

Who is responsible for the climate change problem?¹

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Abstract

Who is responsible for remedying the problem of climate change? One popular answer is given by the Polluter Pays Principle (PPP), according to which such responsibility falls to excessive emitters of greenhouse gases. The underlying rationale of the PPP appears to be that unjust contribution to a problem grounds a responsibility to remedy it; where, in this case, parties contribute by emitting, and those emissions are unjust in virtue of exceeding a fair share. In this paper, I argue that there are other important means by which human agency makes an unjust contribution to the climate problem. This means that if one accepts the underlying rationale of the PPP, then one should abandon its restricted focus on polluters.

I. Introduction.

Who is responsible for remedying the problem of climate change? A common starting point for answering this question is the Polluter Pays Principle (PPP), according to which such responsibility falls to excessive emitters of greenhouse gases (GHGs). The PPP fits with a simple moral principle that those who cause a problem have a responsibility to remedy it – at least in the absence of excusing factors. More precisely, its underlying rationale appears to be that remedial responsibility is possessed by those who make an unjust contribution to a problem; where, in this case, parties contribute by emitting, and those emissions are unjust in virtue of exceeding a fair share. In this paper, I argue that proponents of the PPP – and other theorists of climate justice – tend to overlook other important means by which human agency makes an unjust contribution to the climate problem. This means that if one accepts the underlying rationale of the PPP, then one should abandon its restricted focus on polluters.

I start with a brief overview of how the PPP – and other principles of climate justice – have been used in an attempt to carve up the costs of dealing with climate change (§II). I then consider what kind of moral problem climate change presents, in order to identify two additional pathways via which human agency contributes to it (§III). I explain how this understanding of the climate problem will result in a different landscape of climate responsibilities (§IV-V); and finish by responding to some potential challenges to my view (§VI).

¹ For comments on earlier versions of this paper, I am grateful to Simon Caney, Laura García Portela, Anja Karnein, Tom Parr, and Lukas Tank; and to audiences at the Open University, the Institute of Philosophy, and the universities of East Anglia, Bristol, Fort Hare, Leeds, Oxford, Princeton, Sheffield, Stockholm, Warwick, and Washington (Seattle).

II. *Climate change and remedial responsibility.*

A remedial responsibility can be understood as a special obligation to contribute to the remedy of a problem – special in the sense that it is only possessed by those who are related to the problem in the right way. There are, however, many ways of being related to a problem that might ground a special obligation to remedy it. For example, because you are morally responsible for the problem; because you caused (or causally contributed) to it; because you benefited from its creation; or simply because you are able to remedy it.²

I will understand remedial responsibilities for the climate change problem (in short: climate responsibilities) to consist in special obligations to bear any burdens associated with mitigating, adapting to, or compensating for climate impacts.³ The three grounds commonly cited for such responsibilities are causal contribution (of a particular kind), benefit, and ability. These grounds underwrite the three principles that have dominated philosophical discussions of how to divide any burdens of remedying climate change: the Polluter Pays Principle (PPP), the Beneficiary Pays Principle (BPP), and Ability to Pay (ATP). Roughly speaking, according to the PPP, excessive GHG emitters should bear these burdens, in proportion to their excess emissions, because the problem has been caused by their emissions. According to the BPP, the beneficiaries of GHG emissions should bear them, in proportion to how much they have benefited, because the problem is a result of activities from which they have benefited. And according to the ATP, the wealthy should bear them, in proportion to their wealth, for reasons of practicality or egalitarianism.⁴

Some seem to hope that these principles provide a relatively straightforward way to attribute, quantify and then monetize climate responsibilities. For example, by adopting the PPP one might aim to use historical emissions data to attribute shares of cumulative GHG emissions (after some chosen date) to different countries, quantify them according to some common measure,⁵ judge which countries have emitted more than their fair share, and then convert any resulting emissions debts into financial obligations.⁶ Using the BPP, one might attempt to estimate the amount of wealth each country enjoys as a result of GHG emissions, and then

² See Miller 2007, pp.99-104.

³ Mitigation aims to limit the progress of climate change, by reducing emission of GHGs or removing them from the atmosphere. Adaptation aims to reduce vulnerability to any climate change that isn't prevented, to make its impacts less harmful. Compensation comes into the picture when climate harms are not prevented. As Caney points out, those in possession of remedial responsibilities may discharge them by covering the costs of actions that are ultimately undertaken by others. For example, one might think that when poorer countries undertake mitigative or adaptive actions to reduce climate harm, any costs of their so doing should be covered by richer, industrialized countries – because the latter, but not the former, are the primary possessors of remedial climate responsibilities (Caney 2020, §5).

⁴ See e.g. Caney 2020, §5.2; Roser & Seidel 2017, chs.12-14.

⁵ There are several different GHGs, which differ in their effects. Because CO₂ is the most significant, scientists attempt to quantify other GHGs – such as methane – in terms of a common metric termed 'CO₂-equivalent'.

⁶ E.g. Matthews 2016.

divide out climate costs accordingly.⁷ And with the ATP, one could simply distribute climate costs according to a metric such as GDP.⁸ In other words, each principle appears to promise a relatively neat division of climate responsibilities, thereby making it easy to carve up the financial costs of remedying this problem.

My argument will focus on the PPP (although I will also note some implications regarding the other principles). Accounts of climate responsibility often start with the PPP, because its focus on causation appears a good fit with common sense understandings of remedial responsibility. Imagine, for example, a case in which several companies have dumped toxic waste into a community's water supply. There is a straightforward appeal to saying that – absent excusing factors – these companies (as the polluters) should now remedy the environmental problem to which they have causally contributed. Proponents of the PPP hope to apply a similar form of reasoning to the climate problem.

Things are somewhat more complicated in the climate case, however, making it harder to determine who should be deemed a polluter. First, climate change does not result from the actions of a single agent – or even a group of agents. This is a case of collective causation on a massive scale, with climate change resulting from the cumulative GHG emissions of human activities across the globe, dating back to the Industrial Revolution. And importantly, we must question whether all those emissions count as 'pollution' in the relevant sense. It is commonly suggested that there was a safe budget of emissions, such that if emissions had remained sufficiently low, then they would not have resulted in dangerous climate change. Emissions within this safe budget do not seem to be the problem, then; so perhaps should not count as pollution in the first place – or at least not as pollution that has contributed to the climate problem in a way that gives rise to remedial obligations.⁹

Proponents of the climate PPP therefore usually define polluters as excessive emitters; understood as those who exceed their fair share of the safe budget.¹⁰ This move can get low emitters off the hook, as well as those who only emit to meet basic needs. If these emissions do not exceed a fair share, then they do not make you one of the polluters who must now remedy the climate problem. Thus, for the climate PPP, what makes you a polluter strictly speaking is not that you emit at all, but that you emit too much. The PPP does not ground remedial responsibility in causal contribution simpliciter, then; but rather causal contribution beyond

⁷ E.g. Page 2012, p.325.

⁸ Roser and Seidel, for example, claim one advantage of the ATP 'is that there are hardly any problems with measurability. A country's economic capacity can be operationalized, for example, through its GDP adjusted for purchasing power' (2017, p.141).

⁹ Those emissions could obviously nevertheless have contributed to other problems, such as local environmental harms.

¹⁰ Occasionally it is noted that parties also contribute to increased atmospheric GHGs through deforestation (e.g. Caney 2010, p.205). However, when it comes to defining the PPP, theorists tend to equate polluters with excessive emitters (see e.g. Baatz 2013, p.95; Bell 2010, p.428; Caney 2010, p.222; Duus-Otterström and Jagers 2012, p.748).

one's fair share. This serves, as Simon Caney puts it, 'to distinguish between those who contribute to the causal process who have a duty not to do so (duty-bearers) and those who contribute to the causal process but in doing so do not violate any duties (non-duty bearers)' (2015, p.69).

The underlying rationale for the PPP therefore appears to be that *unjust contribution to a problem grounds a special responsibility to remedy it*.¹¹ The kind of injustice at play here does not entail moral responsibility: by exceeding their fair share, parties make an unjust contribution to the climate problem without necessarily being the subject of blame; and it may be possible to commit this form of injustice unknowingly.¹² There are various ways that one might attempt to specify when emissions become excessive. One option is to combine the PPP with another popular principle of climate justice: that of equal per capita emission shares.¹³ An alternative approach – which I think is more defensible – would be to frame excessive emissions as those that are in some sense avoidable and inexcusable.

For the sake of my argument, I will be assuming that proponents of the PPP are correct to identify unjust contribution as an important ground of remedial responsibilities. The question that I am interested in is whether being an excessive emitter is the only way to make an unjust contribution to the climate problem. Many proponents of the PPP seem to assume that it is. As a result, some have ended up identifying quite unusual forms of injustice in the historical emissions record. Retroactive application of a principle of equal per capita shares, for example, generates the injustice of exceeding an equal share of emissions when you not only did not know – but seemingly *could not have known* – what your share would have been (because you could not know either that there was a limited safe budget, or how many people you must share it with across time).¹⁴ And proponents of the PPP who eschew this historical approach tend to turn to the BPP or ATP to allocate any remaining or residual burdens that then cannot be assigned to polluters, rather than attempting to identify other unjust contributors to the problem.¹⁵

It seems to me that the underlying rationale of the PPP provides us with an additional approach to identifying climate responsibilities. Instead of focusing only on the most obvious causal contributions to the problem – GHG emissions – and attempting to determine which are unjust; why not also examine the many injustices that characterise our world, and consider whether they contribute to the climate problem? In some cases, this approach will lead us back to

¹¹ In line with this, some theorists instead adopt the terminology of a 'contributor pays' principle. However, they too measure contribution in terms of GHG emissions (Page 2012, pp.304-5; Shue 2015, p.13).

¹² On this matter, see debates about the climate responsibilities of 'excusably ignorant' emitters (e.g. Caney 2010, pp.208-210).

¹³ For a critique of this principle, see Blomfield 2019, ch.2.

¹⁴ For discussion, see Blomfield 2019, ch.9.

¹⁵ See e.g. Baatz 2013; Bell 2010; Caney 2010.

individuals or collectives who should be counted as polluters, due to their unjust causal contribution to increased atmospheric GHG concentrations (for example, misinformation campaigners, fossil fuel lobbyists, and politicians who have wrongfully opposed fair and effective mitigation policies). However, in other cases this should lead us to assign remedial responsibilities to those who have unjustly contributed to the climate problem in ways that did not involve emitting – or encouraging the emitting of – GHGs.

III. *What kind of problem is climate change?*

As explained in the previous section, the PPP is based on the more fundamental moral principle that ‘those who have caused the problem should pay’ (Caney 2018, p.667). To determine whether the PPP makes good on this moral principle, we need to understand what kind of problem climate change is.

Anthropogenic climate change is a physical process, caused by human activities. This physical process presents a moral problem because it results in a situation where many things of value are at risk of significant harm. When considering why it is that climate change poses such risk, the first things that likely come to mind – for many at least – will be the climate hazards set to increase in frequency and intensity due to increased atmospheric concentrations of GHGs: hazards such as storms, floods, drought and wildfires. However, climate risk is not a product of these hazards alone. As the Intergovernmental Panel on Climate Change (IPCC) puts it: ‘climate change is not a risk per se; rather climate changes and related hazards interact with the evolving vulnerability and exposure of systems and therewith determine the changing level of risk’ (2014, p.1050; emphases added).

What the IPCC means is that for something of value – a community, say – to be at risk of climate harm, that thing needs to be affected by two social drivers of risk. First, it needs to be exposed to climate hazards, which essentially means that it is present in a setting that could be adversely affected by them. A community is not at risk of coastal erosion, for example, if it is located far inland. But secondly, to be at risk a community also needs to be vulnerable, which means it has ‘the propensity or predisposition to be adversely affected’ by climate hazards; resulting, for example, from ‘sensitivity or susceptibility to harm and lack of capacity to cope and adapt’ (IPCC 2022, p.5). If a community does not have this propensity – say due to its high level of resources – then exposure to climate hazards will not place it at risk (because it can use those resources to acquire food elsewhere, for example, or build a flood defence).

Being vulnerable is largely a matter of lacking the resources that would enable you to avoid being adversely impacted by climate hazards. This propensity to suffer adverse effects is driven by socioeconomic factors such as marginalization, ecosystem degradation, violent conflict, development constraints, ‘poverty, governance challenges and limited access to basic services and resources’. The IPCC also concludes that the development challenges presently causing high vulnerability ‘are influenced by historical and ongoing patterns of inequity such as colonialism’. Levels of vulnerability vary both within and across societies. At the global level, vulnerability hotspots include ‘West-, Central- and East Africa, South Asia, Central and South

America, Small Island Developing States and the Arctic'. Within societies, vulnerability tends to be higher for those already disadvantaged along lines such as gender, ethnicity, and income (IPCC 2022, p.12).¹⁶ These variations in vulnerability make climate change a significant problem of global justice; one where the risk of harm is highly uneven, compounding existing inequalities.

In summary, when a community or other object of value is at risk of climate harm, this is because it is affected by all three of these factors: it is present in a setting that is *exposed* to *climate hazards*, and *vulnerable*.¹⁷ These three drivers work in tandem to make climate change such a grave *moral problem*, where many things of value are placed at significant – but highly uneven – risk of harm. This multi-causal nature of climate change as a moral problem suggests that proponents of the PPP err when they restrict their focus to excessive emitters. If climate responsibilities derive from unjust contribution to the problem, then they will not only be possessed by those who unjustly enhance atmospheric GHG concentrations – but also by those who unjustly enhance vulnerability and exposure.

IV. Unjust contributions to vulnerability and exposure.

If individuals and groups also contribute to the climate problem by enhancing vulnerability and exposure, then who else will contribution-based remedial responsibilities be possessed by?

Recall, first, that I am only assuming climate responsibilities to be possessed by those who make an *unjust* contribution to the problem. Many contributions to vulnerability and exposure will be justified: for example, when communities make faultless decisions to build homes by the coast, ignorant to the likelihood of sea-level rise; or degrade local ecosystems because they have no other livelihood options. Assigning remedial responsibilities to innocent contributors to vulnerability and exposure would not quite result in victim-blaming – since remedial responsibility does not entail blame – but it would further burden those at risk of climate harms through no fault of their own.

Just as the PPP must be supplemented with an account of fair emission shares, then, we need a background theory of justice that can distinguish between just and unjust contributions to vulnerability and exposure. Different background theories will differ in their assessments of injustice with, for example, global egalitarians likely to diagnose injustice in cases where global sufficientarians would not. Instead of defending a particular background theory of justice here, I will instead attempt to identify some cases that should be deemed unjust across a broad range of normative commitments.

¹⁶ For several examples of the way in which social injustices such as racism enhance vulnerability to climate events, see Bullard 2008.

¹⁷ For a helpful illustration of this point, see IPCC 2014, Figure 19-1.

The most clear-cut cases are those in which vulnerability is enhanced through the violation of negative duties of non-interference. Examples will likely include all cases of violent conflict, ecosystem degradation resulting from corrupt corporate practices, governance challenges caused by wrongful political interference, and poverty engendered by the imposition of unfair economic relations. Vulnerability can also be enhanced by the violation of commonly accepted positive duties of provision or protection. This will include cases where a community's own government has failed to provide them with important resources or services due to corruption or negligence;¹⁸ and where other governments or international agencies have failed to live up to their responsibilities to address global poverty. Vulnerability can also be unjustly enhanced by the refusal to make reparation for a prior injustice. For example, when present-day parties refuse to pay the material reparations that they owe (for colonialism, say), then this also constitutes a form of unjust contribution to the climate problem; because those owed reparation are being denied resources to which they are entitled and, as a result, left more vulnerable.

Ultimately, it is likely that injustice will be a contributing factor in most cases of climate vulnerability; because in a world like our own, vulnerability-enhancing factors such as marginalization, ecosystem degradation, conflict, governance challenges and poverty tend to be the product of wrongdoing or negligence.¹⁹ The same cannot be said for exposure, which will often arise from well-intentioned or unavoidable decisions to place things of value in hazardous settings. There are, nevertheless, some cases in which exposure is engendered by injustice; most obviously, when communities have been driven into exposed settings by land grabbing, forced displacement, or forced sedentarization. Exposure may also result from government negligence (for example, in permitting developers to build and sell homes on a known floodplain); or from failures of international duties to protect (owed, for example, to refugees in exposed locations).

A remaining question is how far back in history we should look when seeking to identify remedial responsibilities deriving from unjust contributions to vulnerability and exposure. As mentioned in the previous section, one significant contributor to present-day vulnerability is 'colonialism and its ongoing legacy' (IPCC 2022, p.53). There are also cases in which communities have ended up in exposed locations due to the historical decisions of colonial powers.²⁰ Though I do not have the space to outline a full defence of this position here, elsewhere I have argued that when present-day vulnerability and exposure is partly a product

¹⁸ On this idea see also Karnein's discussion of Hurricane Katrina, where she points out that even though 'To the extent that Katrina was a result of anthropogenic climate change, it is probably accurate to say that previous generations contributed to it'; to pin responsibility on emitters alone would be to overlook the significant responsibility of the contemporaneous US Government (2015, pp.57-59).

¹⁹ See Adger *et al.* for further support for the claim that 'a myriad of past and present social injustices have engendered the complex patterns of vulnerability that prevail in the contemporary world' (2006, p.263).

²⁰ For examples, see Barnett and Campbell 2010, p.35; Carr & Preston 2017, pp.765-6.

of unrectified historical injustice, climate responsibilities will also be possessed by present-day parties who are connected to that injustice in the right way (Blomfield 2019, §10.4.2).²¹

V. The complex landscape of climate responsibilities.

In the previous section I identified some cases in which there should be broad agreement that contributions to climate vulnerability and exposure were unjust. Given the assumption that I am operating with in this paper – that unjust contribution to a problem grounds a responsibility to remedy it – the perpetrators of these injustices should be taken to possess special obligations to remedy the climate problem. To be clear: I am not denying that emissions (or benefit, or ability) should also be understood as an important source of remedial obligations. My point is rather that if we equate unjust contribution with excessive emissions alone, we oversimplify the landscape of climate responsibilities.

The causal picture that I have presented has several important implications. Firstly, it enables us to expand the set of agents with contribution-based climate responsibilities, beyond those who can be judged to have emitted excessively. Secondly, it highlights that many parties have acquired contribution-based climate responsibilities via more than one causal pathway: for example, many states and corporations will have unjustly contributed to the climate problem not only by polluting, but also through forms of interference or negligence that have enhanced climate vulnerability.²² Why does this matter? Well for one thing, it shows that some polluters have more significant contribution-based responsibilities than might otherwise be recognised. And for another, the responsibilities arising from unjust contributions to vulnerability and exposure may be different in nature to those that derive from emissions.

As has often been pointed out in philosophical discussions of climate justice: because physical climate change results from an overall increase in atmospheric GHG concentrations, it is not possible to draw a straightforward causal link between one party's emissions and any particular climate harms. Those who unjustly contribute to atmospheric GHGs therefore seem to acquire a *general* responsibility to contribute to the remedy of the climate problem, rather than one that is owed to anyone in particular. Those who unjustly contribute to vulnerability and exposure, on the other hand, may well gain a responsibility that is owed to the particular communities whose vulnerability and exposure they have enhanced. This approach therefore identifies remedial responsibilities that are different in nature to those recognised by the PPP.

This causal picture also indicates that contribution-based remedial responsibilities will often exist in cases where climate hazards cannot be proven anthropogenic in nature. It is sometimes suggested that when harm is caused or threatened by natural climate events, remedial

²¹ On this point, see also Taiwo 2022, p.178.

²² On this point, see also Whyte 2017.

responsibilities must be based on ability rather than contribution (e.g. Caney 2010).²³ However, the account given here suggests that even in these cases, there could be parties that have enhanced vulnerability or exposure to natural climate hazards in a way that grounds a responsibility to remedy the risks that they pose.²⁴ This will be a welcome result for those who think that contribution-based remedial responsibilities are in some sense stronger than those deriving from ability alone.

Turning next to the BPP: this principle seeks to assign remedial responsibilities to parties who benefit unjustly from contributions to the climate problem; where what makes a party's benefit unjust might be that it is derived from unjust activities, or that it is excessive in the sense that the party benefited too much from the activity in question (whilst others benefited too little).²⁵ If there are more ways of contributing to the climate problem than by emitting, then there will also be more ways of unjustly benefiting from those contributions. Thus, proponents of the BPP should also take remedial responsibilities to be possessed by those who have unjustly benefited from contributions to vulnerability and exposure.

Ultimately, once we recognise the causal complexity of climate change *as a moral problem*, we appear unlikely to be able to identify a neat division of climate responsibilities. As explained in §II, proponents of the PPP sometimes appear to hope that insofar as GHG emissions can be quantified according to a common measure, it should be possible to divide the costs of climate change between polluters in proportion to their excess emissions. This goal should perhaps already be in question, insofar as different parties may have more or less justified reasons for exceeding their fair share (in other words, even if the comparability of emissions makes it possible to judge that two polluters have made an equal causal contribution to the problem, it is not necessarily the case that they should thereby also be taken to acquire equal remedial responsibilities). Once we recognise that parties can contribute to this problem via other means than emissions, however, it looks extremely unlikely that any neat division of costs will follow; because it is not clear what metric we could use to compare the causal efficacy of unjust contributions to atmospheric GHGs, with unjust contributions to vulnerability and exposure.

Some may find this a highly unwelcome conclusion, given the urgency of addressing climate change. This worry does not count against the causal picture that I have painted: whether we like it or not, climate change simply is a moral problem with an extremely high level of causal complexity, which makes it very difficult to determine how remedial responsibility is shared across the many unjust contributors to it. What the urgency of the problem may suggest,

²³ In Page's words: 'Suppose that climate change could be traced entirely to natural climatic variations. In such cases, "contribution to problem" reasoning could not explain why the victims of climate change should not be abandoned to their fate even if measures could be undertaken by wealthy countries to limit their suffering' (Page 2008, p.559; see also Wallimann-Helmer et al. 2019, p.46).

²⁴ For an argument that unjust contribution should be considered an important ground of remedial responsibility in the case of 'natural' disasters, see Valentini 2013.

²⁵ See e.g. Gosseries 2004.

however, is that this is a task that we do not have time for. A more practical approach in these circumstances could be to assign remedial responsibilities on the basis of ATP. Ability-based remedial responsibilities look much more straightforward to identify and compare. There is also likely to be significant overlap between those who are very wealthy, and those who have unjustly contributed to (or unjustly benefited from contributions to) the climate problem. And in cases where ability and unjust contribution come apart, at least assigning remedial responsibilities to the wealthy will not exacerbate global inequality.

In other words, recognising the causal complexity of the climate problem may provide the basis for a new pragmatic justification of an ATP approach. Recognising the significance of vulnerability and exposure also, however, gives us a reason to attempt to modify the ATP approach, so that it can accommodate at least some of the special relationships of responsibility that arise when one party unjustly enhances the vulnerability or exposure of another. Attending to such relationships will be important not only on grounds of principle, but also for pragmatic reasons: as a way to disincentivise unjust behaviour that enhances vulnerability and exposure.

VI. Challenging this account.

In this section I consider three potential challenges to my account. First, a proponent of the PPP might argue that a restricted focus on excessive emitters is justified because GHGs are the salient causal factor when it comes to climate harms, whilst vulnerability and exposure should be viewed as mere background conditions. Analogously, in my example where several companies have dumped toxic waste into a community's water supply, it is true in a sense that the location of the community (exposure) and their lack of alternative water sources (vulnerability) play some causal role in the resulting harm. However, one could still argue that it is the waste dumping that is the salient cause or difference-maker here, whilst these other factors should be assumed as background conditions.

Even in a simple case like this, however, things may not be so straightforward. The presence of human agency can make a significant difference to what we judge to be causal factors versus background conditions. Imagine, for example, that this community is only located close to these toxic companies due to racist zoning laws; or that they lack an alternative water supply due to government neglect. The exposure and vulnerability of this community should not be viewed as a fixed, normal, or natural background condition, then: it is the product of human agency and, more specifically, the unjust exercise of such agency. To hold the companies solely responsible for the harms that the community suffers would seem to overlook that human agency has unjustly contributed to their plight by other means, which should also give rise to remedial obligations.

In the climate change case, any attempt to relegate vulnerability and exposure to the status of background conditions looks even more challenging due to the temporal dimensions of this problem. CO₂ has an extremely long atmospheric lifetime, which means that the climate change being observed today is a result of GHG emissions that have been accumulating in the

atmosphere since the Industrial Revolution. Many contributions to vulnerability and exposure have taken place in the intervening period, so why should these contributions be considered more of a background condition than the emissions that, in some cases, predate them? Looking forward, it is unclear why we would treat vulnerability and exposure as background conditions against which we must make decisions about how far to limit future emission of GHGs, rather than the already changing climate as a background condition against which to make decisions that will affect vulnerability and exposure. All three factors are open to intervention, and the extent of future climate harm will be determined not by atmospheric GHG concentrations alone, but also by the way in which socioeconomic development enhances or reduces vulnerability and exposure.²⁶

A second objection would be that I have misconstrued the PPP. Whilst I am discussing how to identify remedial responsibilities for any harms in which anthropogenic climate change is one causal factor, proponents of the PPP seek to identify responsibility for the portion of harm that stems from emissions alone, factoring out any other causal contributions.²⁷ My reply to this objection is that it is unclear to me that we can identify the proportion of climate harm that can be attributed to polluters alone. Climate harms are jointly produced by the interaction of increased atmospheric GHGs, vulnerability and exposure, and it is unclear how they might be disaggregated in the way that this restricted application of the PPP would require.

To illustrate this, imagine the following example: A community is impacted by flooding, causing a loss of value 60. If precipitation patterns hadn't been intensified by anthropogenic climate change, then the loss would only have been 10. If this community hadn't been rendered more vulnerable by an injustice, then the loss would only have been 20. Many climate harms will be like this example, in the sense that the interaction of anthropogenic climate change and vulnerability will have an amplifying effect, producing harms that are greater than the sum of their parts. But then what is the portion of the harm that we can attribute to polluters alone?

It is not clear that we know how to answer this question. Although philosophers have recently been turning their attention to the question of degrees of causation (see Kaiserman 2018), some deny that causal contributions come in degrees at all.²⁸ And even if causal contributions do come in degrees, it is not clear that we have access to the information that we would need to determine them. Real-world climate harms will generally be far more complex than the imagined example above, in that they will involve more forms of unjust contribution, harms that cannot be easily valued or compared, and uncertainty about the extent of harm in any

²⁶ For a striking illustration of how the risk of food insecurity is predicted to depend to a significant extent on socioeconomic choices, and not only on global average temperature rise, see IPCC 2019, SPM.2.

²⁷ My thanks to Simon Caney for pressing me with this objection.

²⁸ This view has recently been defended by Sartorio (2020). Some other proponents are listed by Kaiserman (2018, p.1).

relevant counterfactual scenarios.²⁹ If proponents of the PPP really are looking to identify responsibility for a portion of harm that can be attributed to excessive emitters alone, then, they need to explain how we are supposed to determine the extent of such harm. In the absence of such an explanation, the question we instead appear to face is how to share remedial responsibility across multiple unjust contributors, who jointly produce climate harms in such a way that their respective degrees of causal contribution are unclear.³⁰

Finally, somebody might challenge my account by arguing that even if unjust contributions to vulnerability and exposure can ground some climate responsibilities, this is only the case for compensation or adaptation responsibilities, but not for mitigation. When it comes to compensating for climate harms, the harms in question can be seen to have resulted not only from climate hazards, but also the underlying situation that those hazards interacted with, meaning that (as Ivo Wallimann-Helmer puts it):

the question of corrective liability for L&D [loss and damage] concerns not only climate change. Liability also covers the question of who unfairly contributed to the socio-economic conditions that increase vulnerability to climate L&D. On a global scale, this means that unfair disadvantage in resources and economic arrangements would have to be compensated by those countries liable and benefitting unfairly from them. (Wallimann-Helmer 2015, p.474)³¹

It might seem similarly straightforward to argue that those who have unjustly enhanced the exposure or vulnerability of a community thereby acquire a responsibility to assist them in adapting to climate change – because adaptation is essentially a means of reducing the exposure and vulnerability that you have unjustly enhanced. It is less clear, however, why those who have unjustly enhanced vulnerability and exposure would have a responsibility to take on any burdens of reducing emissions, or removing GHGs from the atmosphere. It is polluters who have unjustly increased atmospheric GHG concentrations, after all, so shouldn't this responsibility fall to them alone?

There is, nevertheless, reason to think that unjust contributions to vulnerability and exposure can also ground remedial responsibilities for bearing the costs of mitigation. In short, this is because unjust contributions to vulnerability and exposure are one of the key reasons why mitigation is so necessary – these contributions have left communities and other things of value less able to cope with any given degree of global warming. One might question whether it makes any difference that current vulnerability and exposure to climate change is understood to derive from injustice, rather than simply bad luck. Surely, someone might claim, the demand

²⁹ For a compelling illustration of such complexity, see Hartzell-Nichols 2011, p.690.

³⁰ We might also question whether the magnitude of a party's remedial responsibility for a harm should be determined by their degree of causal contribution to it (see, for example, Tadros 2018).

³¹ See also Meyer & Roser 2010, p.231.

for mitigation depends only on the fact of climate vulnerability, and not on its provenance. In a sense this is true. I certainly am not saying that if vulnerability and exposure were simply a matter of natural misfortune, then justice wouldn't demand the same level of protection through mitigation efforts. If climate vulnerability and exposure were purely natural phenomena, however, then the need for mitigation would be manufactured entirely by polluters, whereas in our world this need is also manufactured by those who have enhanced vulnerability and exposure. It seems fair that those who have unjustly manufactured the need for climate mitigation should bear some of the burdens of providing it.

To illustrate this with my simpler example involving pollution of a community's water supply: let's assume that a foreign government has unjustly contributed to this community's exposure and vulnerability to toxic waste dumping. In the eventuality that the community is harmed, it seems fair to say that this government has a shared responsibility to provide compensation along with the companies who dumped the waste. It would obviously be preferable, however, to prevent harm from occurring in the first place and it seems reasonable to hold that the government has contribution-based responsibilities here also. This could mean that the government has some responsibility to provide resources that the community can use to increase its adaptive capacity, so that dumping would not have such adverse effects (say through provision of an alternative water supply). But if adaptation options aren't available, or would not significantly reduce any resulting harm, then it might be better for that government to instead try to mitigate the threat, by doing whatever it can to prevent any dumping from occurring in the first place. Similarly, when one party has unjustly contributed to a community's vulnerability and exposure and, thus, their risk of climate harm, one way that they might make up for this is by supporting mitigation efforts that will reduce the risk of such harm materializing.

To conclude: in this section I have responded to three potential objections to the view that I have attempted to defend in this paper. First, I explained why GHG emissions cannot be singled out as the cause of climate harms, with vulnerability and exposure as mere background conditions. Second, I argued that it is not clear how we could use the PPP to allocate responsibilities for the portion of climate harm resulting from excessive emissions alone, because it is unclear how we are supposed to determine the extent of such harm. And third, I showed that unjust contributions to vulnerability and exposure will not only ground responsibilities to bear burdens of climate adaptation and compensation: they can also ground responsibilities to engage in – or support - mitigation.

VII. *Conclusion.*

According to Henry Shue, 'The basic issue of fairness characteristic of global warming seems to be: How should responsibility for solving the problem of global warming be divided, given how responsibility for creating the problem is in fact divided? And given how the benefits of the activities that produce the problem have in fact been distributed?' (2014, p.127). In this paper I have argued that climate change, as a moral problem, has a more complicated causal structure

than many theorists of climate justice recognise. Responsibility for creating the problem falls not only to emitters, but also to those who enhance vulnerability and exposure. This means that if proponents of the PPP are correct that unjust contribution to a problem grounds a responsibility to remedy it, then responsibility for solving the climate problem will also be possessed by those who unjustly enhance vulnerability and exposure.

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