Mobjörk 2017). In such cases, refugees may be such primarily due to political instability and security issues due to events linked to climate change, and would thus be at once climate refugees and political refugees. Of course, many cases are complex and find refugees fleeing for various reasons that are causally connected and not neatly untangled for purposes of classifying the situation. For instance, many Syrian refugees have fled for overlapping reasons including losses from unprecedented long-term droughts due to climate change and safety issues due to political instability and war arguably enabled by those droughts due to climate change—making them at once environmental, political, and climate refugees (see Wendle 2016).

Neatly classifying types of refugees is no doubt difficult. It is, nevertheless, crucially important to make such distinctions, because the political institutions and legal provisions designed to help various sorts of refugees need criteria for to whom their reliefs and protections should extend. More basically, such distinctions become important because different avenues for relief and protection by design extend to different types of refugees. And so, understanding which peoples count as climate refugees, and what unique challenges such refugees face, is a starting point for critically evaluating potential avenues for helping them through existing institutions.

3.Special Challenges Climate Refugee Cases Present

There are far more ethical and legal issues unique to climate refugee cases than I have space to adequately present and evaluate here. Still, I think glossing the few following key issues will suffice to show that climate refugee cases require novel responses, and are not covered by existing protocol for dealing with other sorts of refugees.

For starters, there are certain legal issue under continued debate in the refugee ethics literature, which center on the question of whether climate refugees should be assisted under the legal provisions and agreements developed to address refugees in general. For instance, after Shacknove (1985), Price (2009) and Cherem (2016) both argue independently that *persecution* is a fundamental aspect of a proper account of refugee status, which implies that climate refugees are not even refugees (cf. Lister 2014). Those who make such arguments basically defend the received criteria for

refugee status within the policy track comprising the UN Refugee Convention, which does not count climate refugees as refugees. That definition is a stipulation of the 1967 Protocol to the UN Convention on the Status of Refugees, which says a refugee is a person who:

Owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership in a particular social group, or political opinion, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence, is unable or, owing to such fear, is unwilling to return to it.

This definition encapsulates what a refugee is according to refugee law, and is thus maintained as the standard to date (see UNHCR 2017). Cherem (2016) argues accordingly that climate refugees should not be handled by existing UN provisions for assisting refugees because the narrow legal definition of 'refugee' used within the Refugee Convention suggests that they are not refugees, since persecution is not the driver of their dislocation. He further argues that the UN definition of 'refugee' should not be expanded to include climate refugees; on grounds that the legal provisions and unilateral protection measures that pertain to refugees would not be as effective as alternative ways of assisting climate refugees.

In response, Lister (2016) has contended that the UN definition should be broadened and that it is simply a sort of impractical conceptual gerrymandering to demand that there is a link between persecution and refugee status, and that being deemed a refugee and thus under UN refugee provisions requires that one has been subject to persecution. Lister (2016; 2014; 2013) also draws attention to another feature unique to climate refugee cases that he says motivates broadening the definition of refugee within the UN Refugee Convention; which is that there are other ways to help refugees that do not rely wholly on providing asylum (e.g. providing relief aid or military support). In view of this, it appears that the received UN definition is inadequate and should be broadened to include refugees not counted under the 1967 protocol by deemphasizing persecution and asylum within the definition. Lister argues accordingly that refugee status is warranted when there is dislocation due to, 'disruption of expected indefinite duration, where international movement is necessitated, and where the threat is not just to a favored or traditional way of life, but to the possibility of a decent life at all' (2014; 2016). These conditions, would include

climate and environmental refugees as well as other sorts refugees, and extend to them rights to asylum and non-refoulement granted under the UN Refugee Convention.

Though it also requires conceiving of refugee status as not essentially tied to some form of persecution, further unique issues arise regarding culpability for losses and damages suffered by climate refugees. Perhaps most interesting for those concerned with climate justice is that against the background presented above, it appears that those nations most capable and equipped to assist climate refugees are exactly the same nations who played the most substantial causal roles in bringing about catastrophic events that have forced many such refugees from their homelands. For example, consider losses and damages resulting from the actions of states and nations who perpetrated those actions even when there was ample evidence that they could significantly raise the probability of exactly those kinds of losses and damages.

Consider the case of Peruvian climate refugees yet again. It is arguable that major emitter nations are culpable and therefore responsible for reparations and provisions for asylum since they continued to fail to reduce emissions that there was evidence would cause such losses and damages due to glacial melting. Even in more complex cases, as when refugees flee for reasons including losses from unprecedented long-term droughts due to climate change and safety issues due to war, this point stands—developed nations most capable of helping climate refugees are those same nations who played the most significant roles in bringing about events that produced losses and damages suffered by such refugees. In essence, climate refugee cases are unique in that they are clear-cut climate justice cases.

As with other sorts of refugee cases, the ethical issues surrounding climate refugeedom are often attached to complex economic and political issues that can be made even more layered and complex by other sociopolitical issues (such as institutionalized race and gender inequities) (see, e.g., Pettit 2004; Terry 2009). Still, issues like those just glossed make climate refugee cases different than other sorts of refugeedom; such that climate refugee cases require different kinds of responses than other sorts of refugee cases.

An obvious way to begin to address the mounting climate refugee issues is to revise the conditions of the UN Refugee convention, as Lister has argued and which I think can and should happen. However, this will require difficult and lengthy international negotiations and, at present, there are already climate refugees who need assistances and protections. So, it is crucial to find alternative and complementary solutions for dealing with climate refugee problems more immediately. In the remainder of this paper, I will compare proposed solutions to the climate refugee problem that work

around the deficiency in the provisions and definitions in the UN Refugee Convention without having to retool the convention itself. Specifically, I will look at two possible work arounds that have been proposed in the refugee ethics literature (§4.1), and then propose that PEAs and the Paris Agreement provide a third option that could provide efficient complementary routes for addressing climate refugee issues (§4.2).

4. Institutional Channels for Helping Climate Refugees

4.1 Promising Existing Proposals

One potential way to help those fleeing climate event losses that does not require fitting climate refugees into the existing Refugee Convention, and perhaps the simplest fix, extends the idea of a Nansen Passport. Nansen passports were the first sort of travel document issued to people who became stateless due to forced migrations and current international laws. Focusing on the example of Island States that will soon become uninhabitable due to sea-level rise and salinization, Clare Heyward and Jörgen Ödalen (2016) have put forth this idea. They point out that climate refugees fit the description of those who have been issued Nansen Passports for other reasons, and propose that climate refugees be issued a new more specific sort of Nansen Passport which they call a 'Passport for the Territorially Disposed.' I think this is a great idea. The practical problem with it is that there still have to be regulations and threshold criteria for issuing such passports; and also protocol and allocated funds for assisting climate refugees who would have these passports available. So, while this is a great idea, there is still work to be done on figuring out what existing institutions could be used to make it work effectively.

Another proposal that begins to broach these implementation details has been considered by Matthias Risse (2009). Risse also focuses on small island states that are threatened by climate driven sea-level rise and salinization, and takes inspiration from the proposal of the island of Kiribati's president, Anote Tong; who, in 2008, proposed to the General Assembly of the UN that his people be systematically redistributed throughout the nations of the world before their homeland was underwater. Tong urged the General Assembly to consider this type of large-scale relocation and to begin the long-term planning this sort of effort requires so that, in his words, "when people migrate, they will migrate on merit and with dignity" (United Nations 2008).

In his examination of Tong's proposal, Risse (2009) considers numerous ways of justifying and motivating such a solution to climate refugedom that I will forgo re-

hashing here in detail. Essentially, the proposal is to flesh out ways of preemptively relocating people throughout the world; so that the burden of taking on refugees is justly and practically distributed. Like the special passport, this too is a great idea. Yet, again, there is still needed planning and negotiating to figure out what existing institutions can be used to make it work effectively. Of course, the special Nansen passport might help to realize this solution. However, there are still considerations of threshold criteria and funding for assisting climate refugees through this preemptive route. So, making this work requires first addressing concerns about predicting what peoples are most in jeopardy and prioritizing who has this relocation option available and under what circumstances. It also requires simply figuring out what existing institutional channels can be used to help realize such preemptive responses.

4.2A New, Complementary, Proposal

My proposal is responsive to the aforementioned concerns about setting priorities and finding institutional channels for implementing responses to emerging climate refugee situations. In sum, I submit that, because they can be used to establish percentages of liability for losses and damages due to events linked to climate change, PEAs can be used to "slice up the liability pie" formed via the risk-sharing and pooling provisions outlined in the UN Paris agreement. Though PEAs themselves are retrodictive, the scenario simulation methods used in such studies may also be crucially useful for helping predict which peoples will probably be most in jeopardy of experiencing coming extreme events; such that they can also be used to help prioritize where preemptive responses and mitigation and relief efforts would be most reasonably allocated. In these two ways, at least, PEAs and the Paris Agreement can complement that above mentioned proposals to help respond more effectively to the snowballing climate refugee problem.

One possibility here is that the "risk sharing" provisions outlined in the Paris Agreement could be used to realize and fund both of the Nansen passport and preemptive relocation responses discussed above. Those provisions could also be used to mitigate the refugee problem through distributions of relief and aid funds from a risk-insurance pool. In its current form, the Losses and Damages section of the Paris Agreement directs specified Committees to develop infrastructure to support such international risk-insurance, and risk-transfer protocol, to address losses and damages. Specifically, it directs those committees to establish: "a clearinghouse for risk transfer that serves as a repository for information on insurance and risk transfer,

in order to facilitate the efforts ...to develop and implement comprehensive risk management strategies" (¶49). Notably, it also includes an explicit no liability clause which states that, "the Agreement does not involve or provide a basis for any liability or compensation" (¶52).

Through these directives and clauses, the Paris Agreement may provide a politically and practically viable route for realizing responses to the climate refugee problem and many other mounting problems. The agreement is also already in effect insofar as roughly 90% of the governments in the world have ratified and begun taking steps to comply with their commitments to the agreement. This is all promising, but there is of course still much work to be done to actually realize and implement the risk-insurance and transfer provisions for addressing losses and damages that the agreement outlines. In addition to the straightforward matter of working out potential risk-management strategies, possible means implementation, and ways to operationalize risk insurance and pooling, I believe that assessing how PEAs and their underlying methods can be used to help set priorities and prioritize strategy options can also push things forward on this front.

Since PEAs are retrodictively powerful, one thing to do is to flesh out how existing PEAs suggest prorating risk-insurance contributions and risk-transfer distributions, and what further sorts of PEAs may be useful for making these determinations. Thompson and Otto (2016) and Otto et al (2017) have taken steps in this direction. Although they are more measured than I in their optimism about the potential applications of PEAs and related methods for addressing climate justice issues, these authors stress the fact that it is now possible to determine the "historical responsibility of individual countries and regions can now be quantified for specific extreme events" with those methods (Otto et al 2017, 758). Thus, they contend that the retrodictive powers of such studies allow them to be used as tool to assign liability to individual world regions for purposes of litigation to address climate justice issues at the international level (ibid., 759).

Another thing to do is to assess the potential capacities of the scenario simulation methods used in PEAs for helping make predictions about extreme events given more and less probable climate change scenarios. In Donhauser (2017) I have taken some initial steps in pursuit of this project, and there identify at least four ways that PEA methods may provide guidance and resources for decision-making about climate change response strategies. I first contend that simply "by enhancing knowledge about changes in extreme weather event patterns, intensity, and frequency under different climate regimes" PEAs provide information about weather events and their causes useful for making decisions about preemptive and mitigatory efforts to minimize

the experience of losses and damages (p.265). I argue moreover that the scenario simulation methods used in PEAs can be used to help *better* estimate likelihoods of potential future events and their possible impacts under various projected climate conditions (Ibid.; cf. Dole et al. 2011; Otto et al. 2012; Pall et al. 2011; Peterson et al. 2012; Rahmstorf & Coumou 2011). I further argue that the sorts of scenario simulations used in PEAs have applications for "helping make inferences about variables that are relevant to forward-looking policy and strategy decisions"; including, for example, how the presence or absence of certain climate effects the likelihood of weather events that can impact valuable agricultural and medicinal species (p. 266; see also Challinor et al. 2009; Dumas & Ha-Duong 2013; Gienapp et al. 2013; Kurukulasuriya et al. 2011; Lobell et al. 2013; Seo & Mendelsohn 2008). And, finally, I contend that, the sorts of possible event simulations used in PEAs may also aid in assessing preemptive and adaptive policy and strategy options by being used to augment other kinds of scenario simulation models; including environmental and more broad socioeconomic resource models (pp.266-7).

All of these potential applications of PEAs and PEA methods I believe may be crucially useful for assessing what peoples in what regions may be most in jeopardy of experience losses ad damages due to climate events. As well, I believe they may be crucially useful for helping devise risk management strategies and setting priorities to operationalize risk insurance and pooling initiatives. I thus urge that further examination of these potential applications of PEAs and PEA methods for climate policy decision-making should pursued, since this will likely help existing institutions and UN parties respond more effectively to climate refugee issues and losses and damages more broadly.

5.Conclusion

In the discussion above, I have drawn attention to ethical and political issues isomorphic to climate refugee cases, and have critically evaluated options for helping climate refugees through existing institutions. I have also sought to contribute to the existing literature on climate refugees by endorsing the pursuit of responses through the risk-sharing provisions of the UNFCCC Paris Agreement and outlining ways that PEAs and related simulation methods may aid in developing effective responses through those channels. I must urge that further examination of my suggestions, and of the alternative climate refugee response strategies discussed, is of great practical and ethical significance as the impacts of climate change continue to unfold. It is

my sincere hope that my discussion has provided inspiration and resources that will facilitate more pointed analyses of how best to assail the climate refuge crisis.

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