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Climate Change is Unjust War:
Geoengineering and the Rising Tides of War

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ABSTRACT: Climate change is undeniably a global problem, but the situation is especially dire for countries whose territory is comprised entirely or primarily of low-lying land. While geoengineering might offer an opportunity to protect these states, international consensus on the particulars of any geoengineering proposal seems unlikely. To consider the moral complexities created by unilateral deployment of geoengineering technologies, we turn to a moral convention with a rich history of assessing interference in the sovereign affairs of foreign states: the just war tradition. We argue that the just war framework demonstrates that, for these nations, geoengineering offers a justified form of self-defense from an unwarranted, albeit unintentional, aggression. This startling result places our own carbon-emitting activities in a stark new light: in perpetrating climate change, we are, in fact, waging war on the most vulnerable.

[1] The views expressed in this paper are the views of the authors alone. They do not reflect the views of Duke Kunshan University, nor do they reflect the official position of the U.S. Naval Academy, the U.S. Navy, or the U.S. Government.

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"We live in constant fear of the adverse impacts of climate change. For a coral atoll nation, sea level rise and more severe weather events loom as a growing threat to our entire population. The threat is real and serious, and is of no difference to a slow and insidious form of terrorism against us."
Saufatu Sopoanga, former Prime Minister of Tuvalu
(Long and Wormworth 2016: 402).

Though the climate crisis is undeniably global in its scope, the situation is especially dire for countries whose territory is comprised entirely or primarily of low-lying land. When, for example, its 11,000 citizens are threatened with displacement by rising waters, the sovereign nation of Tuvalu will face an existential threat. The same could be said of the Maldives, Kiribati, Nauru, and others. Against this backdrop, we argue for a conclusion that might seem implausible to some readers—even some of those most moved by by the plight of Pacific island communities—namely, that these most vulnerable nations very soon will have the right to unilaterally initiate geoengineering efforts even though such actions would constitute an incursion into the sovereign affairs of other states on an unprecedented scale.[3]

Our focus in this paper thus heeds Chris Cuomo's appeal to consider those especially susceptible to the harms of climate change while taking pains to avoid highlighting their "supposed weaknesses or limitations" (2011: 695). More specifically, we follow Simon Caney's (2015: 52) pivot away from analyzing global justice merely through the lens of the obligations of the affluent in order to consider the morally possible avenues of resistance open to those who suffer climate injustice. Unlike Caney, however, our focus is not on what individuals may do in response to climate injustice, but on what states may do in response to a particular kind of injustice, one that manifests in an unintended threat to their territorial integrity and political sovereignty.[4]

To pursue that question, we appeal to the just war tradition. Although analyzing geoengineering proposals under the rubric of just war theory represents a novel approach to

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[3] We should note that organizations that could coordinate political processes among disparate low-lying states already exist. See, for example, The Coalition of Low-Lying Atoll Nations on Climate Change (see www.pacificrising.org).
[4] In his discussion of rights of resistance, Caney (2015) explicitly limits himself to "modes of action that stop short of war" (53). His expressed reasons for this have no bearing on our argument in this paper, and are related to his focus on individual rights of resistance rather than state actions.

questions of climate action, such analysis is not wholly unprecedented within the just war tradition. As we discuss in more detail below, there is a rich history of considering an attack on natural resources an act of war. While paradigmatic just causes generally involve the deliberate use of force against territorial integrity or political sovereignty, we argue that the well-understood and avoidable, albeit unintentional, effects of climate change are similarly intelligible as a relevant kind of aggression capable of justifying acts of war in self-defense. We also demonstrate that in the very near future a compelling case can be made that each of the other *jus ad bellum* criteria can be satisfied as well.

We conclude by circling back to consider the ultimate target of our paper: the obligations of the developed world, obligations which we hope to cast in a newly urgent moral light. We do so by considering a concern that our argument, grounded as it is in the just war tradition, proves too much: If unilateral geoengineering could be justified (even if doing so would constitute an act of war), then some may fear that we will have justified other, more traditional acts of war as well. We contend, however, that this potential objection ought to be read not as a limitation of our argument, but rather as its most significant conclusion, a conclusion that that would seem hyperbolic and absurd were it not the logical conclusion of widely accepted, reasonable assumptions. If low-lying nations could justify the use of geoengineering technology by appealing to the just war tradition, and if therefore they could justify more traditional acts of war as well, that fact ought to change the way we regard climate change itself: Climate change is, it turns out, unjust war.[5]

§1 The threat of climate change to low lying nations

The scientific evidence is clear that climate change has already had a significant impact on our planet. There has already been a rise in atmospheric carbon above 400 parts per million (ppm) and a temperature rise of more than 1.0 degrees centigrade since the beginning of the twentieth century (Field et al. 2014). The last 30 years have been warmer than any since 1850 and they are very likely the warmest in the last 1400 years (Stoker et al. 2013). As temperature has risen, Arctic sea ice has declined (Renner et al. 2014) and mountain glaciers have receded (WGMS 2011). Together with melting ice, increases in ocean temperatures (Abraham et al. 2013) have resulted in higher sea levels (Kuhlbrodt & Gregory 2012) as well as an increase in strength of hurricanes and typhoons (Mei et al. 2015). The scientific evidence is also clear that the impacts of climate change will continue to worsen: the oceans will further acidify, species will continue to decline, floods, droughts and crop failure will increase, and the weather will become increasingly turbulent and variable (Field et al. 2014).

Although climate change will leave no region of the earth unaffected, local changes will often be variable, extreme, and difficult to predict (Field et al. 2014; Aldous et al. 2011). Even with a further global temperature increase of a mere 0.8°C, places like Tuvalu, the Maldives, and Kiribati will likely face such serious problems that their very future will be in jeopardy (Yamamoto and Esteban 2014:35-103). The dramatic threat is that low-lying island nations will simply disappear beneath the rising sea, but the habitability of most low-lying places will be fatally compromised well before all their land is submerged (Nurse et al. 2016:1616-1620,

[5] We take the fact that a nation has a right to defend itself against intentional aggression as an operative assumption for our argument. We recognize the rich pacifist tradition that denies that assumption, but we believe that even those who deny it can find something worth considering in the argument that follows from it.

Storlazzi et al. 2018).[6] Fresh water from precipitation will be adversely affected, and groundwater aquifers will be put under extreme pressure as the freshwater lens rises, floating above the denser but rising salt water below (Nurse et al. 2016:1628). Saline intrusion into fresh groundwater will become increasingly more likely, in part due to the higher frequency of extreme weather events such as cyclones (Nurse et al. 2016:1623). Between sea-level rise and the more frequent, more threatening extreme weather events, the already fragile infrastructure of many low-lying states will become ever more difficult to maintain. In sum, the picture is bleak: continued climate change threatens low-lying states by making already difficult circumstances into existential threats.[7]

Of course, some of these states already face serious challenges independently of climate change. But the threat posed to places like Tuvalu, for example, by its population crush or sanitation crisis is not a threat to the continued existence of the state itself. These issues may present ongoing problems which would be difficult and resource-intensive to solve, but none of them augur a future in which the state of Tuvalu no longer exists. While Tuvalu may have faced increasing dependency on foreign powers independently of the impacts of climate change, that kind of vulnerability is hardly distinctive of Tuvalu in particular or even low-lying nations in general. Claims of prior fragility should be broached with extreme caution. While these states were surely vulnerable in some ways already, they have nonetheless been a durable home for millennia. Climate change poses a novel threat for these states: without radical changes to the *status quo,* soon they will no longer be able to support a permanent population or maintain territory, two necessary conditions for statehood.[8]

§2 Geoengineering & sovereignty

The many undesirable consequences of climate change, in tandem with our collective inability to meaningfully abate greenhouse gas (GHG) emissions or mitigate their effect on our atmosphere, have led some to consider the possibility of geoengineering to avoid the most devastating effects of our altered atmosphere. In this paper, we focus specifically on solar-radiation management (SRM) technologies, the most promising of which is the deployment of sulfate aerosols in the stratosphere in order to scatter and reflect sunlight, diminishing the amount of solar energy absorbed by the planet's surface and thus slowing or reversing the rise of global average temperatures. Controversy attends every facet of such proposals, including the exact nature of the particles to be deployed, the optimal delivery system, the goals of implementation, and the potential moral hazard that would ultimately invite further, unchecked GHG emissions (cf. Rasch et al. 2008). Especially important for our analysis are concerns about the political authority with which geoengineering is undertaken. Forging an international political consensus on whether to implement such proposals, what means to employ, what precise goal they should seek to obtain, etc., seems exceedingly difficult. Yet such a consensus remains vital; for, as we argue in this section, at least two different kinds of reasons support the contention that the *unilateral* use of SRM would constitute nothing less than an act of war.[9]

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[6] Global averages often obscure importantly relevant local diversity. For example, from 1950-2009 the average sea level rise (SLR) at Tuvalu's Funafuti Atoll (its most populous) has been three times the global average.

[7] It's true that there are some more hopeful points. The dynamics of SLR and island are neither simple nor linear. While some small islands have even gained mass in recent years, the pace of SLR is likely to increase in the very near future. There's no real reason to think the accretion rate for low lying nations will do the same in any general or global way.

[8] If a permanent population and territory turn out not to be necessary conditions of statehood, it bears noting that the state of Tuvalu could continue to exist even past the most damaging effects of climate change, but only with serious concessions from the international community (*c.f,* McAdams 2012: 128-135; Yamamoto and Esteban 2014: 175-186). We return to consider some possibilities along these lines in Section 5.

[9] In this paper, we consider only *unilateral* SRM deployment. The analysis that follows in the rest of the paper offers no reason either for or against using SRM technology if all the nations of the world agreed that doing so was the best course of action. In particular, we decline to consider whether environmental reasons would be in decisive opposition to this course of action.

First, the rich history of just war theory contains ample precedent for analyzing attacks on the natural environment as attacks on sovereignty. In *On the Law of War*, for example, Vitoria argued that the just causes of war include damaging the environment, *e.g.,* burning vineyards or olive gardens (1532, Sec 54). Grotius went even further, contending that poisoning the land is analogous to poisoning a person: While poisoning a person invokes the rights to defend, recover, and punish *within* a political community—*i.e.,* it provides just grounds for criminal punishment—poisoning the land invokes the rights to defend, recover, and punish *between* political communities—*i.e.* it provides just grounds for war (1625, Book 2, Chapter 1). More recently, modern theorists have continued this tradition, arguing that in certain circumstances, attacks on natural resources—*e.g.*, a biological attack on a city's water supply—ought to be considered a just cause for war (*e.g.,* Gleick 2006, Elsthain 2003).

Second, international law prohibits states from altering the environment of other states. The Environmental Modification Convention bans techniques that manipulate natural processes to alter "the dynamics, composition or structure of the earth, including its biota, lithosphere, hydro-sphere, and atmosphere" (ENMOD 1977). These prohibitions include, but are not limited to, "changes in weather or climate patterns, in ocean currents, or in the state of the ozone layer or ionosphere, or an upset in the ecological balance...which might result from the use of environmental modification techniques" (ENMOD, 1977). ENMOD was motivated, in part, by serious concerns about American cloud seeding and defoliation campaigns in Vietnam, methods for engaging in hostilities through environmental modification. The lesson is clear: One need not cross a territorial line or seize territory in order to unjustly encroach on another state's sovereignty.[10]

The fact that the unilateral deployment of SRM could rightly be interpreted as an act of war cannot be avoided by pointing to its restorative rather than destructive purposes. This line of thinking—tempting as it may be—rests on an oversimplification of SRM (or, at least the versions of SRM that have been proposed to date). As many have noted previously, we should not confuse the *intention* of SRM technology with its *effects* (Keith 2000, Pereria 2016). The goal of SRM may be to restore worldwide average temperatures to what they would be without climate change, but SRM works to accomplish that goal by making *further* modifications to the climate system (Hale and Dilling 2011, Morton 2015: 113-114). Some (maybe even many) places may be made better off by the use of geoengineering than they would be if climate change went unaddressed altogether, but others will almost assuredly be made worse off. In other words, while some states may find themselves less harmed by climate change with the addition of SRM, others will face greater threats with climate change and SRM together than they would face from climate change alone (see, inter alia, Kravitz et al. 2014; Yu et al. 2015; Morton 2015: 120-121, 164). This fact should not be surprising since geoengineering technologies do not seek to remedy the underlying problem of climate change but merely to solve one aspect of that problem. Geoengineering is only a reaction to a subset of anticipated negative effects of climate change and not a resolution of our underlying climate woes. If launching SRM technologies furthers *one* state's national interests at the expense of significant negative impacts to *other* states by modifying the climate of all states, then the unilateral intentional use of that technology without consent would constitute a violation of sovereignty.[11]

§2 Initial objections to analyzing SRM via the just war framework

[10] Not just any treaty violation constitutes an act of war. If country A violates a trade agreement with country B, that fact alone does not yet constitute an act of war. However, some treaty violations in and of themselves constitute an act of war. The paradigmatic case would be a peace treaty. If two countries agree to end hostilities so long as they abide by certain terms, then to violate those terms in a non-trivial way is to resume previous hostilities. Other treaties avoid a state of nature with respect to nation-states, *e.g.* treaties about the militarization of outer space. Once again, in those cases, to violate a treaty is to return to the previous state of nature, an action that, in certain circumstances, can be categorized as an act of war. ENMOD falls within that latter category.

[11] Even after considerably more technological progress, any unilateral deployment of SRM technology on the required scale will subject many unconsenting states to serious risks. Exposure to significant risk, even in the absence of realized harm, is also something a state may, other things being equal, rightly resist.

The previous section demonstrates that the intentional, unilateral deployment of SRM technology constitutes a significant violation of the sovereignty of other nations. To answer the question of whether such an action could nonetheless be justified, we turn to the just war tradition, the framework that has been used for centuries to consider the moral appropriateness of these kinds of acts. At this point, however, some may remain skeptical that the just war framework is an appropriate tool to use in this context. In this section, we respond to two initial reasons for such skepticism.

First, in order for a war to be just, the possibility must exist of discriminating between legitimate and illegitimate targets (Rigstad 2007). While individual violations of the principle of discrimination within a war do not necessarily make the war itself unjust, if the *only* way a state could fight a war was by violating the principle of discrimination *altogether*, then that war would be unjustified. One might initially suspect that the unilateral deployment of SRM flouts this requirement. After all, SRM does not just target prolific emitters; its effects will be felt indiscriminately by all (Smith (*forthcoming*): 6). To believe that this fact alone necessarily makes the deployment of SRM technology unjustifiable, however, is to misunderstand the nature of the requirement regarding the possibility of discrimination. States are not required to be discriminate in *every* aspect of a war—the impacts of wars are often widely and indiscriminately distributed. Rather, the requirement is that actions that involve the direct and intentional taking of life must be discriminate. If low-lying states were using kinetic force, they may well be required to be discriminate, focusing only on those places most responsible for climate change—oil fields or coal mines, perhaps. SRM, on the other hand, may not be discriminate, but it does not violate any discrimination requirements because it does not involve the direct, intentional destruction of life.

This response leads to a second reason for skepticism about any appeal to the just war tradition: If nations are under threat, why not simply appeal to a defense centered around the fact that SRM could be a "lesser evil"? After all, lesser evil justifications need not take into account any considerations of responsibility or culpability. Rather, in cases of emergency, one simply weighs otherwise unavoidable harms against the harms created by a generally impermissible action (McMahan 2017: 11-12). One might initially suspect that if the deployment of SRM technology offers the chance to avoid great harms, then low lying nations could be justified in deploying that technology simply because doing so would bring about fewer adverse effects than would doing nothing.

At the level of nation-states, however, such a defense risks becoming far too permissive, allowing massive violations of sovereignty whenever the aggregate consequences would be improved by doing so. The common belief that any state proposing a geoengineering solution ought first to try to obtain broad international consent belies the proposal to simply appeal to a lesser evil defense *whenever* a nation is vulnerable and the aggregate consequences would be improved by swift action. Given that such consensus building takes time and effort, and given the very real, very present dangers for low-lying nations, genuine lesser evil defenses would seem to favor moving towards action rather than consensus.

Moreover, analyses of similar environmental issues further highlight the difficulty of merely appealing to lesser-evil style defenses in these kinds of cases. Consider, for example, agreements about water. Over 300 rivers, 100 lakes, and 200 aquifers cross international boundaries. Disputes over water rights are not uncommon; there have been more than 450 agreements about them since 1820 (Salman 2006). Unfortunately, these agreements do not solve the underlying problem, as the water situation for many disputants is becoming increasingly dire. By 2025, approximately 1.8 billion people will be living in countries with "absolute water scarcity" (UN-Water 2013). Nonetheless, it seems unreasonable to conclude that those treaties

could be violated *any time* a nation's citizens were at risk, provided only that aggregate utility would be advanced by doing so. Crises and utility do not, by themselves, justify any and all courses of action that violate sovereignty (Walzer 2006:75-79).

It seems appropriate, therefore, that questions would remain about whether and how the use of SRM technology could be justified *in the absence* of an international consensus. Given the rich legal and moral history of taking unwelcome attacks on the environment as *casus belli,* we contend that the just war framework offers one way to answer those questions. The framework provides a structure in which to justify actions that are of such moral magnitude that they would, under ordinary circumstances, be clearly unjust, and it also directs strict moral scrutiny toward such actions and instantiates appropriate limitations on morally appropriate instruments of self defense (Reichberg & Syse 2000: 453).[12]

§4 SRM & just cause

Having addressed initial concerns about the application of just war theory to the use of SRM technology, another difficulty arises: there is no sovereign entity that can be identified as an aggressor against whom a response can be directed. Tuvalu won't direct the use of SRM *against* the United States or any other profligate emitter. In fact, SRM won't be directed at any party at all. Moreover, there isn't even an aggressor in the traditional sense of the term. There's no club or organization to which all greenhouse gas emitters belong, no means by which they make group decisions or deliberate about the future, no sense in which they act irreducibly jointly. Any paradigmatic just cause for war, by contrast, features an identifiable aggressor. Furthermore, paradigmatic aggression also consists in the *deliberate* and *intentional* use of force. We argue in this section, however, that not only is intentional aggression of an identifiable party not required to meet the *just cause* criterion, but considerations of intentionality are actually anathema to developing an appropriate understanding of this particular *jus ad bellum* criteria. Well-understood and avoidable, albeit unintentional, effects are rightly considered as a relevant kind of aggression capable of justifying acts of war in self-defense.

To make that case, we must first note that while climate change is not the intended result of a specific, planned aggression, it has been brought about by people other than those who might defend themselves with SRM, rather than by natural processes. The right of self-defense codified in the just war tradition is a right of self-defense *against others.* It matters therefore that climate change is the result of human actions, that it has become well-understood, and that it is preventable (Field et al. 2014). It also matters that, from the point of view of those in low-lying nations, climate change is brought about by the actions of others. While the methods for attributing responsibility for climate change are fraught with disagreement at nearly every turn (*e.g.* Bell 2013, Broome 2012, Sinnott-Armstrong 2005, Shue 2010), we can nonetheless safely conclude that the people of low-lying nations are not themselves responsible for their own imminent demise. Low-lying nations consistently rank near the bottom for both *per capita* and total CO_2 emissions; in 2010, for example, the island nation of Vanuatu emitted 0.000014 as much CO_2 as China (Borden et al. 2015).

[12] See Svoboda, et al. 2011 for an argument that unilateral SRM deployment would, in ordinary circumstances, be distributively unjust (because of how it would subject some already vulnerable people to additional harms), intergenerationally unjust (because of the risk of termination shock it would subject future generations to), and procedurally unjust (because it would exclude many affected parties from the decision making process). Significantly, a self-defense justification of the kind we develop avoids all of these arguments by signaling a morally decisive way in which the circumstances are not ordinary.

Even more importantly, in determining whether a just cause exists threats *themselves* turn out to be much more important than the intentional status of the actors responsible for those threats. To see why, it will be helpful to consider first the way in which punishment has fallen out of favor as a justification for war. David Luban (2011), in tracing the history of punishment as a legitimate cause of war, starts his analysis with St. Augustine, but one could go back even further. Plato, for example, said that, "wars are made to punish not only oppression or robbery, but also fraud and deception" (quoted in Grotius 1625:75). However, even very early scholars recognized the limitations of punishment as legitimate cause for war. Vitoria, for example, claimed that "merely by way of avenging a wrong it is not always lawful to kill all the guilty" (1532:47). As the Westphalian order of nation states solidified, punishment was removed as a just cause for war. This transformation was complete by the time Kant wrote *Perpetual Peace,* in which he succinctly stated that a justified war of punishment between states "is inconceivable" (1795: Section I, No. 6). Luban adroitly tracks the history for this change, and provides a powerful moral argument for its appropriateness: the moral benefits of punishing the few who are guilty is vastly outweighed by the negative moral consequences of war endured by the many. More importantly for present purposes, however, is the fact that the move away from punishment as a just cause is a move toward threats *themselves* rather than the intentions behind those threats. Modern justification for war has less to do with locating the analogue of *mens rea* in an aggressor than it does with recognizing the existence of incursion on sovereignty, regardless of how or why it has come about.

Consider, for example, the care and security of nuclear weapons. If a state accidentally launched a nuclear warhead at one of the islands in the Maldives and it did nothing to prevent a similar accident in the future, it would seem to stretch the just war tradition past its logical limits to say that the Maldives could not respond merely because the attack itself was not the result of an intentional use of force. Similarly, the testing of atomic weapons at Bikini Atoll in the Marshall Islands was not an intentional act of aggression against them, but it seems contrary to the just war tradition to infer that the sovereign nation under threat would, based on that fact alone, lose any right to resist. Intransigent negligence that leads to harm in the domestic realm justifies the use of force by the state. There seems to be no reason to believe the same reasoning fails to hold at the international level. Intentions may make wrongs more or less likely to manifest, but those intentions are neither necessary nor sufficient for just cause.

We see a similar strain of thought in response to contemporary issues in unstable states. Often, the justification for U.S. military action in places like Somalia, Yemen, Libya and Syria is that the state lacks the authority over at least part of its territory to secure those areas. Here the clear lack of collective intention on the part of the "threatening" state does not create a shield to prevent the possibility of any justified use of force against those within its borders. On the contrary, such actions—when they are justifiable—can become so *only* through the combination of threat and the *complete lack of ability* on the part of the state itself to have *any intention* one way or the other regarding that threat. In these cases, when the just cause criterion is met, it's met via threat alone rather than via the intention on the part of the state to create that threat.

Moreover, the threat required for the existence of a just cause need not be the result of a single actor. While a state may not simply lash out indiscriminately and claim it is going about the business of defending itself, that fact does not preclude simultaneous actions against multiple states. For example, if two states share the responsibility for nuclear weapons (perhaps after the dissolution of a larger, formerly unifying state actor), that fact does not exculpate either from the responsibilities of ensuring that other states do not face unnecessary risks from the care and maintenance of those weapons. The same case could be made for allied attacks. The number of

liable states is increased rather than diminished when multiple actors are responsible for causing a threat to another. In the case of climate change, even if there are deep, challenging questions of ascribing responsibility to individuals and collectives across a fairly broad stretch of time, it's not exactly a mystery as to who bears some level of responsibility (Cuomo 2011:697-698). If we restrict our notion of liability to being appropriately subjected to the unilateral deployment of SRM, then the liable are legion.

Nonetheless, there is an important concern in the just war tradition to distinguish between mere threats and actual wrongs endured. Preventive war is rarely, if ever, justified (Walzer 2015:74-79). For states whose existence is threatened by climate change to claim they have a just cause for the unilateral use of SRM technology, there must be *more than just a threat* to their continued existence; they must already be experiencing a wrong. Demonstrating the existence of such a wrong, however, merely requires recognizing the difference in the causal mechanisms between environmental threats and more traditional ones. While the causal mechanism behind the climate change threat to low-lying states is complex, probabilistic, and protracted, those threats are not merely looming—the gears are already in motion. Suppose, for the sake of analogy, that one state begins to poison a river that flows into an adjacent state. The river will eventually become hazardous, but because the poison takes time to accumulate downstream, it is not presently compromised.[13] To call intervention at the point after the poison has started to be released but before its effects were felt 'preventive' would be inaccurate. The attack is slow—but it is already underway. Something similar is true in the case of climate change: The accumulation of GHG's in the atmosphere is slow, and the corresponding effects in terms of temperature and sea level rise are slow—but they are already underway. Taking action to neutralize the threat by using SRM is not preventive in the way that term is used in the just war tradition. The first salvoes in this conflict were fired a long time ago.

For all these reasons, it seems appropriate to conclude that provocation for war need not be intentional nor from a particular actor in order for the just cause criterion to be met: Severe, well-understood, and avoidable, albeit unintentional, effects can serve as the relevant kind of threat capable of justifying violations of sovereignty in self-defense.[14] Even if climate change has not yet provided nations like Tuvalu, the Maldives, and Kiribati a just cause to use SRM technology unilaterally, without climate action three times more aggressive than what is outlined in the 2015 Paris Accords, it surely will in the very near future.[15]

§5 SRM & the remaining *jus ad bellum* criteria

Thus far, we have argued first, that any unilateral deployment of SRM technology constitutes a violation of sovereignty that calls out for justification. Second, given the existential threat climate change imposes on low-lying nations, one can conclude that these states possess a *just cause* for the unilateral deployment of SRM, even though that threat is not the intentional result of a single, identifiable actor. Within the just war framework, however, the call for justification is not fully answered by the existence of a just cause. So, in this section, we consider the other *jus ad bellum* criteria, arguing that a compelling case can be made that the use of SRM

[13] Notice this case is deliberately ambiguous with respect to the intentions of the polluting state: in terms of justifying a response from the second state, this ambiguity is not, we have argued, relevant.

[14] See Penz (2012: 163) for a brief discussion of climate change as a violation of sovereignty.

[15] In other words, even with actions in line with the Paris Accords, in the next 15 years the amount of GHG's that will be emitted will be sufficient to make all of the members of The Coalition of Low-Lying Atoll Nations uninhabitable within a few generations (Nurse et al. 2014, Storlazzi, et al. 2018).

by low-lying states would satisfy all of them. To do so, we consider each criterion in turn: right authority, right intentions, reasonable hope of success, wide proportionality, and last resort.

In order to be just, acts of war must be commissioned by a *legitimate authority*. The states under consideration are all recognized as independent states with the political authority to defend their people; they are also democratic states that respect human rights and whose governments are aligned with the interests of their citizens. These states clearly possess the appropriate form of authority required by the just war tradition.[16] Additionally, a state must also exhibit the *right intention*. In particular, the proposed activity must be directed at eliminating the threat that constitutes the state's just cause. In the case of low-lying states, there is little else that might form their intention in unilaterally deploying SRM technology. We may safely suppose that the Marshall Islands have no aspirations to empire, for example, and SRM technology has no foreseeable benefit for such states beyond the very narrow purpose of forestalling the threat of climate change and restoring peace.[17]

Whether the unilateral deployment of SRM technology is justifiable also depends on whether it has a *reasonable hope of success.* This criterion poses an interesting difficulty for justifying the unilateral use of SRM technology. On the one hand, the chances the technology will be successful will surely improve with time. But on the other hand, if too much time passes, it will be too late to save many low-lying states. Uncertainty about the relevant empirical predictions, however, likely opens up a window for the reasonable hope of success criterion to be met. After all, a reasonable hope of success does not require an outcome to be certain, or even more likely than not. Instead the criterion only requires reasonable possibility of success, eliminating the possibility of violence for violence's sake (Lucas 2011:259-260). Moreover, even though the window for reasonable hope of success may be small, since SRM would have an immediate effect on temperatures and could even slow or reverse near term sea level rise, there is no reason at this time to believe that the window will not remain open long enough for the criterion to be met (Bouttes 2013).

The overall benefits of SRM must also be proportional to the inevitable costs. In other words, the cost of a given course of action must not greatly exceed the benefits. Although the use of SRM technology will have negative effects, that fact alone clearly is not enough to flout the criterion of *wide proportionality*. Rather, what wide proportionality requires is that, from an objective point of view, the dangers or costs created by taking action must not be far greater than the dangers or costs faced by not doing so (Orend 2006: 59). Within the literature on geoengineering the burdens and benefits of technologies like SRM are widely discussed (see, inter alia, Svoboda et al. 2011; Morton 2015). It is not our goal here to add to this unavoidably complex discussion of how the burdens and benefits of SRM will compare. Instead, we want to highlight that, framed under the rubric of wide proportionality, assessment of SRM proposals must be attentive to the following two points. First, in wide proportionality calculations, the benefits to individual moral patients are not the only inputs to the moral calculus. In considering the proportionality of WWII, for example, England's continued existence is a benefit that cannot be expressed merely by the continued existence of the set of its individual citizens. While the risks of geoengineering are not to be taken lightly, in order for them, in and of themselves, to weigh against this collective component of wide proportionality, they would have to be comparable to

[16] Unlike recent arguments that the global poor have a just cause for war (see, for example, Fabre 2012 or Lippert–Rasmussen 2013), our analysis does not require a radical redefinition of the relationship between just cause, legitimate authority, and existing political communities.

[17] Cf. Heyward (2014: 414). In the context of exploring compensation schemes for SRM use whereby users would incur duties to compensate those made worse off, Heyward examines emergency deployments of SRM and observes that it's unlikely that a deploying state "would benefit sufficiently...to restore itself to a situation consistent with a reasonable theory of distributive justice, never mind make further gains."

the threats of inaction faced by low-lying states.[18] Second, wide proportionality calculations generally lack the default assumption in favor of precaution and inaction at work in most environmental cost-benefit analysis, because unlike in anthropocentric policy debates, in wide proportionality calculation there exist further constraints on brute utilitarian calculations (*i.e.*, wide proportionality is not sufficient to justify morally appropriate action, the other just war criteria must be met as well).

Therefore, we can conclude that as long as two conditions are met, wide proportionality would be satisfied. First, it would have to be true that no other state was put in as dire a situation as the one in which low-lying nations currently find themselves. Second, the aggregate likely benefits of SRM would have to compare favorably to (i.e. not be clearly worse than) the aggregate likely harms. So, any particular judgment of wide proportionality would depend on a host of specific information: which technology is to be used by which nation state in what geopolitical context at which moment in time, etc.[19] While *proportionality of ends* will certainly rule out some uses of SRM technology, at this point it seems premature to claim that any and all use of SRM technology would be disproportionate to the harms that would be endured by low-lying states without it.[20] Given the damage climate change portends, particularly for the most vulnerable, the harms of SRM would have to be immense to be disproportionate.

Finally, the use of the technology must be a *last resort*. Given their political impotence, the indifference of the international community, and the entrenched interests that resist meaningful climate reform, low-lying states appear entitled to claim that any implementation of SRM technologies would be their last resort. After all, the history of diplomatic failures with respect to climate treaties is both long and inglorious (Jamieson 2014). While *L'accord de Paris* finally codified an international target necessary to protect low-lying nations, the so-called "aim" of avoiding a 1.5°C rise is coupled with neither a plan to achieve it (the nationally self-determined carbon allocations would create an increase of more than 3°C) nor any enforcement mechanisms to punish nations that fail to meet their self-imposed targets (Paris 2015; Milmann 2015). Combined with the escalating urgency of unabated GHG emissions, this history of failure provides no real hope for low-lying states to achieve security through diplomatic or any other multinational means.[21]

One might suspect that the last resort criterion is flouted in the case of unilateral deployment of SRM, because citizens of low-lying states could always relocate as immigrants to other nations. However, while developed states ought to be more accepting of climate migrants than they have indicated they are likely to be,[22] and while such arrangements could actually be more favorable for some individuals, this "solution" is not an alternative means of averting the threat to the state itself. To suppose that individualist, migration solutions constitute true alternatives that make SRM something other than a last resort is to woefully undervalue the shared, social enterprise in which the peoples of low-lying states are engaged. Even if a migration solution had the happy and improbable effect of making most relocated individuals better off in

[18] There is a concern, for example, that SRM will either overcool India or overheat China (Ricke et al., 2010). However, the disruption China and India stand to endure, though serious, is nothing like extinction. So long as these negative effects are offset by positive effects elsewhere, this risk would not, by itself, be sufficient to violate the principle of wide proportionality.

[19] The proportionality of ends calculation will include the possibility that other states may respond to the deployment of SRM technologies with further geoengineering activities. If such a response were a near certainty, and taken together these two actions would make the planet's situation worse, then SRM deployment would fail the criterion of proportionality of ends. We discuss a related concern in more detail later in the section.

[20] Stephen Gardiner (2013) argues that emergency SRM might be disproportionate because it "involves an attempt to exert control over a whole system" (p. 29). It is unclear, however, why the fact of control over a "whole system" is relevant to judgments about proportionality except insofar as that control creates risks and harms.

[21] Gardiner (2013: 29) rightly notes that we must be suspicious of claims of last resort, because of the way in which a lack of any other recourse can justify what would otherwise be unjustifiable. However, he offers no substantive reasons to dispute our claim in the case at hand.

[22] For more on this point, see [removed for blind review].

some respects, this plan still accedes to what are arguably widespread violations of occupancy rights (Stilz 2013). To suppose otherwise is to suggest that the United Kingdom's citizens first ought to have sought asylum in the United States before they could have been justified in fighting back during World War II. Individual relocation—while vastly preferable to numerous alternatives—still involves a violation of rights, the kinds of sovereignty rights that are precisely what the just war tradition is meant to provide a defense against.

Others may suggest that citizens could move together and form a kind of "government in exile."[23] Yet the possibility of relocating the state itself and preserving some of its internal governance is likewise insufficient to demonstrate that the use of SRM technology would fail to be a last resort. Establishing a limited but operational government in another state's sovereign territory still capitulates in important respects to the threatened state's demise. Most starkly, the threatened state would now continue to operate and exist only subject to a foreign set of laws and with the host state's continued clemency. Since occupancy rights are tied to particular places, group relocation, just like individual relocation, accedes in widespread violations of those rights. Moreover, to suppose that group relocation constitutes a true alternative that must be tried before SRM is to woefully undervalue the connection between a shared, social enterprise and a particular place (Moore 2015:34-70). Especially in the case of small island states, this connection is strong and treasured. State relocation proposals cannot be a required alternative that must be attempted before deploying SRM, any more than they could be in the face of a more traditional occupation.

Stephen Gardiner offers one final criticism of a self-defense justification for unilateral SRM not tied to any particular *jus ad bellum* criteria. According to Gardiner, if a self-defense justification is available, it will be claimed by many different nations with different and conflicting views about implementation (2013: 30). This situation, in turn, may well generate an additional round of conflicts. Rather than fighting over climate change, Gardiner worries that states would be pitted against one another over different geoengineering "solutions".

While Gardiner is correct that this kind of escalation could be problematic if a self-defense justification could be widely invoked, our argument is based solely on the existential threat to the state *itself* rather than a threat to some of its interests or to its citizens. The justification is consequently available only to a very small number of states. Moreover, our argument for self-defense attaches fairly narrowly to proposals that would have the effect of slowing and modestly reversing sea-level rise, which limits room for reasonable conflict over differing geoengineering proposals. Finally, Gardiner may well be concerned less with what is reasonable and more with what is descriptively likely to unfold. But even if Gardiner is right that the availability of a self-defense justification would create both an incentive for numerous nations to invoke it and some difficulty in delineating legitimate claims from illegitimate ones, the mere fact of disagreement about which claims are justified cannot, by itself, make it the case that none of them are. It may not always be easy to adjudicate when the justification of self-defense is rightly invoked, but it would be a serious moral mistake to take that fact to imply that the justification may never be invoked.

We therefore conclude that although the unilateral deployment of SRM technology could rightly be construed as an act of war, under plausible if not imminent circumstances, low-lying states could nonetheless be justified in enacting it. Significantly, this justification depends on both the identity of the acting states and their purposes for deploying the technology; the fact that the use of SRM could be justified for the most vulnerable nations does not imply that it would be

[23] These two alternatives clearly do not exhaust the possibilities. See McAdam (2012) for a fuller treatment.

justified for any nation. Within a just war analysis, the unilateral use of SRM by powerful nations who are most responsible for climate change but least vulnerable to its most adverse consequences, for instance, would be rightly condemned as unjust. While the most vulnerable states could enlist the assistance of other states, in order for the actions of other states to be justifiable by the defense offered in this paper, such action would have to come at the behest of the threatened states themselves.[24]

§6 Climate change is unjust war

In order to understand the consequences of our argument, in this penultimate section it will be helpful to consider one final objection to the position we've presented so far: If geoengineering activities can be justified via an appeal to just war principles, then so could activities more traditionally justified by the framework. In other words, if just war theory implies that unilateral SRM deployment is a justified instance of self-defense, then it seems that other, more traditional acts of military self-defense will be justified as well: kinetic attacks on oil fields in Dubai or coal plants in Pennsylvania.

One kind of response to this objection is to argue that any kinetic attack would fail some *jus ad bellum* criteria satisfied by SRM. One could argue, for instance, that whereas SRM could have a *reasonable hope of success* in altering the devastating impact of climate change, kinetic attacks could not. Yet while this type of response highlights important differences between geoengineering and more traditional military activity, it fails to address the core of the objection itself. There are, of course, some sets of circumstances in which the use of SRM technology would be justified, but more traditional kinetic attacks would not be. By focusing on particular *jus ad bellum* criteria, however, this type of response leaves an important moral indictment intact. If this kind of response were successful, then it would still be reasonable to conclude that *if* facilities could be attacked with fewer negative consequences or *if* the action had a slightly greater chance of making a difference in the battle against climate change, *then* low lying nations would be justified in launching tactical, kinetic attacks at GHG emitting facilities. To pursue this kind of response is to resist the conclusion on merely contingent grounds, and in some real sense, to miss the point of the problem entirely.

The appropriate response to this objection may well be counter-intuitive and unpopular, but appears to be a necessary consequence of the analysis above: We ought to embrace it. In the right circumstances, low-lying nations *would* possess the normative authority to engage in kinetic attacks on GHG-producing facilities. We believe that acceding to this objection is not a limitation of our argument, but rather its most pointed conclusion. Because if the just war tradition would justify kinetic attacks in response to climate change, that fact ought to change the way we regard the actions that contribute to the problem and our collective inability to prevent it.

The point is not merely that water failure, crop failure, flooding, and other effects of climate change will lead to mass migration and conflict—that's already happened, and will continue to do so even more dramatically in the near future (Field et al. 2014). Rather, the point is that climate change itself is violence: extreme, widespread, continuous violence. Significantly, the claim that climate change is violence does *not* stem from the mere fact that climate change has violent *effects* (*c.f.* Solnit 2014). That much is true, but our argument demonstrates as well that

[24] We do not consider what Morton (2015) calls the 'Greenfinger' scenario, in which SRM is launched by a wealthy would-be philanthropist (353). Done unilaterally, this scenario falls completely outside our argument. Done at the behest of low-lying states, this scenario presents some additional complications due to the inclusion of a non-state actor.

in changing the climate we are, both individually and collectively, waging an unjust war against the most vulnerable. This conclusion is not intended as an analogy, nor is it the result of an argument from analogy. It is nothing more than the consequence of a venerable principle invoked time and time again by political liberals and conservatives alike: the normative authority of nation-states to defend themselves against existential threats.

§7 Conclusion

Just war theory has been occasionally criticized for its treatment of war as a self-contained event. According to this line of argument, in order to see how war is related to other oppressive, violent institutions, we would be well served to view war through a radically different lens (Cuomo 1996). This critique of just war theory is from the outside, demonstrating the theory's inability to provide those who appeal to it with the tools to resist militarism and create alternative political options. Our conclusion similarly emphasizes that in the modern world, the absence of armed conflict need not indicate the presence of peace. Interestingly, we have reached this conclusion via a method opposite to the one considered above: Even from within the perhaps limited perspective of just war theory, the line between traditional notions of war and violence exemplified by other kinds of political and economic activity is far less less bright than one might have initially suspected.

But we believe something else follows from our conclusions as well: As countless others have pointed out again and again for far too long, we must recognize that now is the time to ramp up the fight against climate change to a scale not seen since the last great world war (McKibben 2016). With the right kind of effort, the United States could generate 80 to 85 percent of its power from sun, wind, and water by 2030, and 100 percent by 2050. To do that, however, we would need to create new sources of clean power at over ten times our current rate (Jacobson et al. 2015). As Bill Mckibben argues, that kind of increase in manufacturing may not be the first thing that comes to mind when we think of warfare, but it was precisely what was required for an Allied victory in WWII: "[a] wholesale industrial retooling…on a previously unprecedented scale" (2016).

To achieve the kind of war-time effort necessary to prevent climate change, it may prove useful to realize that we are already at war—not just metaphorically, but literally. It is not a war in which all of humanity is united against a common threat, but instead one in which the most powerful are aligned against the least advantaged. That may seem like hyperbole, but to see this conclusion in its proper light, we would be well-served to remember Martin Luther King Jr.'s insight that if reform can only be brought about through more sweeping changes in underlying social structures, then reformers must become revolutionaries (1967). That observation is not merely intended as a clarion call for more action, more immediate action, and more significant action. It is, much more fundamentally, a call to *reinterpret* what we are already doing. With respect to climate change, we have advanced a similar call. The time has come to realize what we have been doing all along: waging war on the most vulnerable. To recognize that fact places our own contributions to climate change and our political failure to prevent its ruinous effects in a stark new light, one that reveals the real urgency of radically altering the *status quo* and of stemming the rising tides of war.

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