For the Sake of Future Generations: Intergenerational justice and climate change mitigation

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Table of Contents

Table of Contents

List of figures

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Declaration

I confirm that the submitted work contains neither material from any prior theses nor any material that has already been published. The thesis is my own work submitted for the degree of PhD in Politics and International Studies at the University of Warwick.

Introduction

We must expect posterity
to view with some asperity
  the marvels and the wonders
    we're passing on to it;
But it should change its attitude
to one of heartfelt gratitude
  when thinking of the blunders
    we didn't quite commit.
  - "Our Nobel Achievement", Piet Hein, *Grooks*

1. Climate change and future generations

The present generation must confront a challenge. The challenge is to determine what it must do for the sake of future generations. This challenge is quite puzzling because the present generation, like its predecessors, will pass on to future generations a complex mix of goods, inventions, institutions and opportunities containing a range of benefits and burdens. In this thesis, I focus on one key intergenerational problem – anthropogenic climate change – considering some of the questions of intergenerational justice that it raises. While it has not always been the case, climate and climate change have recently taken on new significance as a process to which humans can, and in fact do, contribute. More specifically, while paleoclimatic data show substantial variation in the Earth's climate (Masson-Delmotte, Schulz, Abe-Ouchi, Beer, Ganopolski, J.F. González Rouco, E. Jansen, et al., 2013: 385),[1] an ever-growing mass of evidence shows that human activity – particularly the sustained emission of greenhouse gases (GHGs) – is beginning to change the global climate, with much greater changes still to come (IPCC, 2013b: 4, 19ff). This produces what is known as anthropogenic climate change, "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer", and that results from human activities (IPCC, 2013a: 1448, 1450).

Climate change is a problem: on balance, it stands to have significant, long-lasting and adverse impacts upon humans well into the future, exacerbating existing risks, as well as generating new ones altogether

[1] Here, and frequently throughout the thesis, I cite the Intergovernmental Panel on Climate Change (IPCC). I follow the citation suggestions in that report, where substantive chapters are to be cited with reference to their authors, while associated publication (the Summary for Policymakers, Annexes, etc.) are to be cited with the IPCC itself as the author.

(IPCC, 2014c: 11–12; Kjellstrom et al., 2016; Mauritsen, 2017; Pecl et al., 2017). The prospect of human interference in the global climate raises a litany of challenges, including pressing normative questions. Some of these normative challenges follow from the intergenerational nature of climate change (Kolstad et al., 2014: 216–8), as its impacts, both beneficial and harmful, will be distributed across many generations. Climate change is intergenerational in the sense that it is a process that takes place across many generations of humans, largely separating those who contribute to the problem from those who will suffer its consequences (Kolstad et al., 2014: 228). It follows, then, that those who can influence the fundamental processes of anthropogenic climate change are not the same as those whose interests, well-being and lives will be shaped by climate change and policies designed for its management. From the perspective of the present generation, it is up to its members to mitigate climate change – "to reduce the sources or enhance the sinks of greenhouse gases" (IPCC, 2013a: 1458) – in order to limit the severity of climate change impacts for the sake of future generations, a responsibility than stands to pass from generation to generation as long as the prospect of such impacts remains. That is, this problem will persist as long as one generation's choices influence the climate that future generations will experience.[2] It is therefore up to the present generation to mitigate climate change, largely for the sake of future generations, as well as lock in social arrangements and technological innovations (including institutions that employ the complementary strategies to mitigation, adaptation and compensation) that allow for humans to live on the Earth without destabilising its climate (Newell and Mulvaney, 2013).

In this thesis, I consider what justice requires, given these questions, asking: to what extent, if at all, does justice require the present generation to mitigate climate change for the sake of future generations? In response, I defend the claim that the present generation should mitigate climate change for the sake of future generations. I develop an interest-based conception of intergenerational duties of justice in the mitigation of climate change (or 'just mitigation') and defend it from some of the key problems that plague theories of intergenerational justice. I also outline a range of scenarios

[2] At this early stage, I should also mention that climate change is beginning to influence the lives of those presently alive. As more and more living people feel the effects of climate change, there will be further reasons to respond to climate change (including, but not limited to, mitigation), reasons that have nothing to do with intergenerational duties. Of course, these will *add to* rather than *replace* intergenerational reasons for action. Moreover, climate change, especially if it is left unmitigated, stands to have far worse effects (as in effects with greater scope and intensity) on future generations, effects that can be prevented by the present generation.

that illustrate different mitigation pathways that the present generation can pursue, arguing that justice requires significant and extensive mitigation.[3]

While pressing environmental and climatic problems breathe new life into discussions of intergenerational justice, they are not new to political and moral thinkers (Ball, 2007: 61). Edmund Burke saw society as a "partnership not only between those who are living, but between those who are living, those who are dead, and those who are yet to be born" (Burke, 1987: 85 [1790]); Thomas Paine, in contrast, argued for the priority of the present (Paine, 1997: 62 [1791]). Thomas Jefferson wrote in a letter to the sceptical James Madison that "the earth belongs in usufruct to the living" (Ball, 2007: 62). John Locke's theory of property acquisition includes the proviso that individuals leave "enough, and as good" for their successors (Locke, 1988: 291 [1689]), which Immanuel Kant noted would burden earlier generations for the sole benefit of later ones (Kant, 1991: 44 [1784]). Adam Smith discussed the claims of humanity, including future generations, in the context of individual self-interest (Smith, 2002: 157–8 [1759]). Even Socrates's alleged corruption of Athenian youth rests on the desire, felt by some, that their way of life persists into future generations (Plato, 1969: 23d). Despite longstanding attention, the intergenerational extension of justice "subjects any ethical theory to severe if not impossible tests" (Rawls, 1999: 251). The novel case of climate change presents precisely this sort of severe test, where working out what justice requires the present generation do for the sake of its successors must, as we shall see, overcome a series of impediments.

2. Preliminaries

2.1. Should we ask normative questions?

Why consider the justice of alternative choices about climate change and its mitigation? Climate change confronts the present generation with the choice of mitigating climate change or leaving it unmitigated (in addition to further questions of how much mitigation to undertake). Each available option embodies a wide range of normative assumptions, including some about what the present owes future generations. More generally, any effort to determine what to choose or how to act will rest on some normative assumption; any claim to possess non-normative devices or approaches to these questions is mistaken (Broome, 2008). In this respect, climate change is no different from other,

[3] I specify 'significant and extensive' more precisely in chapter 2, with reference to what I call the moderate-to-high mitigation pathway.

intragenerational problems. For example, choices about intragenerational distributive policies perennially raise normative debates, since any given choice will rely on certain normative assumptions. It is therefore no stranger to discuss the normative dimensions of climate change than it is to discuss those of alternative distributive policies. Indeed, this is precisely what political theory is about:

> Politics and ethics […] are domains of activity. The reasoning that we bring to them must be practical reasoning, that is reasoning which we and others can use both in personal and in public life not merely to judge and appraise what is going on, not merely to assess what has been done, but to guide activity. (O'Neill, 1996: 2)

In short, normative questions are inescapable. The present generation will make a choice about mitigating climate change, one way or the other. Asking normative questions about what values should guide this choice, including questions about intergenerational climate justice, is simply one important dimension of making that choice: "Science has alerted us to a problem, but the problem also concerns our values. It is about how we ought to live and how humans should relate to one another and to the rest of nature" (Jamieson, 2010: 79).

A further, related reason to consider normative questions is that there exists significant disagreement about what should be done about climate change. Different ideas about the role of scientific knowledge, different conceptions of value and what should be valued, different religious and spiritual beliefs, different notions of risk, different messages about climate change, different goals for human development and different approaches to governance each provide a unique means for disagreeing about climate change (Hulme, 2009: xxiv–xxviii). The extent and depth of disagreement mean that any given decision about how to respond to climate change will need to be justified to individuals who feel that they have good reason to disagree with that decision. Considering normative questions and offering justificatory arguments is an important element of settling on a course of action in the context of significant disagreement.

It is also worth noting that the Intergovernmental Panel on Climate Change (IPCC) explicitly acknowledges the relevance of normative argument to inform policies designed to respond to climate change. For example, two chapters of the third volume of the recent Fifth Assessment Report (AR5) deal extensively with normative concepts. More specifically, the IPCC recognises that "ethical judgements of value underlie almost every decision that is connected with climate change, including decisions made by individuals, public and private organisations, governments, and groupings of

governments" (Kolstad et al., 2014: 215). The IPCC has also specifically identified mitigation as requiring further normative analysis (Kolstad et al., 2014).

In sum, a myriad of choices will have to be made about what to do in response to climate change, choices that will reflect underlying normative assumptions, reasons and arguments (Kolstad et al., 2014: 215). Considering normative questions, then, is one part of making these choices. The widespread disagreement about climate change amplifies the importance of normative inquiry: even though, in the absence of disagreement, normative questions would still need to be answered, the presence of disagreement highlights how important it is that choices connected to climate change be grounded in normative reasons.

2.2. Method

If providing answers to normative questions connected to climate change is important, how do we go about doing so? Since a full explanation of normative methods far exceeds what I can provide in this section, I make three key points.

First, a crucial part of any normative claim is that it requires justification. Any individual can ask why one should think, like, say, do or be according to the reasons offered by any given moral theory. With that in mind, normative claims are ubiquitous (Jamieson, 1993: 479). Humans constantly evaluate their own actions and character (as well as that of others) and states of affairs. Such evaluations inevitably appeal to concept such as permissions, duties and values, to name a few (Jamieson, 2010: 82). By explicitly appealing to theoretical arguments, I intend for the normative arguments defended in this thesis to be a more rigorous form of these ubiquitous evaluations. One way of articulating the approach taken in this thesis is "common sense reasoning carefully conducted" (Lenman, 2000: 351). While the explicit appeal to moral theories is, of course, central to this thesis, it should be noted that moral theories are, in turn, indispensable to moral practice. Indeed, many common-place claims implicitly make certain moral assumptions: the claim that individuals owe certain duties to their children relies on assumptions about the concept of duties, for example. I try to make such assumptions explicitly so that they may be scrutinized, with the intention of outlining how much, if at all, the present generation should mitigate climate change.

Second, reflective equilibrium is a central tool of normative, analytical theory. A coherentist method of inquiry (Jamieson, 1993: 482; McMahan, 2000: 110), reflective equilibrium refers to a "mutual adjustment of principles and considered judgements" (Rawls, 1999: 18, 42-5; see also Rawls, 1974:

7ff). There are two forms of reflective equilibrium, narrow and wide; this thesis employs the latter. While narrow reflective equilibrium aims to establish coherence between initial judgements and a set of principles (Rawls, 2001: 30–1), wide reflective equilibrium is the "attempt to produce coherence [between] (a) a set of considered moral judgements, (b) a set of moral principles, and (c) a set of relevant background theories" (Daniels, 1996: 22). Though the process of wide reflective equilibrium sits in the background of any normative argument, explicit appeals to it are rare. Instead, the method sits in the background of substantive arguments in political theory as they seek to defend (or undermine) particular normative claims. With that in mind, the key point to take away from the abstract discussion of wide reflective equilibrium is that the pursuit of coherence is crucial to the actual practice of normative investigation (on coherence, McDermott, 2008: 13). The structure of my thesis reflects this methodological point. I first set out the concepts of justice between generations and just mitigation, with the aim of specifying exactly what the arguments in the thesis must provide. I then outline a positive argument examining reasons that the present generation should mitigate climate change for the sake of future generations, before defending it from a range of important objections. Coherence is key throughout, since the positive argument about intergenerational duties of just mitigation must meet the conceptual aims I set out beforehand as well as the putatively problematic considerations raised by the objections I consider.

Third and finally, this thesis is problem-led. That is, it "engages theoretical issues but begins with, and remains disciplined by, a moral subject of practical political importance" (Dworkin, 1993: 28), in this case, that of climate change mitigation. The effect of this approach is not to privilege so-called practical concerns over theoretical ones, or vice versa. The effect is instead that the choices about which facts to include, ideas to consider, and arguments to defend flow from the central purpose of providing a clear outline of intergenerational challenges of climate change mitigation and a compelling defence of the claim that the present should mitigate climate change for the sake of future generations.

3. The argument

I argue that the present generation should engage in immediate and extensive mitigation of climate change. By immediate and extensive, I mean that the present generation should pursue what I call the

moderate-to-high mitigation pathway. This is one from a range of four pathways that I use, in chapter 2, to illustrate the range of options that are available to the present generation.[4]

The key normative foundation for this argument rests in what I call *intergenerational justice as proportionality of opportunities* (shortened to *the proportional view*). According to this view, intergenerational justice requires that each generation sustain a range of opportunities for its successors that is in proportion to its original inheritance, where proportionality is defined as non-diminishment of opportunities, plus improvements where they are costless or aid future generations' pursuit of justice. I develop this view by reconstructing what I call *intergenerational justice as non-diminishment* (shortened to *the non-diminishment view*) from remarks on intergenerational justice found throughout Brian Barry's work. I identify several problems with non-diminishment then formulate the proportional view as a development of the non-diminishment view that is not subject to the same problems. More importantly, I also argue that the proportional view captures the requirement of impartiality that justice demands in the intergenerational context. Based on the proportional view, I argue that justice requires the present generation to pursue the moderate-to-high mitigation pathway because this is the only response to climate change that sustains a proportional range of opportunities (as defined above) for future generations.

Having laid out this argument, I then turn my attention to defending it from problems that appear to diminish the importance of intergenerational duties to mitigate climate change or even release the present generation from such duties entirely. These are the problems of non-reciprocity, non-existence, non-identity and indeterminacy. I argue that none of those grounds successful objections that diminish or undermine the present generation's duties of just mitigation. That said, considering each problem provides useful opportunities to develop the proportional view of intergenerational justice. In response to non-reciprocity, I argue that reciprocity as fairness can be extended intergenerationally, once we understand the concept of indirect reciprocity; I also argue that there are limitations to the importance of reciprocity to intergenerational justice. In response to non-existence, I argue that the present generation should avoid making choices that will inevitably violate future generations' rights, when they come into existence. In response to non-identity, I argue that the intergenerational duties rests on properties that the present generation can reasonably expect future generations to have, properties that are not attached to particular identities and that do not vary

[4] As I explain in chapter 2, these options are associated with the IPCC's Representative Concentration Pathways.

according to who exactly will come into existence. Finally, in response to indeterminacy, I develop what I call *the pluralist view of intergenerational duties* as a means of formulating intergenerational duties that the present generation can discharge, despite the indeterminacies associated with climate change and its mitigation.

One of the key contributions in this thesis is the reconstruction of Brian Barry's view on intergenerational justice, the non-diminishment view. Despite writing on a variety of issues in intergenerational justice, much of Barry's work is critical in nature, leaving his more positive claims scattered in different places. I therefore connect these different claims and systematise them to produce the non-diminishment view. I can then critically engage with it, using it to develop the proportional view of intergenerational justice. Another key contribution is in my focus on mitigation. As I discuss in chapter 2, mitigation poses a range of unique normative challenges, primarily (though not entirely) because it is an inevitably intergenerational challenge. Focusing on it alone (as a philosophical strategy, not a normative claim about detaching mitigation from other climate change responses) allows me to consider in detail how to justify intergenerational duties of just mitigation.

4. Thesis structure and chapter outline

The thesis has a three-part structure. I first lay a conceptual foundation, before presenting my view of intergenerational duties, then defending it from objections. The more detailed outline runs as follows. In chapter 1, I consider the concept of justice between generations. First, I outline the concept of generations as non-overlapping cohorts of individuals and defend its use as a simplifying assumption that helps focus the thesis upon the distinct normative problems of intergenerational justice. Second, I outline the concept of justice as a value that impartially adjudicates between individuals' competing claims.

In chapter 2, I deepen the discussion of intergenerational justice found in this chapter by outlining the concept of just mitigation. I outline the agenda for any given conception of just mitigation. In support of that aim, I explain basic processes of climate change, highlighting its intergenerational impacts. I also situate mitigation within the context of other responses to climate change, namely, adaptation and compensation. Most importantly, chapter 2 outlines the key mitigations options available to the present generation. Using the Intergovernmental Panel on Climate Change's (IPCC's) Representative

Concentration Pathways (RCPs), I outline the key choice available to the present generation between different amounts of mitigation.

In chapter 3, I defend the key normative basis for intergenerational duties of just mitigation. I outline the proportional view of intergenerational justice, defending the claim that it best expresses what justice requires one generation do for the sake of its successors. I argue that intergenerational justice requires each generation to secure for its successors a range of opportunities that is undiminished, when compared to each generation's inheritance. Justice also requires each generation to improve that range of opportunities, where doing so is costless and where doing so aids in the pursuit of justice itself. I also discuss key concepts, such as productive potential (the metric for measuring opportunities) and critical natural and non-natural capital (key parts of a generation's inheritance that must be sustained). I also show how the Capabilities Approach helps specify a generation's opportunities.

In the next three chapters, I consider problems which, at first glance, appear to undermine, if not rule out, intergenerational duties of justice mitigation. While I argue that none of the problems are decisive, my response to each helps develop the interest-based account of intergenerational duties of just mitigation provided in chapter 3.

In chapter 4, I consider the problem of non-reciprocity. On some views, duties of justice only apply to reciprocal relationships, such as relationships where individuals can mutually benefit on another; the problem of non-reciprocity flows from the lack of reciprocal relationships between generations. I offer a two-fold answer to this problem. First, I show how on a particular understanding of reciprocity (reciprocity as fairness), indirect relationships as reciprocity can hold between generations. Second, I also discuss the limitation of reciprocity as a means for grounding intergenerational duties of just mitigation, introducing the concept of subject-centred theories of justice as an alternative approach.

In chapter 5, I turn to two further problems. First, there is the problem of non-existence, which is that, since future people do not yet exist, they do not possess the relevant properties needed to generate moral claims against others. I argue that while this problem does not decisively undermine intergenerational duties of just mitigation, its consideration helps bring into focus the notion of future individuals' rights, that is, rights that future individuals will have when they come into existence. This in turn helps further refine the basis of intergenerational duties, including those of just mitigation. Second, I consider the non-identity problem, which appears to make a mockery of the idea of mitigating, or indeed doing anything, for the sake of future people. The reason is that many, if not

most, actions influence those who will in fact populate the future. With that in mind, any given action undertaken for the sake of the interests of a given set of future people will end up changing who will come into existence; therefore, that particular action cannot in fact protect the interest of that given set. In response, I argue that present choices should be evaluated according to the way that they respect future generations as a class of individuals who share a set of normative relevant interests. In other words, by appealing to this notion of interests, the identity-fixing nature of actions does not undermine the prospect of intergenerational duties.

In chapter 6, I turn to the problem of indeterminacy. In short, indeterminacy refers to the many ways in which future states of affairs are not presently fixed. This generates a two-fold problem for intergenerational duties of just mitigation. First, it requires a greater consideration of the concept of a duty. Since the future is unknown, duties of just mitigation need a justificatory basis that does not rely on certainty about the effects of a given action on future generations' interests. Second, indeterminacy breaks down into three sub-types (risk, uncertainty and ignorance), each of which generates a unique problem. In response to the problem of indeterminacy, I defend a pluralist conception of normative duties as duties that hold those alive today to act according to the best available evidence. I then argue that understanding duties in this way resists the problems associated individually with risk, uncertainty and ignorance.

Finally, in chapter 7, I conclude by reconstructing the thread of the argument and placing duties of intergenerational justice in the wider context of reasons why the present generation might mitigation climate change for the sake of future generations.

1. Justice between generations

1.1. Introduction

This is a thesis about what justice requires. While I focus on a particular challenge (climate change) and one strategy for responding to this challenge (mitigation), the argument that I advance contributes to the larger project of working out what justice requires. With that in mind, in this first chapter, I lay out the conceptual foundation for the rest of the thesis. This involves answering two questions: (1) what is the concept of justice? And (2) what is a generation? Answering these two questions together allows me to specify the concept of justice between generations, setting the terms of the arguments that I develop later in the thesis. While I aim to provide a useful outline of the concept of justice between generations, I do not aim to settle any longstanding conceptual debates; neither, however, is my aim purely stipulative, clarifying only what *I* mean by justice between generations. Instead, I outline the concept of justice that captures the important features that a variety of conceptions of justice share.[5]

I begin by defining the concept of a generation as a non-overlapping cohort of individuals and defend this definition on the grounds that it best highlights the normative issues that I tackle in this thesis. I do not claim that this notion should supplant or supersede others, but rather that it adds a complementary perspective on intergenerational justice. I then turn to the concept of justice, distinguishing a core set of conceptual features, as well as some further issues that conceptions of justice generally address. I take justice to be a value that impartially adjudicates between competing individuals' claims by allocating perfect duties (that is, duties with corresponding rights) to ensure that each receives her due. In addition to these core features, I then discuss some important secondary notions, such as that of advantage and disadvantage. Lastly, I introduce the concept of an interest as a relationship between an individual and some good, where that individual is invested in that good.

[5] I distinguish concepts from conceptions, where concepts effectively set the agenda for particular conceptions, which are themselves substantive theories of what a concept should be (Rawls, 1999: 5; Waldron, 2003: 270). For example, Rawls's justice as fairness is a substantive conception of justice because it contains substantive claims about justice. In contrast, I discuss the concept of justice as it defines the role of different conceptions of justice.

Following a range of other thinkers, I introduce the interest-based theory of rights. I then conclude by outlining the idea of standing in the right relationship with future generations.[6]

1.2. Justice between generations

1.2.1. Generations

Though others use labels such as "intertemporal generations" or "removed generations" (Laslett and Fishkin, 1992: 25–6; Tremmel, 2009: 28), I simply use the term 'generations' to refer to non-overlapping cohorts of people. A generation is a group of people, none of whom will live at the same time as another generation. This definition clearly draws out the normative problems that arise when thinking about issues of intergenerational justice and climate change mitigation. [7]

The term generation has several uses, referring variously to birth cohorts (those born between particular dates, e.g. those born from 1980-1990), age groups (those of a particular age at a given time, e.g. the elderly), family generations (e.g. parents, grandparents, etc.) and societal generations (those born during a particular cultural moment, e.g. Millennials) (Daniels, 1996: 258; Tremmel, 2009: 19). There are, of course, many normative issues that arise when thinking about justice between generations, conceived in any of these ways. Children owe their parents some duties, and vice versa; more generally, people have duties that depend on what age group they belong to (i.e. the young, the elderly). Employing the term generation to refer to non-overlapping cohorts of individuals captures the difficulty of justifying duties of just mitigation that are meant to hold between generations. In other words, while there are perhaps interesting questions about what my parent's generation – the generation that partly entrenched (and benefitted from) a social order that led to increasing levels of atmospheric GHGs – owes my generation, these are not the questions with which I am concerned in this thesis. With that in mind, I use the term 'generation' as outlined above.

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[6] I readily acknowledge the anthropocentrism of my approach. To those who see this as a weakness of the thesis, I would point out that my focus is not intended to take anything away from arguments that show the present generation should mitigate climate change for the sake of non-human animals. These considerations are all complementary.

[7] Contrast this approach with others who have considered the concept of a generation in the context of intergenerational justice who seek to establish an "objective" meaning of the term (Laslett and Fishkin, 1992: 8–11). Laslett and Fishkin's discussion notwithstanding, it is not clear what they mean by 'objective' and it seems likely to me that they misunderstand the relationship between concepts and normative theory: "a concept is a product of a theory or a doctrine consisting of moral principles for the guidance and evaluation of political actions and institutions. One can derive concepts from a theory but not the other way round" (Raz, 1986: 16; see also Rawls, 1999: 44).

The idea of generations as non-overlapping cohorts helps bring into focus the problems with which I am concerned in this thesis. Part of this follows from my focus on climate change mitigation. As I develop in greater depth in the next chapter, any theory of just mitigation will necessarily rest in part on duties between generations, as I have defined them. The key reason for this is that the benefits of mitigating climate change will largely be felt by future generations, yet it is the present generation that will have to bear its costs.[8] It is possible to overstate this point: there are some people alive in the present who are beginning to suffer the consequences of climate change (or, at least, who will suffer them at some point in their life). Moreover, the project of mitigation will extend across generations: what the present does for the sake of its successors will need to be carried on to maintain the trajectory away from anthropogenic climate change. These two points notwithstanding, the burdens-now and benefits-later dynamic is still a crucial feature of climate change mitigation. As I explain in chapter 2, the way in which mitigation will reduce the future impacts of climate change is mediated by lags built into the climate system. For this reason, the direct benefits of the present generation's choice to mitigate climate change will be enjoyed by future generations, that is, by non-overlapping cohorts of individuals who will live at a future point in time. Therefore, to justify present mitigation policies, I need to defend duties of justice that hold between generations, using the term generation in the way that I do best draws out the normative impediments to this defence.

Some might suggest alternative approaches to mine. For example, one might take intergenerational justice to refer to duties that hold between those presently alive and those not yet born. The idea of 'people who are not yet born' is not as simple as it appears. The basic problem is that it rests on the incorrect assumption that future people are a collection of unique, distinct individuals, waiting just off-stage for their cue (Reiman, 2007). With this problem in mind, one might then turn to the more general idea of 'possible future people,' as it appears to capture the idea that, from the perspective of the present, there is in fact an enormous range of possible people, only some of whom will become actual. This move leads further into troublesome territory. For one, it is not clear what a possible person is, beyond its definition as a person-like entity that could have come into existence, but does not. It seems to me that nothing can be said about the concept of a possible person that make it anything like the normal use of the term 'person.' This problem comes into sharper focus when considering an example where present people discharge a duty for the sake of future people, which

[8] Again, as I discuss in chapter 3, the intergenerational justification is a necessary, but not sufficient, part of the overall justification of mitigating climate change.

from their perspective (on the view under consideration) include possible and actual future people. In this case, present people constrain their behaviour in part for the sake of people who will never in fact come into existence. This is particularly troubling: possible people do not have the features traditionally associated with people of having interests that can be advanced or set back, yet presently living people certainly do. In this case, then, some people have in fact constrained their behaviour for the sake of no one.

With all this in mind, I proceed on the basis that generations are non-overlapping cohorts of individuals (with no further need to specify them as actual, not possible, people), as this provides an illuminating snapshot of justice between generations. In a sense, however, this understanding of the concept of a generation is a simplification of the real situation, where individuals come in and out of existence continuously. This simplification is not, however, a weakness. Instead, it reveals and isolates an important dimension of intergenerational justice, that is, an important set of duties that hold between generations. While I do not claim that this notion of a generation reveals the full range of intergenerational duties (using the term intergenerational loosely), it reveals an important set of duties, duties that raise theoretical problems to which I dedicate the last three chapters of this thesis. In other words, I take the general category of intergenerational justice to contain a wide range of types of duties, which all depend on the meaning of the term generation that one adopts. The subsequent lines of reasoning are complementary, each providing a distinct perspective on intergenerational justice and together providing a complete picture of intergenerational justice.

There is another, related simplification to be made explicit. Generations are commonly treated as if they are unified, self-governing agents who can make choices and who can harm and wrong, or be harmed and wronged. Thinkers who have employed this shortcut include, among other, Broome (1994: 137), Caney (Caney, 2012: 295; Caney, 2009: 163ff), Gardiner (2011: 146-8), Page (2006: 14), Parfit (1984: 354ff) and Rawls (1999: 251-8).[9] Treating generations in this manner holds certain complicating factors constant, with the intent of simplifying the discussion to support clear normative analysis. For example, the central question of this thesis contains a number of simplifications. For one, the complex global economy is not the result of centralized decision-making; more generally, the present generation – all living people – is not a unified agent that can make choices. Efforts to implement mitigation policies are likely to be national and piece-meal, especially initially, relying on a

[9] One notable exception is Gauthier (1986: 286-305), who refers exclusively to members of generations.

variety of economic and political mechanisms and incentives. Moreover, the impacts of climate change will fall unevenly within any given future generation, with those who will be otherwise worse off standing to bear the brunt of its impacts. To say, then, that the present generation should try to mitigate climate change, but can, for example, pass the cost of doing so on to future generations (Caney, 2014: 13ff), is a simplification, representing the reality that *members* of the present generations need not bear the cost of mitigation for the sake of *members* of future generations. To be clear, I employ this simplification often throughout the thesis, referring to what one generation owes another, as this supports the clear articulation of the normative issues that I consider.

1.2.2. The concept of justice

1.2.2.1. The core concept

Justice is one part of morality (Moellendorf, 2002: 1). At the core of the concept is the idea that justice is giving each her due (Cohen, 2008: 7; Mill, 2003: 233 [1863]; Miller, 1999: 33). Different conceptions of justice, therefore, are simply different ways of spelling out what it is for each to receive her due. This might include specifying particular duties and their relative normative force or weight, the group of individuals to which they apply, as well as the basic unit in which they are best specified. Another closely-linked feature of the concept of justice is that it entails treating like cases alike (Mill, 2003: 232–3 [1863]). Put differently, individuals who have the same normatively relevant features should have the same just entitlements (as well as duties of justice (Rawls, 1999: 5)).

Another key feature of the concept is that it adjudicates between individuals' competing claims: "questions of justice arise when there is a conflict of interest between different people or groups of people" (Barry, 1989b: 7). Social arrangements inevitably advantage some and disadvantage others, which leads to questions about whether individuals are in fact receiving their due. Since individuals, at least *prima facie*, have equal claims to advantage, there needs to be a way to adjudicate between these competing claims and to produce a morally justified social system (and consequent distribution of advantage and disadvantage). Justice provides the means to settle individuals' competing claims justifiably.

As the adjudicator between individuals' interests, justice generates a particular sort of reasons for the individuals to which it applies. Importantly, these reasons are not simply a matter of putting one's interests ahead or behind those of others. Rather, justice specifies what duties we owe to one another

out of mutual respect for one another's interests, duties that we should discharge as a matter of doing what is right. Again, following Barry:

> justice […] is not merely one end of a monochromatic scale that has at the other end sacrifice of self-interest for the good of others to a heroic or saintly degree. Rather, it points to a particular set of reasons why people (or societies) may have duties to one another and picks out particular features of institutions that make them morally condemnable. (Barry, 1991b: 188)

It is important to dwell on the idea that justice points to a particular set of reasons why people have duties to one another because much of what follows in the thesis rest on it. In later chapters, I provide a provisional case for intergenerational duties of just mitigation and then proceed to consider a variety of objections that appear to undermine this case. When I say that justice requires that the present generation mitigate climate change for the sake of future generations out of respect for a principle of intergenerational equality of opportunity (as I shall in chapter 3), what I mean is that the present generation has a distinctively weighty set of reasons (distinctive in the ways enumerated in this chapter) that compels it to pursue a pathway of moderate-to-high mitigation. These reasons together point to what is justice. The subsequent objections target some subset of these reasons, suggesting that – to pick one example – agents cannot have reasons to mitigate climate change because they are uncertain about both the impacts of climate change and the effects that their mitigation efforts will have on it. With this objection in mind, arguments about what justice requires reduce to arguments about a particular set of weighty reasons individuals have, reasons that have to do with impartially adjudicating between individuals' competing claims.

The notion of *impartial* adjudication warrants further attention. Impartiality is a crucial element of justice because of the adjudicatory role that it plays. Part and parcel of treating like cases alike, when adjudicating individuals' claims, is not arbitrarily privileging some claims over others (Barry, 1995: 8–11; Rawls, 1999: 5; Tan, 2004: 190). This is for the simple reason that one cannot treat like cases alike if one treats some cases arbitrarily. In other words, no conception of justice can justifiably settle disputes about the advantages and disadvantages that follow from a particular arrangement of social institutions by arbitrarily ignoring some reasons, but not others (Waldron, 2003: 266–7). The reasons thatjustice points must be impartial; to reject impartiality is to offer "an alternative to justice, not an alternative account of justice" (Kymlicka, 1990: 103).

An illustration of the last point is helpful. When I say that I aim to contribute to our understanding of *just* mitigation, I am implicitly saying that I want to contribute to a theory that impartially determines the design of policies intended to mitigate climate change. That is, for a theory to be a theory of justice in the mitigation of climate change, that theory must impartially adjudicate between the individuals' competing claims. Given the temporal distribution of the benefits and burdens of mitigation, this theory will have to provide a way of balancing the interests of present and future generations without arbitrarily privileging the perspective of one generation.

1.2.2.2. Further features

Perfect duties and rights

Justice is concerned with perfect duties (Mill, 2003: 222–3 [1863]; O'Neill, 1996: 128–36). That is: "justice is a matter of perfect obligations matched by rights" (O'Neill, 1996: 184).[10] A perfect duty is a duty for which there is a corresponding right; an imperfect duty is a duty that is owed without reference to some individual's corresponding right. Justice specifies perfect duties because it is concerned with *both* the individual(s) that justice charges with acting in a certain way *and* the individual(s) for whose sake justice requires the action. Different conceptions of justice can specify this relationship any number of ways, but what marks the concept of justice is that it addresses the agent who has a duty of justice and the agent whose claim generates this duty.[11]

Implicit in the notion of perfect duties is a distinction between two perspectives, that of agency and that of recipience (O'Neill, 1996: 125–8,146, 2000: 198). These represent two ways in which one can press the requirements of justice. On the one hand, one can say that justice holds some agents to some duty; on the other, one can say that some agents have just claims or rights.[12] In principle, these two are equivalent, with duties of justice implying some rights and vice versa. In practice, however, there

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[10] For clarity, I refer only to duties throughout the thesis. I do not mean to imply a distinction between duties and obligations, and could use the term interchangeably.

[11] Some may object to my citation of Onora O'Neill on this point because she discusses virtues of justice, which some might take to expand the notion of justice itself beyond perfect duties. As I understand it, this is not the case. Virtues of justice and required virtues more generally, are important complements that O'Neill argues have an important (and, in recent times, neglected) place in our political morality. That said, they are separate from the core concept of justice, which stipulates individual duties matched by rights. While I take this to be the correct interpretation, nothing in my argument rides on it. If a critic rejects my reading of O'Neill, I would still suggest that the critic will be hard pressed to show that the concept (as opposed to O'Neill's conception) of justice should include perfect duties, as well as certain virtues.

[12] With this point in mind, some might object to the labels of 'agency' and 'recipience' on the grounds that together they imply that recipients are not always moral agents. Against this point, I stress that both are perspectives that moral agents can adopt, articulating either what they owe others or what they are entitled to.

is reason to favour articulating what justice requires from the perspective of agency, represented by duties: the "advantage of beginning with obligations is that taking this perspective requires one to be more realistic, clear and honest about burden, their justification and their allocation" (O'Neill, 1996: 135).[13] One weakness with doing the converse and articulating requirements of justice primarily in terms of rights, rather than duties, is that if a right fails to specify against whom its claim should be pressed, then it "[amounts] only to rhetoric. Nothing can be claimed, waived or enforced if it is indeterminate where the claim should be lodged, for whom it may be waived or on whom it could be enforced" (O'Neill, 1996: 129).

I take the implication of O'Neill argument to be that those developing arguments such as mine should be cautious in how they proceed, being sure to emphasise what their arguments require of agents, not just what claims their arguments entitle agents to. That being said, the symmetry between rights and duties of justice means that the allocation of duties will always imply the allocation of some rights, even if the latter are left implicit.

Advantage and disadvantage

In my explanation of the core of the concept of justice, I refer repeatedly to the concept of advantage and disadvantage and so it is useful to further clarity to these concepts. Justice dictates the distribution of advantages and disadvantages amongst individual members of the relevant social institutions (Rawls, 1999: 3–5). The term advantage is in one way unsatisfactory, implying some sort of competitive or comparative advantage. Following Cohen: "here 'advantage' must be understood shorn of that implication. Something can add to someone's advantage without him, as a result, being better placed, or less worse place, than somebody else" (1989: 917 fn. 18).This area has proven to be one where conceptions of justice differ significantly (Wolff and De-Shalit, 2013: 5). For example, s*ocial egalitarians* (e.g. Anderson, 1999; Scheffler, 2010; Walzer, 1983) adopt a version of advantage and disadvantage that is arguably broader than *distributive egalitarians* (e.g. Arneson, 2004; Cohen, 1989; Dworkin, 2000). Advantage and disadvantage provide a relatively neutral means of articulating one of the key concerns for conceptions of justice. For example, one of the important discussions that I include in chapter 3 considers what the metric of intergenerational justice should be. I focus on opportunities and I

[13] The quote here uses the term obligation, whereas I prefer the term duty. For some, each of these two terms captures a distinct moral requirement (e.g. Rawls, 1999: 97; Brandt, 1964: 374). I will not use them in this way and, for the sake of consistency, will use the term duty.

investigate a particular concept (productive potential) as it helps measure the influence of one generation's choices on its successors' opportunities. Since it specifies in more detail one way to think about advantage and disadvantage, this discussion is part of a particular conception of justice. For the moment, the general point is that a conception of justice must specify what it takes to be an advantage or disadvantage, and so these are part of the concept itself.

Scope, profile, metric

Debates about how to measure advantage and disadvantage constitute disagreement about the *metric* (or currency) of justice, which is itself one of three useful labels with which to categorise the different features of the concept of justice. The other two are the *scope* of justice and the *profile* (or pattern) of justice (Page, 2006: 50–1). The profile of justice refers to the distributive principles that it uses to allocate whatever is taken to be the metric; the metric of justice refers to the basic unit the principles of justice allocate. For example, on the proportional view that I defend in chapter 3, justice requires that each generation leave an undiminished range (profile) of opportunities (metric) for its successors, as well as expand the range (profile) in certain circumstances. I call this the proportional view because a given generation's intergenerational duties of justice are always in proportion to what the generation can do for its successors, which is itself largely (but not entirely) a function of its inheritance. I should at this early stage also point out that I complicate the metric somewhat beyond simple opportunities to suit the context of *intergenerational* justice.[14]

The scope of justice has to do with the range of moral agents to whom the value is taken to apply. Questions about whether, and to what extent, justice requires that the present generation mitigate climate change, then, raises important issues of scope. Indeed, chapters 4, 5 and 6, where I canvas a range of objections to the view outlined in chapter 3, amount to a collection of efforts to restrict the scope of justice, one way or another. It is perhaps unsurprising to note here that I do not find that any of the objections succeed at limiting the scope of the view that I defend. That said, considering these problems is useful in two ways. First, it contributes to the defence of my view, since I can pre-empt some of the criticism that it will garner. Second, considering these problems also helps develop

[14] Note that while these labels are useful as explanatory heuristics, such as in my case, the separation that they imply is somewhat artificial, since the reasons for a conception's metric might be equally important to the profile.

my view, for example, by forcing me to specify more precisely the nature of a future person's interest (which is important to the proportional view) and the nature of intergenerational duties themselves.

Duties individually held, institutionally discharged

Up to this point, I have been somewhat unclear about the place of social institutions in conceptions of justice. I clear up this confusion here. Duties of justice are individually held, but institutionally discharged. In other words, individuals are of basic moral importance: conceptions of justice aim to establish the rightful treatment of individuals. That said, justice applies to social institutions, setting out how these determine individuals' advantage and disadvantage by allocating their duties and entitlements. Though the arrangement of social institutions is an important element of the concept of justice, the concept's normative force flows from the fact that it regulates individuals' advantages and disadvantages: an "interest in justice […] is an interest in distributive information across individuals" (Waldron, 2003: 277). In short, while individuals are the source of the moral importance of justice, they are not always the site of justice.[15]

With all this in mind, justice is the primary value by which social institutions should be evaluated. In Rawls's words: "Justice is the first virtue of social institutions, as truth is to systems of thought" (1999: 3). This represents a departure from everyday speech, where the term justice is often used more broadly. For example, individuals' attitudes and dispositions are often deemed unjust (Rawls, 1999: 6). The concept of justice being developed here is narrower, where attitudes and dispositions only matter from the standpoint of justice insofar as they have an impact upon individuals' claims and duties of justice. In other words, attitudes cannot be unjust in themselves. I do not act unjustly by being a curmudgeon; I act unjustly when my curmudgeonliness leads me to deny you your just entitlements or fail to discharge my duties of justice. Justice is the central value that should guide the arrangement of social institutions: duties of justice are "usually discharged through conduct directed towards institutions, such as obeying institutional rules" (Moellendorf, 2002: 1).[16] It therefore makes perfect sense to consider justice as a social value, despite the fact that it rest on an individualist foundation.

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[15] Indeed, throughout the thesis, I refer to *agents*' duties of just mitigation as a way of recognising that some portion of these duties of justice apply to collective agents as well as individuals.

[16] This leads to questions about what exactly counts as a social institutions, which different conceptions will have to answer (Cohen, 2008: chap. 3; Pogge, 2007: 28; Rawls, 1999: 6).

1.3. Interests and future generations

The final key concept that I need to outline at this early stage is that of an interest. In abstract terms, an interest is a relationship between some individual and some good. An individual has an interest in X when that individual is invested in or has a stake in X (Feinberg, 1984: 33–4). On this definition, one can have interests in many goods, from the trivial (e.g. I have an interest in eating a tasty supper) to the significant (e.g. I have an interest in controlling my own life). Interest can also be objective or subjective: some of my interests are subjectively set in that they are mine alone and depend on my attitudes (e.g. I have an interest in finishing my thesis); some of my interests are objectively set in that they are interests that I have as an individual, regardless of my particular identity or attitude towards that interest (e.g. I have an interest in completing the important tasks to which I set myself) (Darwall, 1997: 178). Finally, while individuals' interests influence the way that they should be treated (Darwall, 1997: 165), the existence of an interest alone is insufficient to generate moral requirements for others. In other words, the mere existence of one person's interest in X does not generate duties for others to promote that person's ability to secure X. That said, interests remain important to detailing what we owe each other, since they describe many goods that any given individual might wish to pursue, as well as the relative importance of goods to those that have an interest in them.

Interests are important to my argument because they are key to the way in which I interpret the phrase 'for the sake of future generations.' For one, to use terms introduced above, a given person is advantaged when they are better able to secure for an end in which that person has an interest. Furthermore, I use the notion of interests to outline which of a future generation's claims the present generation should respect by mitigating climate change. I follow others working on issues of justice and climate change in adopting an interest-based theory of rights (e.g. Shue, 2014; Bell, 2011; Caney, 2010 & 2009). This view holds that rights protect individuals' interests, when those interests are sufficiently weighty to generate duties for others; that is, X has a right if X has an interest that is weighty enough to generate duties for others (Raz, 1986: 165ff). To do something in the present for the sake of future generations, then, is in effect to do something out of respect for their interests.[17]

[17] Some might object that this overinflates or misidentifies the importance of interests in normative argument. To anticipate this objection, I stress that interests are theoretically important, though they are not important in themselves. In other words, they are important tools with which to specify what matters to individuals, as well as the relative importance of a particular good to a given individual. I employ them in this way throughout the thesis, without implying that interests, rather than individuals, are a source of moral value in themselves.

I am effectively trying to establish what justice between generations demands of the present generation with respect to climate change mitigation. Of course, I am not trying to present anything like a full theory of justice and neither do I aim even to provide a full theory of just mitigation. Instead, I focus directly on whether justice requires that the present generation mitigate climate change for the sake of future generations and how much mitigation it requires.[18] As duties of justice, these must meet the conceptual standards outlined above. In general terms, it follows that, as duties of justice, they impartially adjudicate between the claims of the individuals to which they apply and the claims of the individuals for whose sake they must be discharged. These duties must also treat like cases alike, ensure that the distribution of advantage and disadvantage tracks morally significant features (as opposed to arbitrary, for example, or morally irrelevant) of individuals.

The case for duties of just mitigation that I provide in chapter 3 meets precisely these standards. I argue that the present generation should undertake significant climate change mitigation out of respect for the proportional view of intergenerational justice. I argue that this principle best captures what justice requires that one generation do for the sake of another. With respect to climate change, this principle holds the present generation to mitigate climate to match the moderate-to-high mitigation pathway, as this preserves a reasonable range of opportunities for future generations to secure their own interests.

1.3.1. Standing in the right relationship with future generations

In general terms, this thesis contributes to the general task of determining what the present generation must do with respect to climate change *to stand in the right relationship* with future generations; more abstractly, the contribution is towards the task of determining what a given generation must do to stand in the right relationship with its successors. The idea is that intergenerational justice defines the choices that the present generation should make to ensure it acts in a way that is justified, especially to future generations. When I say that choosing stringent climate change mitigation policies is part of what the present generation must do to stand in the right relationship with future generations, the thought is that this choice is part of a range of choices that must be made to ensure that the present generation acts in a justified way, especially to future generation. In contrast to this, an alternative way of characterising the task is negative, where my aim would be to work out what the present generation

[18] I justify this focus further in chapter 2. Here I focus instead on what the conceptual arguments of this chapter imply for the argument of the thesis.

must do to avoid wronging future generations. At first glance, the latter framing is appealing, especially given my focus on climate change and the prospect of the wrongs that it will inflict on future generations. With that in mind, surely the goal is to avoid wronging future generations.

I frame the underlying aim of the thesis as helping to determine what the present generation must do to stand in the right relationship with future generation. For one, avoiding wrongs is only one part of the larger project of making just choices. Nowhere is this clearer than in the case of intergenerational justice. As I discuss in chapter 3, the generation that is alive at any given moment finds itself in a two-fold position, both as the inheritor of the accumulated efforts of its ancestors (as well as a range of practically accessible natural resources) and as the bequeather of a range of goods, including material wealth to social and political institutions, to its successors. In addition to avoiding making wrongful choices, each generation should consider the values that it protects or promotes in the choices that it makes about its treatment of its successors. Standing in the right relationship with future generations is therefore not only a matter of avoiding wronging them, but it is also a matter of doing what is right and acting out of respect for values, such as justice, that demand protection and promotion. Determining what justice requires with respect to climate change mitigation is one part of the overall project of determining what the present generation must do to stand in the right relationship with future generations.

1.4. Conclusion

This chapter is the first of two that focus on laying the groundwork for the normative argument of chapter 3. Here, I have outlined the concept of justice between generations, where a generation is a cohort of individuals that does not overlap with any other and where justice is a value that impartially allocates perfect duties (that is, duties matched by rights) to adjudicate between individuals' competing claims. In the next chapter, I turn to the process of climate change and the prospects for its mitigation, introducing a set of mitigation pathways to compare alternative choices that the present generation can make with respect to climate change mitigation. I then outline the concept of a theory of just mitigation and locate the role of my intergenerational argument within it.

2. Just mitigation

2.1. Introduction

In this chapter, I aim to answer three questions: what is climate change? What is mitigation? And what is just mitigation? In general terms, this means addressing three issues: (1) the phenomenon of climate change and its adverse effects; (2) the nature of mitigation and the challenge that it poses for the present generation; and (3) the role that a theory of just mitigation plays in answering this challenge.

Throughout this chapter, I emphasise four key claims. First, it is well within the capacity of the present generation to mitigate climate change and thereby reduce the many threats that it poses for future generations and their interests. Second, mitigation is not a single entity that the present generation can choose to pursue. Instead, there is a range of possible mitigation pathways available to the present generation, each of which is associated both with a certain distribution of the costs of undertaking mitigation and a certain distribution of the costs of climate change. Third, climate change mitigation is an intergenerational challenge because those who bear its costs will, for the most part, not be the same people as those who enjoy its benefits. In other words, mitigation must in part be justified with reference to future generations' interests, since it is those interests that mitigation secures. I take this to be part of the justification for my focus on intergenerational duties of just mitigation.

The chapter proceeds as follows. In section 2.2, I explain the basic features of climate change and the process through which human activity changes the climate, as well as projections about the impact that climate change will have on humans. In section 2.3, I turn to mitigation, first outlining the key features of this response to climate change. I then explain the various mitigation options available to the present generation, using four mitigation pathways to illustrate the climate changes, and human impacts, associated with each. In section 2.4, I outline the key features of just mitigation and locate the role that my defence of intergenerational duties of just mitigation plays within such a theory.

2.2. What is climate change?

Anthropogenic climate change refers to large-scale changes to the global climate system that are the result of human activity, such as the emission of GHGs. While the type of climate change that is the concern of this thesis is *anthropogenic* climate change, human activity is not the only possible source of climate change. Indeed, the global climate has varied wildly over the history of the Earth, with average

pre-industrial global temperatures reaching up to 8ºC warmer than twelve thousand years ago (the end of the last Ice Age, that is, the last Glacial Termination), warming that was certainly not anthropogenic in origin (Masson-Delmotte, Schulz, Abe-Ouchi, Beer, Ganopolski, Rouco, et al., 2013: 399). However, as I explain in this section, human activity – particularly GHG emissions – is responsible for important changes to the global climate, changes that are projected to increase in number and intensity well into the future. In this section, I first explain the basic features of the climate system, before outlining how human activity is interfering with it to create anthropogenic climate change. I then outline some key human impacts of climate change.[19]

2.2.1. The climate

Climate is the average of weather (Cubasch et al., 2013: 126); more precisely, climate refers to the average weather that is found in a defined area, from a regional to global scale, and that is measured over an extended period of time, from thirty years to several thousand (Farmer and Cook, 2013: 511). Weather refers to whatever particular meteorological conditions obtain at a particular time and place (Cubasch et al., 2013: 124). The Earth's climate, then, refers to the "mean variability" of particular quantities, including temperature, precipitation and extreme weather events (Farmer and Cook, 2013: 511). The climate system itself consists of five interrelated components: the atmosphere, the hydrosphere, the cryosphere, the lithosphere (or geosphere) and the biosphere (IPCC, 2013a: 1451). The climate system changes as a result of the internal interactions between these five, in addition to their interaction with external influences.

One implication of this definition is that individuals frustrated with the inaccuracy of weather forecasts cannot infer that climate predictions are equally unreliable. An analogy to a coin flipping exercise is illustrative. Trying to predict the weather for a given place is a (more complex) version of predicting the outcome of coin flips. Consider next how to predict what will happen if you flip a coin ten thousand times. Knowing the boundary conditions of the coin-flipping system (e.g. the coin is equally weighted) means that we should expect roughly five thousand each of heads and tails. Establishing the climate of a particular system, such as a continent, ocean, or indeed the entire planet, involves setting the boundary conditions of the system and constructing a large number of hypothetical

[19] I rely on the IPCC, as well as a range of other authors, for the empirical details about climate change. While I am not an expert in climate science, it is important to engage with the scientific evidence about climate change, for it determines what the present generation can do for the sake of future generations. I therefore investigate normative questions of intergenerational justice, drawing as closely as I can on climate science literature.

outcomes. Properties of climate are therefore inferred from "observations, theory and computer simulation models" (Allen, 2012: 10). In other words, climate is inferred from amassed hypothetical outcomes, with observation providing one key way in which climate models can be tested. For example, by constructing a climate model, running it using historical conditions, and then comparing its results against historical data, one can establish the reliability of a model. Observation also plays a role in setting the boundary conditions of a given climate model. This is where theory is also relevant: theoretical knowledge must supplement observation, as the best available understanding of climate drivers is not perfect. In sum, the climate refers to the long-term patterns found in elements of the climate system, such as precipitation or temperature, as well as the frequency of climate extremes, such as heatwaves or heavy precipitation events (Allen, 2012: 10; IPCC, 2013b: 5). These are not only the result of observation: climatologists rely on developing models of the climate system, given what is known about the parameters of the system, to understand the nature of climate (Allen, 2012: 10).

One significant determinant of the Earth's climate at any given time is the Earth's energy balance. This refers to the difference between incoming and outgoing energy. Virtually all incoming energy is solar in origin, whilst outgoing energy is either reflected by different components of the climate system (e.g. certain cloud types, ice cover) or radiated as infrared radiation back into space (IPCC, 2013a: 1459). The energy balance can be positive, negative or in equilibrium (IPCC, 2013a: 1453; Hansen et al., 2013: 2; Dessler, 2012: 48). If the balance is in equilibrium, then the global climate – especially average global temperatures – will be stable. If the balance is positive, then there is a surplus of incoming energy. That is, for some reason, the Earth is radiating less energy back into space than it receives. This increases the amount of energy retained within the Earth's climate systems, creating an upward pressure on average global temperature. A negative energy balance refers to a deficit in incoming energy, with the ensuing reduction in energy within the global climate. The energy balance is the key to understanding climate change, since it helps describe the pressures that change the Earth's climate.

One of the central determinants of the Earth's energy balance is the Greenhouse Effect. Its primary effect is to decrease the amount of energy that the Earth radiates back into space, which in turn constitutes an upward pressure on average global temperatures (Dessler, 2012: 54).[20] GHGs are the

[20] This is not a new concept: the mathematician Joseph Fourier first came up with this idea in 1827 (Archer & Rahmstorf, 2010: 8)

key components of the Greenhouse Effect, as they are the atmospheric chemical agents that absorb energy. The major GHGs are CO_2, methane (CH4), N_2O, halocarbons (the more widely known of which are chlorofluocarbons, or CFCs), ozone (O_3) and water vapour (Cubasch et al., 2013: 126). The Greenhouse Effect is a crucial part of the climate system (or to be precise, the atmospheric sub-system of the global climate system) because without it, average global temperatures would be -15ºC (Farmer & Cook, 2013: 25). There are two kinds of Greenhouse Effects, enhanced and unenhanced. I am concerned with the former, as it refers to a Greenhouse Effect that has been strengthened by the increase in the concentrations of atmospheric GHGs that result from human activity (IPCC, 2013a: 1455).

Before turning to the process of anthropogenic climate change, there remain two important concepts that need explanation: radiative forcing and climate sensitivity. In simple terms, radiative forcing is the change in the net solar energy absorbed by the Earth's climate system (IPCC, 2013a: 1460; Farmer & Cook, 2013: 220; Dessler, 2012: 84).[21] By increasing the concentration of atmospheric GHGs, humans have increased the Earth's radiative forcing, from 1.699 Watt per square meter (W m^{-2}) in 1979 to 2.974 W m^{-2} in 2015 (Butler & Montzka, 2016: Table 2). The positive value implies that the Earth's climate system is absorbing more energy than it radiates; a negative value would imply the reverse. Radiative forcing thus represents whether the global climate system is gaining, or shedding, energy at any given time. The concept is an important component of the contemporary understanding of climate change projections, since, as I discuss in detail in section 2.3.3, the literature on such projections distinguishes different pathways according to the radiative forcing that they each pathway is projected to produce in the year 2100.

Climate sensitivity is similarly important to understanding climate change projections. In general terms, it refers to the relationship between the stock of atmospheric GHGs and the amount of warming produced in the climate system. It often appears as "equilibrium climate sensitivity," which refers to the change in average global temperature that follows from a doubling of atmospheric CO_2 (IPCC, 2013a: 1451). Current projections give a bounded uncertainty for equilibrium climate sensitivity between 1.5ºC and 4.5ºC (IPCC, 2013b: 16). This means that for a doubling of atmospheric CO_2, there is projected to be an increase in average global temperature of between 1.5ºC and 4.5ºC.

[21] The full definition is as follows: "Radiative forcing is the change in the net, downward minus upward, radiative flux (expressed in W m–2) at the tropopause or top of atmosphere due to a change in an external driver of climate change, such as, for example, a change in the concentration of carbon dioxide or the output of the Sun" (IPCC 2013a: 1460).

Since climate sensitivity is a range, rather than a specific value, it serves as an important source of uncertainty in climate change projections, which I discuss further below.

2.2.2. Anthropogenic climate change

Anthropogenic climate change results from human interference with the Earth's energy balance. The core of the problem is that humans are creating a surplus of energy in the global climate system. The key way in which humans are doing so is by engaging in activities that emit GHGs, thereby generating an enhanced Greenhouse effect, increasing the quantity of energy retained in the atmosphere (Hansen et al., 2013: 2). As we shall see, this is a four-part process that occurs over a significant period of time, with the energy balance indicating the Earth's climate change commitment, that is, how much change is locked in or "in the pipeline" (Hansen et al., 2013: 5). For example, if anthropogenic emissions ceased entirely, the global climate would change until it reached the equilibrium temperature that is commensurate with an equilibrium energy balance, a process that would take "many centuries" (Cubasch et al., 2013: 128-9).

CO_2 emissions are the principal means through which human activity interferes with the global climate, both because of the quantity of CO_2 that human activity emits, relative to other GHGs, and because of its long atmospheric lifetime. CO_2 comprises 76% of anthropogenic emissions, compared to the next most commonly emitted gas, methane, at 16% (IPCC, 2014: 7). In terms of the atmospheric stock of these gases, there are 391 parts per million (ppm) of CO_2 in the atmosphere, compared to 1803 parts per billion (ppb) of methane (IPCC, 2013b: 11). Moreover, CO_2 has a long atmospheric lifetime, with a significant proportion of today's atmospheric CO_2 lasting into the distant future, on the order of millennia (Eby et al., 2009; Archer, 2005).[22] In short, those alive today should expect the CO_2 emissions of their activities to last "300 years, plus 25% that lasts forever" (Archer, 2005: 5). More specifically, various processes will remove roughly 75% of anthropogenic CO_2 from the atmosphere within roughly three centuries of its emission. However, the mean atmospheric lifetime is between thirty and thirty five thousand years, with between 17% and 33% remaining in the atmosphere for one thousand years (Archer, 2005: 5).[23]

[22] Compare with the atmospheric lifetime of methane, which is on the order of years to decades.

[23] Note that, though it makes up a smaller proportion of anthropogenic GHG emissions, methane is a more potent GHG than CO_2 by a factor of 28 (Myhre et al., 2013: 714). However, its atmospheric lifetime is far shorter, lasting roughly 12 years (Myhre et al., 2013: 731).

CO_2 is the central driver of climate change, both because it constitutes a disproportionate amount of anthropogenic emissions and because of its long atmospheric lifetime. Cumulative anthropogenic emissions have already produced an increase in average global temperature of 0.85ºC between 1880 and 2012 (IPCC, 2013b: 5). Atmospheric CO_2 has similarly risen, with an increase of 40% between 1750 and 2011, or from a concentration of roughly 278 ppm to 391 ppm (IPCC, 2013b: 11; Hartmann et al., 2013 :161, 182). This amounts to the anthropogenic emission of 555 gigatons of carbon (GtC) (IPCC, 2013b: 12).[24] Moreover, the rate at which humans are emitting GHG continues to increase. For example, on average, 8.3 GtC were emitted annually between 2002 and 2011; in 2011, 9.5 GtC were emitted, a 54% increase over CO_2 emissions in 1991 (IPCC, 2013b: 12). More generally, the mean rate of increase in the atmospheric concentration of CO_2 over the twentieth century is "unprecedented in 22 000 years" (IPCC, 2013b: 11). Table 2.1 presents some key data on important GHGs.[25]

	PPM	*Lifetime (years)*	*Global warming potential (GWP) (100 years)*
CO_2	391	300 (with 25% remainder)	1
Methane (CH_4)	1.8	12.4	34
Nitrous Oxide (NO_2)	0.3	131	298
Chlorofluorocarbon (CFC)	0.2	45	5350

Figure 2.1. Key GHGs. Source: (Hartmann et al., 2013: 182; IPCC, 2013b: 11; Myhre et al., 2013: 674 ff)

Anthropogenic GHG emissions are upsetting the Earth's energy balance and enhancing the Greenhouse Effect, thereby increasing the amount of energy in the global climate system and contributing to climate change. One useful way of framing this process is as a problem of stocks and

[24] Given a lack of mitigation, this number continues to rise. As of September 16th, 2017, the trillionthtonne.org website, which aims to track CO_2 emissions in real time, measures cumulative emissions at over 614 GtC (TrillionthTonne). Another data repository, the Carbon Dioxide Information Analysis Center (CDIAC), estimates atmospheric CO_2 to be 403.94 ppm at that same date (CDIAC, n.d.).

[25] GWP refers to the extent to which a given gas contributes to the Greenhouse Effect in comparison with the same quantity of CO_2. This is closely related to the concept of CO_{2e} (CO_2 equivalency), which comes up below. It expresses the amount of CO_2 that matches the GWP of a given quantity of GHG.

flows (Blanco et al., 2014: 357ff; Stern, 2014: 41). The idea is that the stock of atmospheric GHGs produces the important changes to the global climate: "the climate change problem is fundamentally due to the 'stock' of emissions that builds up in the atmosphere" (Victor et al., 2014: 129). Humans indirectly influence the stock by altering the flow of GHGs into, and out of, the atmosphere. This generates a lag between any human effort to reduce the flow of GHGs into the atmosphere and a decrease in the stock of atmospheric GHGs. Take the following example, where mitigation efforts have begun, including yearly six percent cuts to global CO_2 emissions in 2013, plus reforestation drawing down 100GtC, thereby decreasing atmospheric CO_2 to 350 ppm by the end of the 21st C (from the 391 ppm in 2011) (Hansen et al., 2013: 10). In this case, the date at which reductions begin comes many decades before the desired atmospheric concentration is reached. Consider furthermore that if the same programme of reductions were initiated in 2020, it would take until 2300 for atmospheric CO_2 to return to the same concentration (assuming a 2% increase in emissions from 2013 to 2020) (Hansen et al., 2013: 10). In addition to important lags between changes to the flow of GHGs and changes in the stock of atmospheric gases, the timing of any given change is equally important. In short, "it makes a huge difference when reductions begin" (Hansen et al., 2013: 10). Decreasing the flow of CO_2 into the atmosphere (or increasing the rate at which various processes absorb CO_2 out of the atmosphere) does not immediately and straightforwardly decrease the upward pressure that the increasing stocks of atmospheric GHGs generates for average global temperatures. These constitute important features of the relationship between the stock and flows of atmospheric GHGs, and anthropogenic climate change cannot be understood in their absence. I return to them below, in section 2.3, when introducing the concept of mitigation and the different possible mitigation pathways.

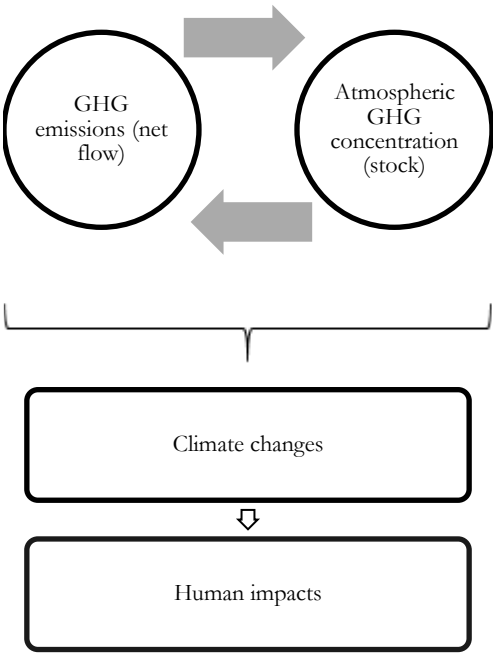

Figure 2.2. The four-part process of anthropogenic climate change

It is useful to think of climate change as part of a four-part process, illustrated in figure 2.2. In this section, I have focused on the flow and stock of atmospheric GHGs. Of course, from the perspective of humans and their interests, this alone is not what matters. Rather, it is the climatic changes that atmospheric GHG stocks cause and their consequent adverse impacts on human society and human lives that matters. Before turning to these (in section 2.2.4.), I first want to outline some of the key indeterminacies that are found within climate change projections. This is one of the many places where the scientific evidence comes into close contact with the normative arguments. The reason is that, as I discuss in chapter 6, there are a range of objections to intergenerational duties of just mitigation on the grounds of the indeterminacies that I describe below.[26]

2.2.3. Indeterminacies in climate change projections

"[S]cience always involves uncertainties" and climate science is no exception (Cubasch et al., 2013: 138). Indeterminacy within the scientific study of climate change, however, is only one example of the indeterminacies found in climate change projections. In this subsection, I offer a representative sample of the indeterminacies found within climate change projections, each of which threaten intergenerational duties of just mitigation, in one way or another. I stress that my aim is not to provide an exhaustive list of all relevant indeterminacies. Rather, it is to illustrate the key indeterminacies that threaten intergenerational duties of just mitigation. The crucial point is that projections about how the climate will change and what impacts these changes will have to life on Earth are indeterminate in a number of different ways (Caney, 2009a: 176). In other words, a wide range of features of climate change remain unknown or only partially understood. In the absence of determinate projections, both claims about the fundamental justification of intergenerational duties of just mitigation, as well as

[26] I use the term indeterminacy here for consistency, as it is the umbrella term that I use in chapter 6. An indeterminacy in climate change projections is one way in which those projections are probabilistic or not fixed. In chapter 6, I use the term 'indeterminacy' as a general term under which risk, uncertainty and ignorance fall.

claims about the formulation of what precisely these projections require of the present generation, become more difficult to defend.

Climate sensitivity

Climate sensitivity is one of the chief sources of indeterminacy in climate change (IPCC, 2013b: 16; Stocker et al., 2013: 82-5; for a discussion of the normative implications, see also Moellendorf, 2014: 68ff). As explained above, climate sensitivity refers to the relationship between the stock of atmospheric GHGs and the amount of warming produced in the climate system. It often appears as "equilibrium climate sensitivity," which refers to the change in average global temperature that follows from a doubling of atmospheric CO_2 (IPCC, 2013a: 1451). Current projections give a bounded uncertainty for equilibrium climate sensitivity between 1.5ºC and 4.5ºC (IPCC, 2013b: 16). This means that for a doubling of atmospheric CO_2, there is projected to be an increase in average global temperature of between 1.5ºC and 4.5ºC.

Climate feedbacks

Climate feedbacks are another key source of indeterminacy. Climate feedbacks are "an interaction in which a perturbation in one climate quantity causes a change in a second, and the changes in the second quantity ultimately leads to an additional change in the first" (Allwood et al., 2014: 1256). Feedbacks can be positive, reinforcing the initial change, or negative, diminishing or counteracting the initial change. Cloud formation is one example in which even the valence (i.e. whether it is positive or negative) of the feedback in indeterminate, as is the intensity of the feedback (Boucher et al., 2013: 578–92; see also Lee et al., 2013). The mechanism of clouds as a climate feedback works as follows. As the global temperatures increase, a number of changes in the climate system will occur that will influence cloud formation, including the extent and type of cloud cover. Clouds, however, have important climate-influencing properties. For example, some types of cloud increase the Earth's albedo, *decreasing* the proportion of incoming solar radiation that is reflected back into space and thereby counteracting the initial warming. Other types decrease the Earth's albedo, *increasing* the proportion of incoming solar radiation that is reflected back into space and thereby reinforcing the initial warming. This is but one illustrative example of many other, significantly more complex

processes. No matter the complexity, the basic point remains that cloud formation is one source of indeterminacy within projections of climate change.[27]

Low probability, high impact possible catastrophes

The possibility of catastrophic events is a third important source of indeterminacy within climate change. Possible catastrophic events that remain, at best, only partly understood include:

(1) Irreversible perturbations[28] that fundamentally alter the equilibrium of the climate system, such as the release of methane stored in permafrost or oceanic clathrates (Lenton et al., 2008: 1786);
(2) Large-scale die back of tropical and/or boreal forests (Collins et al., 2013: 1117);
(3) Massive loss of species diversity (Bellard et al., 2012; Moritz and Agudo, 2013).

None of the possibilities just mentioned are certain to happen. However, they constitute so-called 'fat tailed' problems (Weitzman, 2011). Despite being unlikely, the events all hold the possibility of inflicting enormous harms and wrongs on future generations. The name 'fat tail' refers to a specific property of the relevant probability distribution, namely that the probability of the event decrease slowly while the potential disvalue remains significant (Kolstad et al., 2014: 246 Box 3.9). Take the possibility of methane release. Paleoclimate data associate historical spikes in temperature on the order of 5-6ºC with methane released from oceanic and permafrost sources (Hansen et al., 2013: 14). Warming of that magnitude would lead to radical alteration in the Earth's climate, with significant consequences for future generations.

Lack of precedent

Another important contributor to the indeterminacy of climate change projections is that anthropogenic climate change is unprecedented. Of course, non-anthropogenic climate change has occurred in the past, and this climate change has had significant impacts on human life (for particular examples, see Campbell, 2010; Parker, 2008; Reynard, 2002; Te Brake, 2016). That said, the scale of anthropogenic climate change, including both the atmospheric concentration of GHGs and the rate at which this concentration is increasing, lacks any historical precedent against which to compare contemporary changes. For the last 800 000 years, atmospheric CO_2 levels have varied between

[27] It is worth noting that, according to the IPCC, "the net radiative feedback due to all cloud types is judged likely to be positive"(Boucher et al., 2013: 592). The term likely corresponds to the uncertainty judgement of 66%-100% (Stocker et al., 2013: 36).

[28] A perturbation is "irreversible on a given time scale if the recovery time scale from this state due to natural processes is significantly longer than the time it takes for the system to reach this perturbed state" (Collins et al., 2013: 1102)

roughly 180 and 280 ppm, and the level has never varied more than 25 ppm over any given 1000-year period within those 800 000 years (Weitzman, 2011). In contrast, the concentration of atmospheric CO_2 is 391 ppm (as of 2011), which represents a 40% increase over pre-industrial levels (IPCC, 2013b: 11).

The unprecedented nature of anthropogenic climate change means that there is little empirical foundation upon which to base projections about what impact the contemporary concentration of atmospheric CO_2 will have on the climate system and, consequently, what climate changes humans ought to expect (Weitzman, 2011: 277).

Future human behaviour

While it is not an internal feature of climate change, future human behaviour is another source of indeterminacy that is sufficiently significant to warrant mentioning. Sometimes referred to as "moral uncertainty" (Moellendorf, 2014: 64–5), the problem is that the effect a given mitigation policy will actually have is partly a function of future choices and behaviour. Because climate change "is driven by concentrations of greenhouse gases in the atmosphere, and those concentrations depend on a myriad of policy choices about economic development and climate change mitigation," the actual effect of the present generation's actions will depend on the actions of future people (Moellendorf, 2014: 66). Any judgement about the value of a particular mitigation pathway, or the disvalue of leaving climate change mitigation, is subject to events that are solely under the control of future people. For example, one may argue that the present generation should mitigate climate change to ensure a return to pre-Industrial levels of atmospheric GHGs, or to pre-Industrial temperatures. The former would take a length of time in the order of several thousand years (Archer, 2005: 3–4), which leaves plenty of time for human society to re-engage in climate-changing activities. The latter is equally indeterminate, for even on the moderate to high mitigation pathway of RCP2.6, average global surface temperature will not return to pre-Industrial levels by even 2300 (Collins et al., 2013: 1054). This leaves a number of intervening generations whose decisions can easily undo the present generation's efforts to mitigate climate change for the sake of future generations.

2.2.4. The human impacts of climate change

In this section, I survey projected climate change impacts on human beings. Space precludes an exhaustive catalogue of the many ways in which climate change will variously set back, undermine and violate human interests. Instead, I aim to provide some context for my later discussion of just

mitigation by explaining the process through which climate change produces its adverse effects, appealing to some representative examples.

Projections show that anthropogenic climate change will adversely impact human lives in a wide variety of ways.[29] Identifying possible future impacts is not as simple as identifying certain ways in which the climate will change. Instead, it requires identifying both changes to the climate that might adversely impact humans ('climate hazards') as well as the ways in which humans and human society are liable to suffer from these changes ('human vulnerabilities') (Oppenheimer et al., 2014: 1048; IPCC, 2014a: 1775). Together, climate hazards and human vulnerabilities produce risks, that is, possible adverse impacts from climate change. These risks are not isolated from one another; instead, multiple climate risks interact together to generate emergent risks, or possible, indirect, adverse effects from climate change that result from the interaction of several climate risks (Oppenheimer et al., 2014: 1048; IPCC, 2014a: 1764). Figure 2.3 summarises this process.[30]

Figure 2.3. The human impacts of climate change (Source: Oppenheimer et al., 2014: section 19.6.2, esp. p. 1070-1)

More concretely, climate change is projected to produce sea level rise, rising temperatures (both oceanic and terrestrial) and changes to precipitation patterns. Each of these represents an important climate hazard. For example, consider the many ways in which humans are vulnerable to such changes: low-lying areas (e.g. coastal zones, small islands) are home to populous human settlements; many communities rely on both oceanic and terrestrial ecosystem services; and existing agricultural practices are insufficiently resilient to cope, worsening food insecurity. In combination, these climate hazards and human vulnerabilities bring on a whole host of risks, from increased mortality and morbidity,

[29] Anthropogenic climate change has already begun to have an impact on human wellbeing. (Field et al., 2014: 40). Examples of observed impacts of climate change include the economic losses and human displacement caused by flooding across several regions of Africa, increased mortality and morbidity, as well as infrastructure damage, brought about by extreme coastal storms in North America and disruption to agricultural practices in parts of South America (Field et al., 2014: 42).

[30] I address risk in much greater detail in chapter 6. There, I offer a more precise definition and consider what difference, if any, it makes that duties of just mitigation aim to prevent *risks* of harm rather than harm that are certain to occur. In the present discussion, a risk generated by climate change is simply a possible adverse impact of climate change, flowing from particular combinations of climate hazards and human vulnerabilities.

through to disrupted livelihoods and cultural practices. The interrelation of these risks leads to further emergent risks, including greater inequality, exhaustion of social networks and reduced capacity to cope with the disease burden, as well as the loss of economic productivity. I note these examples here to provide some illustration of the wide ranging adverse effects that projections show climate change will have on humans and human societies. In chapter 3, I return to these examples again in more detail, enumerating the core human interests that these threaten.

The human vulnerabilities that climate hazards share another important feature. It is individuals in impoverished communities who are disadvantaged in ways quite distinct from climate change and who tend to be most vulnerable to climate hazards, both in terms of the number of vulnerabilities and their depth. This has the following implication: climate change risks "are generally greater for disadvantaged people and communities in countries at all levels of development" (IPCC, 2014b: 64). That is, the impacts of climate change will fall predominantly on those who are already disadvantaged, regardless of whether they reside in a developed or developing country (Adger, 2010: 276). Those marginalized "socially, economically, culturally, politically, [and] institutionally" are most vulnerable to the adverse impacts of climate change (Field et al., 2014: 51). Examples include low-income groups occupying informal settlements throughout the developing world, racially marginalized groups suffering more from heat stress and extreme weather events, and groups lacking access to land (Field et al., 2014: 47-50).

2.3. What is mitigation?

2.3.1. Mitigation

In the previous section, I outlined some of the basic dynamics of the climate system, the way in which human activity is causing climate change, and the projected human impacts of climate change. This state of affairs, however, is not inevitable; the present generation can pursue policies that will prevent a large portion of the possible adverse impacts of climate change on future generations. In this section, I turn to mitigation strategies, strategies that aim to prevent climate change, thereby protecting future people from its many risks. I have four aims. First, I explain what mitigation is and why it is an intergenerational challenge. Second, I present the general features of the choice that face the present generation with respect to climate change mitigation, including the important concepts of peak GHG emissions, the rate of emissions reduction, and the total emissions budget. Third, I outline four

different mitigation pathways that illustrate what different possible choices imply for climate change and, most importantly, its effects on future generations. Finally, I situate mitigation within the larger context of climate justice and other human responses to climate change, including adaptation and rectification.

According to the IPCC's Fifth Assessment Report (AR5), mitigation is "a human intervention to reduce the sources or enhance the sinks of greenhouse gases" (Allwood et al., 2014: 1266). To mitigate climate change, on this definition, is to target and reduce a significant cause of climate change, the stock of atmospheric GHGs. Both emissions reduction and sink enhancement strategies fundamentally aim at the same thing, which is to stabilise (and eventually decrease) the concentration of atmospheric GHGs. It is this feature that unifies them both as mitigation strategies that aim to prevent projected adverse impacts of climate change by reducing the level of climate change. Where the two strategies differ is in the means that they employ to bring about this end. Whereas emissions reduction refers to efforts to reduce the flow of GHGs into the atmosphere, sink enhancement refers to efforts to reduce the stock of atmospheric GHGs by increasing the capacity of systems that do precisely this (Heyward, 2013: 24–5).

An important feature of mitigation – one that is perhaps most important, given the present concern with intergenerational justice – is that those who will bear the burdens of climate change mitigation, such as the present generation, are not those who stand to enjoy its benefits. The reason is as follows. Actions that reduce GHG emissions or enhance sinks will first impact the flow of GHGs into, and out of, the atmosphere. Over time this will reduce the stock of atmospheric GHGs, lowering the surplus energy in the global climate system, which will in turn lead to a decrease in climate change, including smaller increases in global temperatures. It could also, potentially, put an end to increases in global temperatures altogether. This process takes time; as discussed above (in section 2.2), there is a lag between emissions reductions and their effect on climate change. Exacerbating this is the problem that GHG emissions continue to increase. One estimate shows a year-on-year increase of 2.5% from 2012 to 2013, in addition to projecting further year-on-year increases through at least 2020 (Friedlingstein et al., 2014: 711).

It is therefore up to those alive today to reduce the rate of GHG emissions, even though they will not benefit directly from these efforts, and to do so sooner rather than later, since the problem continues to worsen. Changes will not have an immediate impact, since the present stock of atmospheric GHGs

is already committed to some climate changes. Indeed, as noted in the above section, even if the flow of GHGs into the atmosphere was reduced to zero immediately, it would not prevent some climate changes to which the Earth is already committed because of past emissions. Moreover, due to its long lifetime (discussed above in section 2.2), a large portion of atmospheric CO_2 that originates from human activity will remain in the atmosphere for roughly three hundred years, with one quarter lasting far longer. With all this in mind, while it is up to the present generation to mitigate climate change, doing so will end up benefitting future generations. By reducing emissions and enhancing sinks, those alive today will prevent some of the projected adverse impacts of climate change that future generations will experience by reducing the number and intensity of changes to the climate that will occur.

In this section, as well as throughout the thesis more generally, I make frequent reference to the burdens of climate change mitigation. By the burdens of mitigation, I mean both the financial and material costs that mitigation strategies entail, as well as burdens that individuals whose lives and livelihoods must change will bear as a result of climate change mitigation. Mitigation policies, like most other policies (related to climate change or not), need financial and material investment. This raises the prospect of opportunity costs; that is, every investment in mitigation implies that some other policy will not be pursued.[31] In addition to direct material costs and indirect opportunity costs, mitigation will also make certain life plans impossible to pursue, mostly those associated with "professions that depend for their existence on fossil fuels [such as] heavy industry, manufacturing, coalmining, and construction" (Caney, 2014: 133). The setback to some individuals' interests can itself be to some extent counterbalanced, through retraining, for example, and climate change mitigation will generate comparable professions in manufacturing sustainable technologies in less GHG-emission-intensive ways. That said, these options still carry with them some transition costs. Moreover, some who depend on the unsustainable professions will not, for whatever reason, be able to avail themselves of these other options, or indeed the options will prove unsatisfactory, not returning them to the level of wellbeing that they would have enjoyed in a world without mitigation. These are important sacrifices that increase the significance of defending intergenerational duties of

[31] It is tempting to set up the opportunity cost of investing in climate change mitigation as other policies that redress injustice, such as poverty reduction or relief for some of the world's most deadly diseases. This is a mistake, for governments today expend vast resources on unjust policies: "the budget for climate change does not need to be deducted from the budget for chronic poverty. It could be deducted from the budget for misguided military adventures" (Shue, 2010a: 34)[fixed].

just mitigation. If some in the present are going to bear the sacrifices just outlined (in addition to financial and material costs) to mitigate climate change for the sake of future generations, then it must be shown that these burdens are required by justice, out of respect for the claims of those who will bear them.

It is important not to over-emphasise how costly mitigation will be. Models suggest that its economic costs will not be excessive, though there remains a high degree of variation between the models as they are especially sensitive to initial assumptions (IPCC, 2014c: 14).[32] However, the cost of mitigation is not the only relevant consideration. For one, leaving climate change unmitigated would also prove financially costly (in addition to its human costs). As an example, one study projects that global income will decrease by roughly 23% by 2100, if climate change is left unmitigated, in addition to exacerbating inequality by making those who are already the least advantaged worse off (Burke et al., 2015: 235). Moreover, the cost of deferring mitigation are potentially enormous: projections outlined in the IPCC, for example, show an increase in the cost of mitigation of between 28-44%, should it be delayed to 2050 (IPCC, 2014c: 15-6). Furthermore, there are a number of mitigation opportunities that will produce "no regrets" changes, such as efficiencies in energy consumption (either through behavioural changes or technological innovation) that both save costs in the near term and contribute to climate change mitigation (Shue, 2014a: 96). When considering the burdens of mitigation, then, there is significant reason to take potential financial costs to be relatively low, especially compared with the alternatives of delayed mitigation or leaving climate change unmitigated.

Of course, there are human costs to consider as well. Even if the financial costs of mitigation are minimal, the disruptions that it will generate for existing individuals' lives are important. In conjunction with this point, however, it is worth noting that it is the most advantaged, wealthiest members of the present generation that contribute most to the problem of climate change, whereas climate change poses the greatest threat to the members of future generations that are the least advantaged (Shue, 2010b: 212). Making sacrifices in the present to mitigate climate change for the sake of future generations ensures that those who are best able to accommodate some sacrifice (i.e. the most advantaged) are asked to do so. In contrast, leaving climate change unmitigated means

[32] As an illustrative example, one study suggests a loss of 0.9-2.5% to the global GDP at 2100 (Edenhofer et al., 2010: 53).

predominantly burdening the least advantaged members of future generations with sacrifices over which they will have no control.[33]

2.3.2. Additional responses to climate change: adaptation and rectification

In addition to climate change mitigation, there are two responses to climate change: adaptation and rectification. Just mitigation is only one part of the full human response to climate change, and a fully just response to climate change will involve achieving a justified balance between mitigation, adaptation, and rectification. That said, in the next section (section 3.4.1), I argue that mitigation is still the primary response to climate change. Before coming to that argument, in this section, I first explain what adaptation and rectification are.

Adaptation refers to the "process of adjustment to actual or expected climate and its effects" (Allwood et al., 2014: 1251). Whereas mitigation strategies aim to prevent climate change, thereby reducing the number and intensity of its adverse effects, adaptation strategies seek to change human systems in reaction to climate change, thereby moderating or avoiding its harms, or indeed exploiting beneficial opportunities (IPCC, 2014a: 1758). Adaptation strategies thus act in concert with climate change mitigation. Those adverse impacts of climate change that are not, for whatever reason, prevented through climate change mitigation, may often be avoidable through adaptation.[34] That said, there are limits to adaptation. Even where mitigation has been aggressively pursued and where adaptation strategies have received significant investment, there will be cases where climate change nonetheless prevents some actors from securing their objectives (Dow, Berkhout and Preston, 2013: 383; Klein et al., 2014: 383; see also Dow, Berkhout, Preston, et al., 2013). Examples include settlements in low-lying islands, coasts or riverine areas are already experiencing outmigration, with resettlement intended in some cases, such as in certain Alaskan villages (Dow, Berkhout & Preston, 2013: 387). The prospect of resettlement indicates a limit to adaptation, since it shows that some cannot secure "a valued objective (living in a particular place with cultural significance)" (Dow, Berkhout & Preston, 2013: 387). Rice cultivation in South Asia is another example of an important limit to adaptation. Rice

[33] Reasons such as these cast doubt on proposals that suggest mitigating climate change and passing on the cost to future generations (e.g. Broome, 2012: chap. 3; Rendall, 2011).

[34] There is much debate about the precise nature of the relationship between mitigation and adaptation. Some take them to be substitutes (e.g. Tol, 2005), while others take them to be complementary (Klein et al., 2014: 925; see also Yohe & Strzepek, 2007). For my present purpose of laying out the context of mitigation as a response to climate change, the point is that adaptation in some way fills out the human response to climate change by preventing some adverse human impacts of climate change without preventing changes to the climate.

pollination and flowering requires a night-time temperature of 26ºC or less, "with a 10% decline in yield for every 1ºC increase in temperature above that" (Dow, Berkhout, Preston, et al., 2013: 306; see also Dow, Berkhout & Preston, 2013: 387). Moreover, depending on the variety, rice will not breed if night-time temperatures sit between 32-35ºC (Dow, Berkhout & Preston, 2013: 387). As climate change becomes more severe, it will become increasingly difficult for those societies that rely on rice cultivation to continue doing so. At a certain point, they will have to consider alternatives, including growing different crops, new locations for cultivation, or simply new livelihoods entirely; each alternative carries significant economic, social, and cultural impacts (Dow, Berkhout & Preston, 2013: 387). The basic point is this: there are some climate change impacts, such as the illustrations outlined above, to which adaptation is impossible. Though adaptation can complement mitigation strategies, there is still a remainder that lies beyond the limits of adaptation.

Rectification strategies respond to the remainder that lies beyond the limits of adaptation (Adger et al., 2009). Rectification refers to "financial compensation and symbolic measures such as apology" in response to residual loss and damage (Heyward, 2013: 25). The idea is that, even once mitigation and adaptation strategies have been implemented, there remains some loss and damage from climate change that requires rectification. According to the UNFCCC, climate change loss and damage is "the actual and potential manifestation of climate change impacts that negatively affect human and natural systems" (UNFCCC, 2012: 4). More precisely, loss and damage are "unjustified disruptions in the lives of individuals and communities, whether permanent or otherwise, that are attributable to anthropogenic climate change and which remain after mitigation and adaptation efforts have been attempted" (Page & Heyward, 2016: 3). In short, no amount of mitigation and adaptation is enough to prevent an important remainder of residual impacts of climate change. Given the prospect of loss and damage from climate change, a fully just human response to climate change will involve forms of rectification that supply just compensation to those who suffer from climate change.

2.3.2.1. Why focus on mitigation?

Given that mitigation is only one of three components of a just response to climate change, why focus on it alone? It is important to justify my focus on it, not least because it raises normative questions that are distinct from those raised by other responses to climate change (Jagers and Duus-Otterström, 2008: 76–7). I take mitigation to be the primary response of the mitigation – adaptation – rectification triad. In this section, I explain the three interrelated ways in which I take mitigation and preventing climate change to be primary.

First, mitigation will largely determine the shape of other responses to climate change. By targeting the fundamental processes of anthropogenic climate change, that is, by reducing GHG emissions and enhancing GHG sinks, mitigation (or the lack thereof) will largely determine the extent to which future generations will have to adapt to a changed global climate (Watkiss et al., 2015: 544). Should the present generation mitigate climate change and diminish the severity of its impacts upon future generations, those generations will, in turn, have less need to adapt to climatic threats and less need to compensate some of their members for the loss or damage to their objectives.

One important way in which mitigation determines the shape of subsequent adaptation and rectification is that it will limit "catastrophic surprises" (Jamieson, 2005: 229). A catastrophic surprise is an event where "GHG forcing may suddenly drive the climate system into some unanticipated, radically different state to which it is virtually impossible to adapt" (Jamieson, 2005: 222-3). Examples include radical changes to thermohaline circulation, which is largely responsible for the habitable European climate, or rapid and irreversible melting of certain key glaciers (Gardiner, 2004: 559). By mitigating climate change, the present generation will reduce the risk of such catastrophes. Indeed, that is the only way to diminish such risks: by definition, it is difficult for human (as well as non-human) systems to adapt to catastrophic surprises, even including prospective adaptation strategies. After all, if this were possible, then these events would not be catastrophic surprises. Given that adaptation is largely out of the question, such extreme events will generate significant rectificatory requirements, where those subjected to unjust losses and damages will be entitled to compensation from others. With all this in mind, mitigation underlies other responses to climate change by reducing the risk of catastrophic surprises. If the present generation leaves climate change unmitigated, it raises the risk of climatic events that will cause significant loss of life and impose burdens, such as ruined livelihoods, on future people. More generally, the extent to which those alive mitigate climate change determines the extent to which future generations will have to adapt to a new climate and the extent to which they will have to compensate those who cannot adapt.

Second, for the present generation, duties of just mitigation are the most significant subset of climate change duties. While the present generation does have some duties related to adaptation and rectification, owed both to its members that already feel the effects of climate change, as well as members of future generations, duties of just mitigation are the most significant subset of climate change duties from the perspective of the present generation. From a more general perspective, justice in adaptation and justice in rectification – or, to be consistent, just adaptation and just rectification –

are as important as just mitigation. After all, they are not distinct values. Rather, they represent a way of categorising the demands of climate justice, which is itself simply a subcategory of justice itself. That said, working out what constitutes just mitigation (and, indeed, seeing that it is done) is primary. Consider a scenario where the present generation leaves climate change unmitigated. This would leave future generations to adapt to (and to undertake rectificatory compensation for) the climate change to which those presently alive have committed them, in addition to mitigating climate so that yet more generations will not have to live with an increasingly unstable climate. Justice can still be done, in this case, where a given future generation discharges its duties of just mitigation, adaptation and rectification. However, the present generation would still have acted unjustly, ignoring its duties to prevent (or minimise the severity of) climate change and its impacts on future generations. From the perspective of those alive today, mitigation requires a greater proportion of the present generation's attention. In short, prevention through mitigation will not always be just, but it is (temporarily) the most important part of the present generation's duties of climate justice.

Mitigation directly combats one of the fundamental injustices of climate change. It has been widely shown that GHG emissions, left unrestricted, benefit the advantaged members of past, present and future generations, while the consequences of climate change stand to inflict suffering on those who are already disadvantaged (Caney, 2006; Fleurbaey et al., 2014; Gardiner, 2004; Jamieson, 2005; Jamieson and Di Paola, 2014). It follows that, by requiring them to cease their unchecked emission of GHGs, mitigation will in fact require the already-advantaged to cease unjustly abusing their dominant position and instead respect the claims of those who are comparatively disadvantaged. Of course, as should already be clear, mitigation is only one of several responses to climate change. With that in mind, it is reasonable to assume that a just response by the present generation to climate change will include an appropriate mix of all three. However, as I discuss in the next chapter, there are limits to the extent to which doing anything other than mitigation (e.g. helping build the capacity for future generations to adapt to climate change; accumulating capital with which to provide compensation) is just. This is one of the central points that I develop as it is key to outlining an appropriate metric for intergenerational justice. Given the extended treatment that it receives in chapter 3, I leave further discussion of it until then.

One final point is in order. Though mitigation is primary, in the ways explained above, from the perspective of the present generation, over time this will not always be the case: duties of just adaptation and just rectification will increase in importance. Imagine a scenario where the present

generation undertakes significant mitigation.[35] In this case, as noted above, there will still be some changes to the global climate, partly as a result of historical emissions and as a result of the emissions that occur during the period of reduction. Duties of just adaptation and just rectification will increase in relative importance within the overall picture of what climate justice requires, since they respond to the remaining injustice.[36] The same general point – that duties of just mitigation may diminish in importance over time – stands in less optimistic scenarios, where the more dangerous pathways occur. In such cases, however, the reason for the change is slightly different, namely, that the prospect of immediate intragenerational justice will demand attention, increasing the relative weight of duties of just adaptation and just rectification. For example, the generation alive in the year 2300, where the present generation pursues a moderate-to-low mitigation pathway, will need to deal with significant intragenerational injustices of climate change and justice will require significant investment in adaptation and compensation.

2.3.3. The present generation's choice

At this point, in simple terms, it seems like the present generation has a choice: take on some burdens to mitigate climate change (burdens that are minimal, compared to the burdens others will bear if climate change is left unmitigated), or leave climate change unmitigated. The choice, however, is not so simple. For one, the present generation has a number of options, including the timing of peak emissions, the rate of emissions reduction, and the target concentration of atmospheric GHGs, all of which make up what we can think of as the present generation's mitigation strategy. The present generation's choice to mitigate climate change, or leave it unmitigated, is in fact a set of choices that, taken together, will produce a particular mitigation pathway. In the following three subsections (3.2.1-3), I explain these different sub-components of mitigation, as well as the concept of a mitigation pathway.

3.3.1. Mitigation targets

Setting a target is important for any comprehensive mitigation strategy. By target, I mean the state of affairs at which mitigation should aim, be it a particular temperature, concentration of atmospheric GHGs or level of radiative forcing. As I explain in this section, setting mitigation targets is

[35] I have in mind something like the moderate-to-high mitigation pathway, which I explain (along with others) below.
[36] On this optimistic scenario, there may still be some duties of just mitigation with respect to sink enhancement as a means of accelerating a return to pre-Industrial concentrations of atmospheric GHGs.

controversial; possible targets involve a series of interrelated decisions and choices that the present generation must make. After outlining these complications, in the next section, I present a set of pathways to help better describe the present generation's mitigation options.

One influential target is the aim that average global temperatures be maintained below a 2ºC increase over pre-Industrial temperatures. For example, both the Copenhagen Accord (2009) and the Paris Agreement (2015) affirmed the goal to hold the increase in average global temperature to below 2ºC at the year 2100 (UNFCCC, 2009: 5, 2015: 3). Originating in heuristics developed by economists working on climate change in the 1970s, the purpose of adopting such a limit is to balance the cost of mitigation with the magnitude of "avoided damages" (Randalls, 2010: 598; for an example of economic analysis, see Nordhaus 1977). It is important to note that the 2ºC limit does not represent some important point at which climate change suddenly becomes much worse: indeed, "there is no single change in global mean temperature beyond which large negative impacts occur. Rather, there will be an increasing number of increasingly negative impacts as greater climatic change occurs" (Harvey, 2007: 7; Archer, 2009: 160).

The 2ºC target is controversial. For example, some argue that limiting the increase in average global temperature to 2ºC above pre-Industrial temperatures at 2100 is insufficiently stringent. However, a problem is that the concentration of atmospheric carbon associated with the 2ºC target could in fact lead to "eventual warming of 3-4ºC with disastrous consequences" (Hansen et al., 2013: 1). There is evidence that shows that warming of 2ºC will trigger "slow feedbacks" within the climate system that will produce greater warming over time (Hansen et al. 2013: 14-5). The long lifetime of atmospheric CO_2 is part of the reason for this projection: "The lifetime of fossil fuel CO_2 in the climate system is so long that it must be assumed that these slow feedbacks will occur if temperature rises well above the Holocene range [e.g. by 2ºC]" (Hansen et al., 2013: 15). Moreover, warming of 2ºC is likely to trigger slow feedbacks, including changes to the absorptive capacity of some parts of the carbon cycle, most notably "perhaps even making the Amazon rainforest a source of CO_2" (Hansen et al., 2013: 15).

Part of the challenge facing the present generation involves setting the right target for climate change mitigation. While there is a global, political consensus in favour of the 2ºC target, as it has been incorporated into international legal mechanisms (Moellendorf, 2014: 24-5), there is reason for

concern that targeting 2ºC at 2100 might lead to much greater changes to the global climate, with consequently worse impacts for future generations.

Some targets aim to avoid dangerous anthropogenic interference (DAI) in the global climate system, others at preventing dangerous climate change (DCC). The key distinction between these two is the stage in the four-part process of climate change that each targets. DAI-related targets are usually expressed in terms of atmospheric GHG stocks, while DCC-related targets refer to particular changes in the climate (Harvey, 2007: 3; see also Dessai et al., 2004; Parry et al., 1996). Some argue that there is reason to prefer DAI as a target-setting strategy since, for example, to avoid DAI one needs only to know the upper boundary on climate sensitivity (Harvey, 2007: 1, 21). On this view, one needs to know only how much climate change is unacceptable and aim to keep atmospheric GHGs at a level that stands a good chance of keeping climate change below that threshold. In contrast, to avoid DCC, one needs to know climate sensitivity more precisely (Harvey, 2007: 1, 21). That is, one needs to know exactly what stock of atmospheric GHGs leads to what climate changes, and then settle on what projected climate changes are in fact dangerous.

There are other controversies that arise when thinking about mitigation targets. Even if we settle on the 2ºC target, there remain further questions. For example, there is controversy about related goals that should be pursued to meet that target, including whether to focus on the date of peak emissions and the rate of reduction in emissions rather than a total carbon budget (Anderson and Bows, 2011), as well as what total carbon budget will in fact meet the 2ºC target. There are several terms here to unpack. The date of peak emissions refers to the timing of the inflection point at which the rate of anthropogenic GHG emissions decreases; the rate of reduction refers to the pace at which reductions in emissions rate occur. The carbon budget refers to a cumulative quantity of GHGs that can be emitted, given some other target. Controversy about those includes disagreement about what this budget should be, to meet the 2ºC target, with Working Group I of the IPCC arguing that a budget of 1000 GtC gives a >66% chance of *meeting* the target (Collins et al., 2013: 1113), while others assert that this will produce a 25% chance of *exceeding* the target (Meinshausen et al., 2009: 1161). Furthermore, it bears repeating, as stated above, that the 2ºC target is controversial in itself, since some argue that it is an inadequate constraint on emissions (Hansen et al., 2013: 1–2).

2.3.4. Alternative mitigation pathways

As I tried to make clear in the previous section, the present generation's choice with respect to mitigation, is in fact a range of interrelated options that will have significant consequences on the extent and gravity of climate change and therefore also on the lives of future generations. To simplify the characterisation of the present generation's choice, I here introduce four mitigation pathways, following from the IPCC's Representative Concentration Pathways (RCPs), which I classify as moderate-to-high, moderate, moderate-to-low and low. Figure 2.4 summarises some key differences between each of these.

There are a few initial points to be made. First, the difference between each of these scenarios is not simply a matter of degree: models show, for example, that returning to lower levels of radiative forcing (and thereby diminishing climate change) becomes disproportionately more difficult when shifting from the moderate mitigation pathway (RCP4.5) to the moderate-to-low mitigation pathway (RCP6)

	Year of peak emissions	CO_2-equivalent ($CO_{2\text{-eq}}$) Concentrations at 2100	Projected Increase in average global temperatures at 2100 (ºC) (relative to 1850-1900)	Likelihood of temperatures exceeding 2ºC increase at 2100 (relative to 1850-1900)	Sea level increase at 2100 (m) (relative to 1986-2005)	Rate of change in radiative forcing at 2100
RCP2.6 (moderate-to-high mitigation)	2020	475 ppm	1.85	<33%	0.4	Declining
RCP4.5 (moderate mitigation)	2040	630 ppm	2.65	>50%	0.47	Stable
RCP6 (low-to-moderate mitigation)	2080	800 ppm	3.05	>66%	0.48	Increasing
RCP8.5 (low mitigation)	After 2100	1313 ppm	4.55	>66%	0.63	Increasing

Figure 2.4. Key RCP projections (IPCC, 2013b: 20, 23, 29, 2014b: 40; Meinshausen et al., 2011: 229–30).

(Meinshausen et al., 2011: 230). Second, to defend my choice to use non-numerical labels: in this thesis, each of these pathways individually represents a set of choices that the present generation can make with respect to climate change mitigation. By distinguishing these pathways according to the amount of mitigation they entail, I emphasise that the present generation's choice is not only about the binary choice of whether or not to mitigate, but it is also about the scale of mitigation that justice requires. Distinguishing the pathways allows me to compare what each entails for future generations and therefore supports my later judgement that justice requires that the present generation undertake significant mitigation of climate change for the sake of future generations, which is roughly consonant with the moderate-to-low mitigation pathway.

The key comparison between the pathways with which I am concerned has to do with the human impacts that projections show will accompany each one. I have covered the relationship between climate hazards and human vulnerabilities when I discussed some representative examples above. The climate hazards that will accompany each are distinct, with both sea level rise and average global temperatures (both important examples of climate hazards) increasing as the amount of mitigation that the present generation undertakes decreases. It follows that the threat that these climate hazards pose for future generations (according to the relevant vulnerabilities) increases in a similar fashion. With these threats in mind, the moderate-to-high pathway threatens to violate future generations' interests the *least*. Of course, it does not immediately follow from this claim that the present generation should aim to follow that pathway. But this is a key component of the argument that I present in the next chapter, where I defend the claim that the present generation should pursue the moderate-to-high mitigation pathways for the sake of future generations.

Notice also that I endorse the pursuit of a *moderate*-to-high pathway, not simply a high mitigation pathway. I choose this label deliberately, to communicate the idea that the present generation's choice with respect to mitigation must balance a range of concerns. Of course, the goal of preventing a large portion of climate change is important (as I hope I have made clear). In addition to it, however, there are other responses to climate change (adaptation and rectification) that require present attention, as well as other concerns of justice (such as global poverty, to name one) that are similarly important. Insofar as just mitigation is a component of justice more generally, then, the present generation's aim to make just choices with respect to a range of issues means that its goal, with respect to mitigation, should be more nuanced than simply mitigation at all costs. In sum, (1) the present generation must

choose between pathways (which is a normative decision); (2) the choice is profoundly intergenerational; and (3) the choice involves balancing a range of concerns of justice.

2.4. Just mitigation and its context

My aim in this final section is to connect the above discussion about climate science and mitigation pathways with the normative project that is my central concern. To do so, I locate just mitigation within the larger project of climate justice, emphasising its intergenerational foundation. The key claim of the section is that mitigation, particularly of the scale required by the moderate-to-high pathway, can only be justified by appealing to the interests of future generations. The reasons for this have come in and out of focus throughout the chapter. I emphasise their importance both as the rationale for my focus on mitigation and as a necessary component of a theory of just mitigation.

A theory of climate justice sits at an intermediate point between justice in general and just mitigation. Building on the discussion of the concept of justice from chapter 1, climate change justice is a theory that impartially adjudicates between individuals' claims with respect to climate change, enumerating perfect duties that agents should discharge to stand in the right relationship with one another.[37] Of course, climate change is but one problem that threatens injustice; it is therefore one of many concerns of justice, each of which represents a subcategory of justice in general. Furthermore, climate change justice decomposes into three categories: just mitigation, just adaptation, and just rectification. (Figure 2.5 illustrates these relationships.) In other words, duties of climate change justice apportion responsibility for each of mitigation, adaptation, and rectification which, taken together, must in turn cohere with other demands of justice that govern different parts of human life.

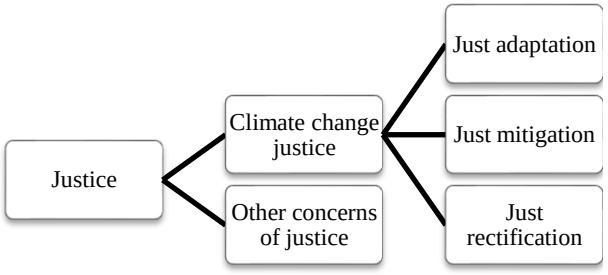

Figure 2.5. Justice, climate justice and just mitigation

[37] Recall that I use the notion of standing in the right relationship to articulate the idea that justice includes more than avoiding wronging others; justice defines what individuals must do as a mutual effort to do what is right.

Given that just mitigation is embedded within climate justice, which itself must cohere with the other concerns of justice as part of justice in general, there are further questions about the relation between just mitigation and all of these other components of justice. Here, there are different approaches. An integrationist approach "considers a given issue X (say, climate change) in conjunction with other issues (like poverty, development […]) and treats them both as part of a general normative theory" (Caney, 2016: 14-5; see also Caney, 2012: 259). In contrast, an isolationist approach "isolates the responsibilities associated with climate change from a consideration of other issues (like poverty […])" (Caney 2012: 259). At first glance, there might seem to be some reason to favour the isolationist approach. For one, climate change is sufficiently pressing that one might consider its mitigation to take priority over other injustices. This view, however, is simply implausible, for it assumes that discrete injustices, including those that follow from climate change, can be treated separately.

The problem with isolationism is that it ignores the simple fact that injustices all set back the same feature of individuals, namely, their interests (for a similar point in the context of nonideal theory, see Caney, 2016: 15). Whether a given set of individuals experiences setbacks to their interests from climate change or from poverty, what matters from the perspective of justice are the setbacks to those interests. When considering how to respond to these injustices, that is, when considering what justice requires in either of those cases, it is unjustified and artificial to focus on securing those individuals' interests by mitigating climate change while ignoring the effect of poverty. In other words, part of justice in general requires that individuals receive "a fair share of a 'total package of goods'" (Caney, 2012: 271). It is simply impossible to know what individuals' entitlements are with respect to one good from that total package in isolation from its other constituents. Climate change is but one threat to those goods – and mitigation is but one way of protecting those goods – so settling on what justice requires in either of those two contexts is inextricably linked to other injustices that might threaten those goods.

With all this in mind, it follows that mitigation should not be treated apart from adaptation and rectification; that is, climate change justice should be treated holistically, rather than atomistically (Caney, 2012: 258-9). In section 3.2 above, I noted practical reasons why this is the case. For one, the amount that climate change is mitigated (or left unmitigated) will contribute significantly to the adaptation and rectification that future generations will require. The discussion of integrationism and isolationism implies a further reason for approaching the three holistically: all three constitute strategies for securing both present and future individuals' interests. It is impossible to ascertain, for

example, how much mitigation, in aggregate, the present generation must undertake without knowing the extent to which future adaptation can protect future individuals' interests.

The same point can be put differently. The integrationist approach effectively denies that there is something special about climate justice (or just mitigation), since it is a part of justice itself. It does not, however, have direct implication for the practical matter of how to answer specific normative questions, such as how much mitigation the present generation should undertake for the sake of future generations. With this is mind, does my focus on mitigation reflect some underlying isolationism and atomism? One might object that while I explicitly defend an integrationist approach to just mitigation, my focus on its justification, particularly against objections that constrain or undermine intergenerational duties of justice, implicitly adopts an isolationist and atomist approach. One answer is that the complexity of climate change, and indeed the complexity of other injustice, justifies a division of labour (Zellentin, 2015: 2). This answer seems to me to be perfectly consonant with an underlying commitment to integrationism as a theory that relates justice in general to specific questions of what justice requires in a given circumstance, such as climate change or mitigation.

This leaves one final question, namely, where in all of this does my defence of intergenerational duties of just mitigation fit in? Significant mitigation can only be justified with reference to the interests of future generations. The reason for this has cropped up repeatedly throughout this chapter. By mitigating climate change, the present generation takes on a range of burdens that will, for the most part, only benefit future generations. In other words, if the present generation mitigates climate change, in all likelihood it will be out of respect for the interests of future generations. Because the burdens of mitigation can only be borne in anticipation of future benefits of mitigation, any duty of justice that requires some group of people (i.e. the present generation) to mitigate climate change must appeal to the interests of another group (i.e. future generations). While the adverse effects of climate change amplify the importance of mitigation, there remains one underlying problem, namely, that the appeal to future generations' interests to ground duties of justice is controversial and requires defence. By defending intergenerational duties of just mitigation, I aim to provide the normative foundation for just mitigation. That is, I aim to provide the basic justification that provides the normative force behind the claim that the present generation should mitigate climate change for the sake of future generations. Without this, other questions that a theory of just mitigation might answer – such as: what is a fair distribution of the burdens of mitigation? Or what process for designing mitigation policies is just? – are premature, since there may be no reason to mitigate in the first place. In sum, an

intergenerational justification is a necessary component of a theory of just mitigation, but it is alone insufficient to determine the full range of duties of just mitigation that apply to the present generation.

2.5. Conclusion

In this chapter, I have laid out the basic components of the climate system, outlined the process of climate change and explained some of the projected impacts that it threatens to have on future generations and their interests. I have also outlined a range of mitigation pathways to help clarify the mitigation options that are available to the present generation. I then finished by connecting this to the normative discussion, emphasising the important place of intergenerational justice within just mitigation, climate justice and justice in general.

In the end, there are many reasons to take climate change seriously: for one, the impacts associated with leaving it unmitigated, or with partially mitigating it (as represented by the low and medium mitigation pathways), are severe, threatening future generations with significant harms. Moreover, delaying mitigation increases the magnitude of its challenge, as the steadily increasing rate of GHG emissions grows the atmospheric stock of GHGs and increases the severity of climate change. While these facts highlight how pressing the problem of climate change is, they do not in themselves justify mitigating climate change for the sake of future generations. In the next chapter, I aim to do exactly that, reconstructing what I call the non-diminishment view, based on Brian Barry's work, and then offering the proportional view as a development of non-diminishment that avoids its problems.

3. Intergenerational justice and proportional opportunities

3.1. Introduction

Why mitigate? And how much mitigation does justice require? With the conceptual foundation in its place, I now turn to my positive case for why the present generation has significant and pressing duties of justice to mitigate climate change. My aim is to provide a plausible and coherent defence of intergenerational duties of just mitigation, which I can then defend and elaborate by, in subsequent chapters, pressing against it a range of objections.

In what follows, I defend what I call *the proportional view* of intergenerational justice. I develop this view by considering Brian Barry's application of equality of opportunity to the intergenerational context. Barry's view, *the non-diminishment view,* is a plausible, intergenerational extension of equality of opportunity, offering both a profile and a metric of intergenerational justice.[38] Despite its appeal, I suggest that there are several problems with the non-diminishment view and the profile of justice that it implies. In response to these shortcomings, I outline the proportional view as a development of the non-diminishment view. The proportional view is in many ways a close cousin to the non-diminishment view, particularly in its approach to the metric of intergenerational justice. The key difference is in the profile of justice, in which I take the proportional view to be immune to problems that I suggest plague the non-diminishment view.

The chapter proceeds as follows. In section 3.2, I discuss intergenerational impartiality as a key part of intergenerational justice. In section 3.3, I first discuss equality of opportunity in general, before outlining Barry's intergenerational application of it, the non-diminishment view. In my reconstruction of the non-diminishment view, I discuss the profile and the metric separately. I then introduce my proportional view as an account of intergenerational justice that is not subject to the same problems that I argue plague the profile of the non-diminishment view. In section 3.4, I reconnect the discussion

[38] Barry does not himself lay out a view of intergenerational justice as non-diminishment. Instead, I reconstruct this view from remarks found throughout his work on particular issues that raise problems of intergenerational justice, most notably non-renewable resource depletion and environmental sustainability. The aim in so doing is to articulate a view that is recognisably associated with Barry's work and charitably reconstructed (e.g. without complaining about a lack of comprehensiveness when that was never his intention).

with just mitigation, laying out some key reasons why the proportional view of intergenerational justice requires that the present generation engage in significant mitigation for the sake of future generations.

3.2. Intergenerational impartiality

I begin by examining the moral importance of a given generation's temporal location. In general terms, I develop the idea of intergenerational impartiality. More specifically, I argue that the advantages and disadvantages that temporal location affords a given generation are morally arbitrary and, therefore, that the demands of intergenerational justice should not sustain or reflect these arbitrary facts.[39] To this end, I examine and reject two related claims: (1) the temporal separation of generation matters morally and (2) the temporal separation of generations allows for, or even requires, the present generation to show less moral concern for future generations. I draw an analogy between intergenerational duties (between individuals separated in time from one another) and *intra*generational duties (between individuals separated in space from one another) and I aim to show that claim (1) is false and, moreover, that even if we operate on the opposite assumption that (1) is correct, claim (2) does not follow.[40]

With respect to climate change, the present generation has one important, arbitrary advantage over future generations, namely, that it has to deal with fewer climate change impacts than will subsequent generations. Instead, it can enjoy the benefits of GHG-intensive activities without incurring many of their costs, at least in principle. I say at least in principle because the present generation is also the first one to realise the extent to which human activities alter the climate and the enormous adverse consequences that has for future generations. With respect to climate change, then, the present generation is in a complicated position. On the one hand, it has an advantage over its successors, namely, that it can choose to benefit from GHG-intensive activities, externalising a range of costs for future generations to bear. On the other hand, it also has the disadvantage of being the first to become aware of these externalities, which has the potential to in turn produce new and burdensome responsibilities for the present generation.

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[39] For similar arguments about the irrelevance of temporal location see Reiman (Reiman, 2007: 89) and Narveson (Narveson, 1973: 65–6).

[40] The analogy between intra- and intergenerational justice might not be perfect. This does not make a difference to my argument. The key normative claim is that intergenerational justice has no feature that differs from intrargenerational justice *and* that permits one group of people to exploit its dominant position over another. For a more general discussion of this analogy, see Temkin (1995).

In what follows, I am mainly concerned with the arbitrary advantage that the present generation has over its successors, since it controls the extent to which it will mitigate climate change, with the main beneficiaries of such mitigation (future generations) unable to advocate for themselves. Properly understood, however, the present generation is not necessarily at a net advantage because the responsibilities of climate change mitigation will prove significant.[41] In any case, I focus on the possibility of arbitrary advantage. The reason is that I use this to defend a presumption in favour of intergeneration impartiality. As noted at the outset of the section, I reject two claims, (1) that temporal separation matters morally and (2) that temporal separation allows for (or permits) one generation to show less concern for the claims of others.

The responsibility of mitigating climate change notwithstanding, whether one has the good fortune to be born into the present generation, or the misfortune to be born into a future generation that has inherited a world of unmitigated climate change, is a hugely important determinant of the extent to which one can pursue and secure one's interests. Moreover, when one is born is, of course, outside of one's control. In this context, by leaving climate change unmitigated, the present generation exploits its advantageous position in time, an advantage that is entirely arbitrary. The objection, from those concerned with justice, is that accidents of birth should not allow some people to enjoy a greater capacity to pursue their interest at the expense of others' capacity to do the same.[42]

One way to resist this conclusion is to point to the separateness of present and future generations and argue *both* (1) that their temporal separation is morally relevant *and* that (2) this morally relevant distinction is grounds for treating future generation differently, with less concern for their interests.

To evaluate the possibility that temporal separation matters, let us consider a close analogy, namely, that spatial separation matters. Here, the matter is clearer. While spatial separation tends to track morally significant relationships – that is, I tend to live closer to those to whom I have special duties, for example – this is simply a contingent feature of how humans often, but not always, arrange their lives. For example, I live in England, but my family lives in Canada. Does the fact that I put more distance between me and them diminish what special duties I have to them (assuming that I do in fact

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[41] Though, as discussed in chapter 2, not especially significant.

[42] My argument is inspired by Joseph Carens's discussion of citizenship and freedom of movement (1992: 26; see also 1987).

have such duties)? I think the answer is obviously no.[43] The special duties that I owe my family flow from other morally important facts, such as the mutual dependence of family members at different stages of their life. Close proximity is not one of these important facts. Similarly, the duties that I owe to distant strangers remain constant, whether I am in England or in Canada, for the fact that they are distant is not morally relevant.

Even if we assume, for the moment, that I am mistaken and that existing in the same physical space is morally significant, it remains to be shown that I owe more to those physically close to me than I do to those who are far away. It might simply be true, for example, that I owe different (as opposed to stronger or weaker) duties to those around me than I do to those who are far away, different duties that do not assume that the interests of the former matter more than the interests of the latter. Distance is not relevant to the moral concern that I owe others (contra claim (1)) and, even if it were, it does not follow that I owe less moral concern to those who are far away (contra claim (2)). Of course, distance – spatial and temporal – might still influence what we owe one another. For example, insofar as I am more likely to enter into special moral relationships with those around me (e.g. contracts, promises, etc.) than I am with those who are far away, distance is relevant. This has implications for intergenerational justice, since generations cannot explicitly undertake these sorts of joint enterprises. Distance influences what duties hold between individuals, but only insofar as it influences the basis of duties, such as contracts or promises.

Do I owe more to my contemporaries because we happen to exist at the same time? That is, does justice permit me (or even require me) to show less concern for the interests of those who will exist in the future? The logic that applied to the spatial case extends quite readily to this intergenerational case. For one, it is not clear that temporal distance matters any more than spatial distance. Furthermore, even if temporal distance were an important, morally-relevant fact, it does not follow directly that it licenses some agents to be less concerned with the claims of those who are distant in time. In contrast, there is good reason to consider other features of the relationship between present and future generations to work out what duties hold between them.

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[43] Parfit argues for the same conclusion in the context of a temporal discount rate: "No one thinks that we would be morally justified if we cared less about the long-range effects of our acts, at some rate of *n* percent per yard" (Parfit, 1984: 485).

Let us return to the case of climate change mitigation. The present generation, by acting in ways that emit GHGs, thereby contributing to climate change, violates future generations' rights by making it harder, if not impossible, for them to secure the goods in which they have weighty interests. In other words, the extent to which future generations will be able to secure their own interests depends on the actions of the present generation. The right question, in this context, asks what justice requires the present generation do, given the control that it has over how future generations' lives will go, *not* what justice requires, given that future generations are temporally separate from the present. Insofar as justice impartially adjudicates between individuals' competing claims, then, intergenerational justice does not permit a particular generation to privilege its own claims over those of its successors'. In other words, intergenerational justice embodies a standpoint that takes every individuals' lives and claims to be equally valuable, independent of when they exist in time.

In sum, to release the present generation from duties of intergenerational justice on the grounds of temporal separation effectively defends a temporal aristocracy, where those who happen to live at any given time enjoy the arbitrary benefits that come with being born ahead of their descendants. Against this, I argue that there is no principled reason to accept that temporal distance matters (contra (1)), from the perspective of justice, and that even if there were, it does not follow that temporal distance justifies a disregard for the claims of future generations (contra (2)). Defending these claims is even more objectionable in the context of climate change, since they appear to allow the present generation to enjoy certain activities (ones that emit GHGs) that violate future generations' interests.

3.2.1. Distinguishing equal respect and equal concern

Based on the argument in the previous section, one might contend that since intergenerational justice is impartial in the sense of taking individuals' claims to be equal across time, it should also be egalitarian in a distributive sense that accords equal entitlements to individuals across time. This inference is too quick. To show how, I introduce the distinction between equal respect and equal concern (following Miller, 1998). Equal respect is a matter of valuing individuals equally. A conception of justice shows equal respect for individuals when it takes them to be equally valuable; I show equal respect for my contemporaries when I take them to each have the same value in themselves. Equal *concern*, however, does not follow from equal respect (Miller, 1998: 204–7). Here, concern refers to the extent to which a given agent should act out respect for another's interests. For example, I might value two individuals' lives equally, but show more concern for one if I have special reason to, for example, if one is a family member or if I have a pre-existing contract with one but not the other. Equal respect, then, does not

entail equal concern. More specifically, while intergenerational impartiality does imply intergenerational equal respect, intergenerational equal concern does not follow. With all this in mind, one way of thinking about the task in the chapter is as considering to what extent justice requires that a particular generation be concerned with other generations (in the sense of concern specified above), given the underlying notion of intergenerational impartiality and the equal respect that follows. For this discussion, I effectively suspend questions about the scope of justice and instead develop a principle that governs the profile of intergenerational justice and defends a particular metric of justice, as these determine the extent of each generation's duties of intergenerational concern.

3.3. Two principles of intergenerational justice: non-diminishment and proportionality

The idea of intergenerational impartiality, that no generation should take advantage of its (morally arbitrary) position in time is quite general, even if it is compelling. To build more concrete duties on this foundation, I turn to the concept of equality of opportunity. This focus has three virtues. First, equality of opportunity, howsoever conceived, clearly grounds objections to the idea that accidents of birth (i.e. its timing) justify the advantage of some individuals over others. Second, this principle is denser than the idea of not taking advantage of the timing of one's birth, containing the resources to help specify intergenerational duties of just mitigation. Third, and most importantly, considering this principle leads to a compelling account of duties of just mitigation. In what follows, though I begin with equality of opportunity, it is not where I end up. The view that I defend is not egalitarian in the sense of requiring equal intergenerational concern, but it still rests on the foundation of equal respect between generations. In many ways, however, the view I defend is a development of equality of opportunity, and so I begin by discussing this principle to lay the groundwork for my subsequent defence of proportional opportunities between generations.

3.3.1. Equality of opportunity in general

Many different interpretations of equality of opportunity have figured prominently in debates about the intragenerational demands of egalitarian justice (Arneson, 1989, 1990; Barry, 1989: 217–34; Cohen, 1989, 2008: 89 ff, Dworkin, 1981, 2000: chaps. 1–2; Mason, 2006; Rawls, 1999: §13-5, 2001: 43–4, Roemer, 1996, 1998: chaps. 7–8). This rich philosophical literature provides useful resources when considering intergenerational equality of opportunity. In this context, however, I take the literature to be informative but not binding. The reason is that, as I discuss below, some of the problems that

animate debates about intragenerational equality of opportunity simply do not arise in the intergenerational context.

As a general and fairly neutral starting point, a principle of equality of opportunity holds that individuals should have equal claim to the means "to create meaningful and successful lives for themselves" (Roemer, 1996: 9). The aim of such a principle is to ensure that a given individual's life prospects follow from morally relevant features of that individual and are under that individual's appropriate control (Barry, 1988: 29–3; see also Caney, 2001).

One of the most important distinguishing features of any principle of equality of opportunity is that it is concerned first and foremost with equality between individuals' life prospects, given the choices that each has made with respect to those life prospects, rather than 'straight equality,' where equality simply overrides other considerations, including the choices that individuals make that influence their life prospects: the "argument for equal opportunity rather than straight equality is that it is morally fitting to hold individuals responsible for the foreseeable consequences of their voluntary choices" (Arneson, 1989: 88). Of course, debate over what counts as a foreseeable consequence, as well as the degree to which responsibility matters morally (if at all), are two significant sources of controversy about what justice as equality of opportunity requires. The relationship between responsibility and distributive entitlements is complicated, for there are many intervening variables that shape a given individual's responsibility for a given choice. Natural endowments – talents to which an individual is predisposed at birth, but the possession of which is not fully under that individual's control – are clearly influential (Rawls, 1999); social circumstances, including the institutional arrangements and social norms that surround an individual also influence the degree of responsibility that this individual has over her situation (Mason, 2006: 99 ff); and a given individual's responsibility further depends in part of that individual's preferences (Dworkin, 2000; Cohen, 1989; Scanlon, 1986). Notwithstanding these complicating factors, responsibility remains an important component of any principle of equality of opportunity.

It is useful to approach the concepts of equality and of opportunity separately, before bringing the two together to produce a conception of equality of opportunity (Mason, 2006: 5–6). More generally, any principle of equal opportunity must specify the following: (1) who is responsible for securing the relevant opportunities; (2) whose opportunities are at stake; (3) what is an opportunity; and (4) what distribution of opportunities is just (Mason, 2006: 5; Westen, 1985: 838–41).

Given my concern with intergenerational duties of just mitigation, (1) and (2) are easily specified: I am here concerned with the opportunities that are available to future generations and the duties (if any) that the present generation has to preserve those opportunities. Note that I am not concerned with all of the opportunities that future generations will enjoy, for a great deal of those will depend on choices that future people will make. With that limitation in mind, I focus on the opportunities that will be available to future generations *in prospect*, that is, the opportunities that the present generation can reasonably expect future generations to have. Given that the present generation can, through the choices it makes, create, foreclose and, in general, influence the opportunities available to future generations, I argue that justice requires that those choices conform to a principle of intergenerational equality of opportunity. I specify (3) and (4) in what follows.

One final point is in order, which has to do with the notion of responsibility that is relevant to equality of opportunity. This concept appeared above as part of the rationale for moving from 'straight equality' to equality of opportunity. In the passage of Arneson's that I cited, responsibility appears in the following sense: individuals should internalise the costs and enjoy the benefits of their choices. The idea here is that when an individual freely chooses courses of action with foreseen consequences, justice should neither insulate that individual from the (foreseen) costs of the action, nor should it remove the (foreseen) benefits from that individuals' possession. I addition to this, however, there is another, complementary notion of responsibility, one that is important to the intergenerational extension of equality of opportunity. For to be responsible for their actions, individuals' acts must be freely chosen, which means that individuals must choose from a range of meaningful options. This might include (at a bare minimum) access to particular resources, as well as protection from various constraints, such as political repression. A person who has no real options because of destitution or political repression (for example) cannot be responsible for her choices, since in effect that person does not make a (free) choice.

The general point is this: responsibility has two closely related meanings. On the one hand, responsibility means that a principle of equality of opportunity should hold people to account for the foreseen consequences of their actions (Arneson's idea); on the other, responsibility means that equality of opportunity, to some degree, should support the range of options from which a given individual chooses. The latter understanding of responsibility is important for my argument because I use it to help justify my focus on intergenerational equality of opportunity. It is to this that I now turn.

3.3.2. Why equality of opportunity: comparing its inter- and intragenerational application

Earlier, I briefly mentioned one rationale for focusing on equality of opportunity, which is that it captures the notion of intergenerational impartiality and equal respect that I discussed in section 3.2. In this section, I add another reason for focusing on equality of opportunity, one that comes from comparing intragenerational and intergenerational justice.

In general terms, applying equality of opportunity intergenerationally is simpler than applying it intragenerationally. This is not merely a practical matter: there are important details that complicate intragenerational equality of opportunity. As noted above, these complications animate much of the literature on equality of opportunity cited above. For example, thinking about why, how, and to what extent social and political institutions should equalise opportunities within a generation requires a fine-grained parsing of individual responsibility, in the first of the two senses of responsibility mentioned above. This includes answering questions about the extent to which natural and social circumstances, as well as personal preferences, influence opportunities, as well as questions about whether these matter at all. This raises a further question: how far back, so to speak, should a principle of equality of opportunity aim to intervene? This animates much of the work on equality of opportunity as an ideal of intragenerational justice.

These complications can be set aside when thinking about equality of opportunity as an intergenerational principle.[44] The reason is that, properly understood, intergenerational equality of opportunity should determine what a given generation must do for the sake of its successors, as a matter of ensuring that its successors can take responsibility for their lives, in the second sense discussed above, where they have a range of options from which to choose. For one, there are important limitations to what one generation can achieve for the sake of another (Barry, 1991c: 262). The present generation can, for example, pursue moderate-to-high mitigation, locking in the necessary social and technological innovations to transition away from GHG-intensive methods of energy production. Insofar as this reduces the present generation's climate-changing GHG emissions, then it will have contributed to a stable climate for future generations. It is up to future generations, however, whether or not the global economy returns to hydrocarbons as the dominant energy source. The point is that the present generation cannot ensure that future generations will live according to particular social arrangements. Instead, those alive today are limited to doing the following: (1) ensure that

[44] For a similar point in the context of comparing opportunities and utilities, see Page (1983: 53).

present actions do not directly restrict the opportunities available to future generations (for example, by reducing GHG emissions to limit future climate change and its impacts); and (2) leave a reasonable range of opportunities for future generations to choose from, thereby leaving their members room to take responsibility for how their lives unfold.

This is a practical limitation: it is simply impossible for one generation to determine exactly what its successors will do with the opportunities they inherit. In addition to this point, however, there is a further, principled point to be made. In seeking to preserve a range of opportunities for its successors, a given generation aims to enable them to take responsibility for how their lives unfold. In concrete terms, if the present generation were to leave climate change unmitigated, there is an important sense in which future generations will not be responsible for how their lives unfold, since efforts to adapt to climate change, compensate its victims where possible, and potentially even mitigate it for the sake of still further generations will dominate. More generally, as the climate continues to change, fewer and fewer opportunities will be open for future generation. This undermines the room that will be available for them to make choices about how their lives unfold, as the adverse consequences of climate change begin to demand more and more resources and attention. In addition to the point made in the previous paragraph (that equality of opportunity is appropriate in the intergenerational context because of practical limitations to what one generation can do for the sake of another), equality of opportunity also appropriately captures the importance of intergenerational duties to the preservation of each generation's responsibility. In other words, intergenerational justice should be primarily concerned with opportunities not only because that is all that one generation can influence for another, but also because that it is what one generation *should* influence for its successors, with the aim of supporting their successors' effort to control how their lives unfold. Though equality of opportunity is at times criticised for being a "starting-gate theory" (Dworkin, 2000: 87–9), this turns into a virtue, when applied to the intergenerational context.

Climate change mitigation is a case in point. Take the argument that the present generation should mitigate climate change to produce a reasonable range of opportunities for future generations to secure their own interests. This means that the present generation should revise its own social and political arrangements to bring about changes to individual behaviour, consumption patterns and energy production (to name a few examples), thereby ensuring that it avoids inflicting dangerous climate change on future generations. In so doing, the present generation avoids restricting future generations'

opportunities through the process of climate change, avoiding reductions in the extent to which they can be responsible for their own lives.[45]

3.3.3. The non-diminishment view

Up to this point, my discussion in this section has been relatively abstract, considering some of the advantages of thinking about intergenerational justice in terms of equality of opportunity. I now turn to substantive conceptions of equality of opportunity. I begin by reconstructing Brian Barry's view – which I call *the non-diminishment view* – from remarks on this subject that have been scattered throughout his work.[46] I identify some weaknesses to this view of intergenerational justice and so I later introduce *the proportional view* as a development of Barry's view. I begin with the non-diminishment view because it approaches intergenerational justice, as well as intergenerational equality of opportunity, in precisely the way I have outlined above.

3.3.3.1. The non-diminishment view: the profile

As a starting point, let us take the following: "What justice requires, I suggest, is that the overall range of opportunities open to successor generations should not be narrowed" (Barry, 1978: 243). I propose the following as a principle, based on Barry's view of intergenerational justice:

> *Intergenerational justice as non-diminishment of opportunities:* each generation should ensure that it does not diminish the opportunities that are available to the generations that follow it.
>
> *Applied to mitigation:* the present generation should mitigate climate change to the point that it ensures that it will not diminish the range of opportunities that will be available to future generations.

I begin with the profile of justice which, as I explain in chapter 1, has to do with the distributive pattern that a given principle of justice aims to achieve (where what it aims to distribute is specified

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[45] Note also that climate change mitigation is only one part of a larger range of ways that the present generation's choice will affect the package of opportunities that future generations will inherit. The point here, which receives more attention below, is that the justice of revisions to social and political arrangements that have mitigation has their end cannot be assessed divorced from the justice of the entire range of opportunities left for future generations. Again, I address this further when discussing the notion of opportunities.

[46] It is worth mentioning that, as far as I know, Barry is one of the only authors to discuss something like an intergenerational principle of equality of opportunity. James Woodward (1986: 819 ff) is one exception, though he simply cites Barry's suggestion and only uses it as an illustrative example.

by the metric). Again, as I noted in that chapter, though it is somewhat artificial to explain profile and metric separately since some of the reasons for accepting a given profile depend on the metric in question (and vice versa), it remains a useful explanatory approach.

In the passage cited from Barry above, the key concept is that of narrowing. On the face of it, this concept is relatively straightforward. A given generation's duties of justice to its successors follow from the total package of opportunities that it inherits from its predecessors. The principal virtue of this concept, in the intergenerational context, is that each generation's intergenerational duties scale according to the specific circumstances of that generation. For the time being, let us say that the relevant circumstances include its level of wealth and technological achievement, as well as particular social and political institutional arrangements. (The aim here is to stipulate a broad placeholder; opportunities and their measurement receive further attention below, when I turn to the metric of non-diminishment.) From the perspective of someone concerned with intergenerational justice, using a scaling profile of justice solves the apparent problem that there is enormous variation in the circumstances (as just defined) of each generation as it is unclear how a single theory of intergenerational justice can apply in such incredibly dissimilar situations (Barry, 1991c: 261–2).

The problem just mentioned immediately rules out a time-independent profile of intergenerational justice, where each generation is entitled to an equal range of opportunities. The reason is that such a baseline will inevitably be too demanding (requiring a generation to sacrifice too much for the sake of its successors) or insufficiently demanding (requiring that a generation do far too little for the sake of its successors). In Barry's words: "Few would really want to say that we would be beyond criticism on the grounds of justice if we ran down capital and used up natural resources in whatever way best suited us, as long as we left our successors somewhat better equipped than people were in the Stone Age" (Barry, 1991c: 266). Likewise, it would be absurd for justice to require enormous sacrifices of one generation for the sake of later generations who turn out to be far wealthier.

The general point is that the requirements of intergenerational justice should change according to the circumstances of the generations to which it applies. At times, Barry makes this seem like a practical issue: since "nothing can be done to make people in the past better off than they actually were," they are simply irrelevant to the requirement of justice (Barry, 1999: 107; see also 1989: 189). More than a practical matter, however, it would be unjust for the present generation to claim to act justly by leaving future generations no better off than those alive in the distant past.

The benefit of adopting a scaling profile of intergenerational justice is that it is sensitive to the accumulation that occurs over the existence of many generations, both intentionally and as a by-product of self-interest (Barry, 1983: 22, 1991c: 265). It is similarly true that a generation made worse off by the dissipation of wealth by their immediate ancestors would owe comparatively less to its successors as a result. Some might object that this approach unjustifiably privileges the perspective of the present generation. Indeed, Barry himself recognises as much: "It must be conceded that the expression 'intergenerational justice' is potentially misleading […]. It is a sort of shorthand for 'justice between the present generation and future generations'" (Barry, 1999: 107). Given the emphasis on intertemporal impartiality throughout this chapter, this objection might seem to have some bite. After all, the point of intertemporal impartiality is that no generation's claims outweigh those of another. While this might be appealing as a general thought, it is not clear what the objection is exactly. After all, as I have already argued, the prospects for a time-independent conception of intergenerational justice are not good. For this reason, it seems to me to be perfectly reasonable for a given generation's duties of justice to be matched to its circumstances. Against this objection, then, I take non-diminishment, which scales according to the circumstances of each generation, to reflect the underlying moral equality of generations. It is furthermore consistent to say that each generation should show the same concern for its successors that it received from its own predecessors.

This leads to another question: why non-diminishment? To answer this question, I begin with the idea that no particular generation has a special claim to goods, such as the Earth's resources, or to the cumulative product of human labour and innovation over time (as well as the opportunities that these provide) (Barry, 1983: 21). Intergenerational justice, as a value that impartially adjudicates between different generations' claims, does not permit a particular generation to consume or in some way run down its opportunity-supporting inheritance, thereby diminishing what will be available for future generations. This raises the following question: why not equality? Why not endorse a substantively egalitarian profile of intergenerational justice, where each generation must show equal concern for its successors by leaving them a range of opportunities equal to that which they themselves inherited? After all, this seems to follow directly from the idea of impartiality.

Adopting non-diminishment, not equality, of opportunities leaves room for generations to consume some inherited goods where doing so does not set back the interests of future generations. This is most obviously just in cases of resource depletion (Barry, 1991c: 264–5). Future generations do not have an objection to their ancestors' exploitation of some non-renewable resources when it does not

diminish the range of opportunities available to them. Of course, the depletion of a non-renewable resource, in practice, does not occur in a vacuum. The exploitation of hydrocarbon reserves by the generations since the Industrial Revolution has expanded the opportunities available to the present generation, through the resulting technological innovations. At the same time, this resource depletion threatens to reduce the range of opportunities available to the present generation, as well as many future generations, most obviously through the process of climate change, but also by creating the burdens of climate change mitigation for those who take responsibility to shift away from the reliance on hydrocarbons. More generally, the point of selecting non-diminishment over equality is that it emphasises that justice requires each generation not reduce future generations' opportunities, while leaving open the possibility that a generation might in fact leave its successors better off. A profile of equality would hold a generation to nether diminish nor enhance; a profile of non-diminishment prohibits reduction and permits enhancement.[47] This also leaves room for a given generation to choose how it protects its successors' opportunities. This last point, however, begins to take us away from the profile of the non-diminishment view and towards the metric, to which I now turn.

3.3.3.2. The non-diminishment view: the metric

The metric of non-diminishment requires significant attention, not least because I effectively import it into the proportional view below. For Barry, the key concept here is that of productive potential, which refers to the combination of a given generation's inheritance and the effort that is required to take advantage of their inheritance, which together create the range of opportunities available to that generation. In other words, productive potential provides a way of measuring the total package of a given generation's inheritance, a metric which emphasises the primary importance of opportunities. At first glance, the notion of production potential seems too permissive, allowing for an implausibly wide range of substitutions, where each generation appears to be permitted to dissipate or consume any part of its inheritance and substitute some other means of securing an undiminished range of opportunities for its successors. To foreclose this possibility, I look to the literature on sustainability to provide some limits to substitution. Finally, I connect the metric of the non-diminishment with the Capability Approach to justice as a means of further specifying the range of opportunities that is relevant to intergenerational justice. Detached from the Capability Approach, the value of a given

[47] This raises interesting questions about the relationship between intra- and intergenerational justice, since presumably one generation could choose to make its successors far better off at the expense of discharging intragenerational duties of justice. These questions do not arise in the case of climate change mitigation, so I do not discuss them in detail. For a detailed discussion of this problem in the context of Rawls's just savings principle, see (Gosseries, 2001).

generation's inheritance *to that generation* is unclear and so what justice requires that generation to preserve undiminished for its successors is equally unclear. In other words, the Capability Approach further specifies the opportunities that a given set of productive potential secures for a given generation. In so doing, the capabilities listed below help each generation determine what opportunities is must secure for its successors. This is especially helpful in section 3.4, where I bring together the normative argument about intergenerational justice with details about climate change mitigation to further defend the claim that the present generation should engage in significant mitigation for the sake of future generations.

Measuring opportunities using productive potential

Intergenerational justice as non-diminishment is primarily concerned with opportunities. This raises obvious questions about how to measure opportunities. As a rough first cut, there are two ways to measure opportunities in the intergenerational context: (1) count their number or (2) measure what they enable their holders to do (Barry, 1999: 104–5). The first is not a particularly promising approach. For one, it is entirely insensitive to the similarity or dissimilarity of opportunities. For example, this approach would implausibly hold that a choice that increases the number of a certain type of opportunities is equally valuable to a choice that generates an entirely new type of opportunity, as long as their effect on the total number of opportunities is the same. In simple terms: "Three options that are very similar (three apples of the same variety) will have to be said to give more opportunity than two more dissimilar options (an apple and an orange)" (Barry, 1999: 104). In contrast, the second approach has the virtue of cohering with the reason for considering equality of opportunity in the first place (rather than straight equality). From the perspective of justice, the means and prospects available to individuals to create meaningful lives for themselves are what matters. Therefore, we need a measurement that allows for a comparison of what different ranges of opportunities allow individuals to do with their lives.

For this, Barry proposes the concept of "productive potential" (Barry, 1983, 1991c, 1999). It is the unit that ties together what a given generation leaves for its successors and what this inheritance allows the successor to do. The idea is that the natural resources, capital and innovations (both technological and non-material, such as institutional arrangements and social practices) each afford a given generation a certain amount of productive potential, thereby determining the range of opportunities that are available to it. Intergenerational justice as non-diminishment therefore requires that each

generation preserve for future generations the same level of productive potential as it inherited itself, thereby protecting the same range of opportunities for their successors

The normative value of productive potential rests in the opportunities that it secures. Practically speaking, effort is the key to determining the practical value of productive potential: "Productive potential is equal in two situations if the same effort would produce the same output" (Barry, 1991c: 263). Productive potential refers to the uses to which members of a given generation can put their inheritance. It measures what a given generation can do with its inheritance, adjusted for the effort required to turn productive potential into actual attainment. To ensure that it meets the demands of the non-diminishment view, a generation should ensure that the productive potential of the total package of goods that it leaves for its successors is no less than the total package of goods that it received from its predecessor.

This approach to measuring opportunities allows for significant substitutions in part because it is what we might call a *total package view* of intergenerational justice. To evaluate what justice requires of a given generation, this view considers the total package that this generation inherited and then holds that it must bequeath to its successors an undiminished total package of goods, where undiminished means of equal or greater productive potential. For example, the exhaustion of natural resources is permissible, on this view, as long as this does not reduce the productive potential available to future generations and therefore also reduce the total range of opportunities available to them (Barry, 1991c: 260). Similarly, climate change appears to be less of a problem, as long as the present generation can offset the influence that it will have on the productive potential of future generations. (A point to which I return below.) The general point is that the non-diminishment view is a total package view, in the sense that it regulates the total package of productive goods (again, material and non-material) that a generation leaves to its successors. This is not particularly surprising: since the view is primarily concerned with the range of opportunities available to a given generation, there is no principled reason why it should focus on specific aspects of this (e.g. natural capital, public debt, etc.).

In the discussion of the profile of the non-diminishment view, I stipulated a broad understanding of a given generation's circumstances to help explain what non-diminishment means. Armed with the idea of productive potential, however, I can further elucidate what it means for a principle of intergenerational justice to scale according to the circumstances of the generation to which it applies. Here, circumstances refer to the level of productive potential that a given generation inherits. As the

level of productive potential available to generations grows, so too do the demands of justice. These duties grow in proportion at the rate and to the extent that productive potential increases. In general terms, what a given generation can do for its successors and what justice requires that generation to do for its successors are intimately related. This thought is two-sided: what a generation can do constrains what justice requires of that generation; but the requirements of intergenerational justice also grow according to the influence that each generation has over its successors.

It is useful at this point to return to the case of climate change mitigation to illustrate the metric of the non-diminishment view more concretely. In this case, social-political arrangements that rely on GHG-intensive energy production are part of the present generation's inheritance. Given the long-term effects of these arrangements on future generations, there is a question about what justice requires the present generation do about them. The non-diminishment view tells us that if climate change stands to limit future generations' opportunities by reducing the productive potential that is available to them to less than what the present generation has received, then there is some potential for injustice to occur if the present generation does nothing to respond to climate change. This implies two possible sets of duties. One consists of duties to mitigate climate change, thereby shrinking the number and intensity of the threats to future productive potential. The other consists of duties to adapt to or compensate for the projected impacts of climate change on productive potential by, for example, generating other ways of securing an undiminished range of opportunities for future generations.

Measuring the total package of opportunities using productive potential might strike some as overly permissive in the substitutions that it allows. For some, this approach objectionably leaves everything up for grabs. As I pointed out above, this approach seems to diminish the problem of climate change, since it provides a means to offset the adverse effects that it will have on future generations' opportunities. Some might take this example as a reason to be skeptical of the metric under development here. As I see it, there are two objections worth considering.

First, one might object that this is simply the wrong way to think about certain parts of generations' inheritance, most notably natural capital. The problem is that treating everything as both fungible and important only for the opportunities that it affords humans ignores the other ways in which some parts of this inheritance might matter. I have two points in response to this objection. To diminish the force of the objection, I would emphasise that this approach is not as mercenary as it might initially

seem. Take, for example, cultural artefacts that have irreplaceable historical importance or ecosystems that once disrupted cannot be replaced or returned to a sustainable state. The view under consideration here clearly requires that such artefacts and systems be preserved for future generations, since no amount of effort can produce the same opportunities for future generations, should they be lost or destroyed. The general point is that the term 'productive potential' is not meant to imply an exclusively economic understanding of intergenerational justice. Instead, it is meant to reflect the way in which generations rely on their inheritance to define the opportunities that will be available to them and that justice therefore proscribes the extent to which one generation can influence the opportunities available to another generation.

Despite my attempt to diminish the force of the objection, I must concede that some critics pressing this objection will not be satisfied. For if the objection is that certain things (e.g. the natural environment, specific ecosystems, etc.) are simply valuable in themselves, irrespective of their productive potential and their value to human beings, then the idea of measuring the value of these entities *to humans* is itself the problem. Here, I can but acknowledge the possibility that there exists this sort of value of this nature. I would also say, however, that this is not necessarily a problem for the non-diminishment view. As I suggest later in the conclusion, there are a range of other sources of value that should be taken into consideration when formulating intergenerational duties of justice. The value of certain entities in themselves, for example, might be an important constraint on what intergenerational justice permits, as it is being defined here. I set these considerations aside, however, since they are not central to my task of developing an interest-based conception of intergenerational justice and outlining the duties of just mitigation that this conception produces.

On the second objection, the problem is that this approach objectionably uses the prospect of compensation to license wrongful action. For example, it seems to license harm, where the license flows from the assurance that the harming party adequately compensates those harmed. On the face of it, this sort of thing is clearly impermissible: justice does not allow for rights to be violated, even if they are violated with the expectation of compensation (Barry, 1991c: 264). That said, this objection rests on a mistaken understanding of the ways in which generations affect one another's opportunities. The relevant options are not (1) no harm, no compensation or (2) harm with compensation; rather the choice is between an option where generations preserve productive potential for future generations and an option where they do not (Barry, 1983: 20, 1991c: 264). Generations cannot help but make some choices that restrict the opportunities available to successor generations. Non-

diminishment of productive potential simply ensures that that inevitability does not produce intergenerational injustices by requiring that each generation offset such contraction and maintain an undiminished level of productive potential. On these grounds, the second objection simply misses its mark.

§

The limits to substitution (1): generational intentions

In the previous section, I defended the extent of substitution permitted by the non-diminishment view. There, the only limit to substitution is the central one, that no substitution can occur where it diminishes productive potential. That is, the present generation cannot substitute some new technology for an inherited resource, where such a substitution would diminish the productive potential available to future generations. Beyond this, however, I have yet to consider where there should be further limits.

Barry discusses precisely this. He first distinguishes between two perspectives, the perspective of the creators of a given set of capital and the perspective of the next generation, the recipients of that capital, suggesting that "the trick is to give weight to both perspectives" (Barry, 1991c: 266). With this balance in mind, we can distinguish between two sorts of resources, those that some set of humans creates (e.g. non-natural capital) and those that are created by no one (e.g. natural resources). From the perspective of the recipients, there is little difference, since both are parts of their inheritance for which they cannot claim "credit" (Barry, 1991c: 266). However, from the perspective of early generations who contribute to the accumulation of non-natural capital, there is a difference, since they create some non-natural capital. With this in mind, Barry makes the following claim: "As a reasonable reconciliation of the two perspectives, each generation's sacrifices (if any) to increase the capital stock it passes on give it a claim to some consideration by the following generation as its objectives in making these sacrifices" (Barry, 1991c: 266–7). This obviously generates a limit to what the present generation can do with its inheritance: where the creators of a particular good intend for it to be passed on to future generations, the present generation cannot substitute it for another good with equal productive potential, since this violates the duty that Barry suggests the creators' intentions produce for future generations.

Barry takes the creators' claims quite seriously: "If we suppose, for example, that the previous generation made sacrifices to permit the present generation a higher standard of living without any

expectation that this generation would pass it on, it would seem legitimate for the present generation to pass on slightly less" (Barry, 1991c: 267). This passage is a heavy revision to the non-diminishment view, since it permits diminishment where it is consonant with a given generation's intentions for its successors. However, this is the point at which the line of reasoning that begins with the distinction of the creators' and recipients' perspectives begins to unravel.

To see how, let us begin with the passage just cited, where a particular generation can deplete the part of their inheritance that its predecessor generation intended for it (and only it) to enjoy.[48] In schematic terms: if G_1 makes sacrifices to leave an increased inheritance (relative to G_1's inheritance) for G_2, then G_2 can permissibly leave a diminished inheritance for $G_{3\text{-}n}$ (relative to G_2's inheritance). For ease of explanation, let us refer to the excess left by G_1 for G_2 as the Gift. Can G_2 spend the Gift with no concern for $G_{3\text{-}n}$? More generally, do generational intentions matter to intergenerational justice? Barry's thought is that they matter to the profile: departures from non-diminishment are permissible where a given generation enjoys an excess deliberately left by their predecessor *for it*. If generational intentions matter in this way, it follows that they might matter to the metric of justice. For example, imagine that G_1 creates an invention and designs it to last in perpetuity (or at last for as long as can be reasonably foreseen). It seems that G_2 and (later generations) cannot permissibly destroy this invention and substitute it for another with equal productive potential, for doing so would violate the creators' claims.

Against this, I do not think that generational intentions should matter at all, either to the profile or metric of intergenerational justice. In other words, it does not seem unjust for a given generation to ignore the wishes of its predecessors, with respect to the permissibility both of depletion and of substitution/compensation. To use the terms outlined earlier in this chapter, it seems to me to violate the idea of justice as impartiality if G_2 takes advantage of its arbitrary position following G_1 to enjoy a wider range of opportunities than its successors will. If G_2 can preserve an undiminished range of opportunities for its successors, then I do not see why G_1's intentions should permit G_2 to do otherwise. If the Gift can be sustained, then the fact that its creators did not intend for it to be does

[48] I think that Barry must have in mind something like parent-child concern, where the parents make extra sacrifices for the explicit and intended benefit of their children. In addition to the fact that he does not say this explicitly, I do not consider this because it seems to me that it would constitute an especially uncharitable reading of the view. For example, there is the immediate problem that this dynamic will repeat generation by generation, insofar as special concern for one's children is an exceedingly common human motivation. With this motivation in mind, it seems that the non-diminishment view ceases to be about non-diminishment, since every generation will intend for their children to be especially well-off.

not suddenly release the recipients of the Gift to allow it to dissipate. Of course, if it cannot be sustained for whatever reason, then it seems more reasonable for G_2 to enjoy it without preserving it. But in this case, it is the practical impossibility that release G_2 from non-diminishment of the Gift, not the intentions of the Gift's creators.

More generally, it seems to me that generational intentions are a red herring in this debate. While the perspective of creators and recipients is quite important to questions of intragenerational justice (e.g. parents can direct a certain proportion of their goods to their children[49]), it is not similarly relevant when thinking about intergenerational justice as I conceive of it. Part of the distraction is the basic construction of the animating example. While conceivable, the idea of a generation intending to benefit its successor constitutes a significant departure from a more realistic picture of intergenerational interaction. Moreover, I would argue that this particular example constitutes a significant departure from the more realistic picture that appears throughout Barry's work on intergenerational justice. The following passage clearly articulates the latter:

> [H]uman generations do not succeed one another with one generation marching off the stage as another marches on, so self-interest on the part of the living will in any case ensure that far more than that [the maintenance of productive potential] is handed on. However, selfishly those alive at any given time behave, they can scarcely avoid passing on to their successors a pretty large capital stock that embodies thousands of years of technological development. (Barry, 1991c: 266)

For those concerned with intergenerational justice, the pressing concern is the extent to which justice requires that a given generation (who happens to control the collective product of human industry over many generations, as well as the Earth's natural resources, for a period of time) deplete, preserve or enhance its inheritance, thereby influencing the range of opportunities that its successors will enjoy. The fact that accumulation tends to occur has a complex explanation, only part of which refers to intention of intergenerational benefit. Each generation comes into existence controlling the sum total of its ancestors' efforts, as well as the resources that happen to be found on Earth. Intergenerational justice consists of constraints that limit what a generation can do with that inheritance, given that

[49] Though the extent of this control is not without limit. While it controversial, I take it to be at least plausible that parents should have some special say in this matter. See for example (Brighouse and Swift, 2014). In any case, the truth of the example does not matter, since it is merely illustrative of an intragenerational creator-recipient relationship.

justice aims to impartially adjudicate between the claims of that generation and the claims of its successor.

This points us in a more fruitful direction with respect to establishing the just limits of substitution, one that is intimately linked to the concept of sustainability. It is to this that I now turn.

§

The limits to substitution (2): sustainability

Barry's focus on intentions and the duties that the creators of some good can generate for the intended recipients of the good is unwarranted. However, there are other considerations that appear to constrain the degree of substitution. In fact, a large literature has grown up around the concept of sustainability and sustainable development, seeking to distinguish precisely what generation must sustain for the sake of future generations from the other areas where generations can allow some inherited goods to dissipate or degrade (with adequate compensation for future generations).

In general terms, theories of sustainability address the following questions: what should be sustained and how should it be sustained? For what reasons? And who is responsible for sustainability? (Dobson, 1998: 38 ff; Luke, 1995: 21–22). Often, theories of sustainability are classed as strong or weak depending on the answers that they give to such questions (Attfield, 2003: 132–3; Ekins et al., 2003: section 3; O'Neill, 2007: 100–5). Some draw the distinction as follows: weak sustainability takes natural and non-natural capital to be substitutes, while strong sustainability takes them to be complements (Daly, 1995: 50).[50] In other words, the weak sustainability view holds that the overall level of capital should be sustained, whereas the strong sustainability view holds that not all natural capital is substitutable (Chiesura and de Groot, 2003: 220).

Using productive potential to measure a given generation's opportunities (and thus also to measure what they owe their successors) is a variant of strong sustainability; the non-diminishment fits most comfortably within its confines.[51] I have already hinted at the reasons above. Not all opportunities rely on fungible goods. Quite the contrary: many of a given generation's opportunities rely on goods that

[50] This opposition is perhaps too simple. Some suggest a continuum of positions (e.g. Page, 2017) or at least that there are further distinctions to be made (e.g. very strong sustainability, absurdly strong, etc.) (Dobson, 1998: 43).

[51] Again, I recognise that some find the strong-weak binary to be unsatisfactory. Insofar as strong sustainability refers to a cluster of theories that take at least some natural capital to be unsubstitutable, then the non-diminishment view falls within that cluster. Other categorisations might prove useful elsewhere, but this distinction is sufficient for my purpose.

must be preserved, rather than replaced, by their forbearers. There are large parts of each generation's inheritance that are both crucial to its opportunities and that it receive because its immediate predecessor has passed on some piece of their own inheritance intact.

The sustainability literature has a term for precisely this: critical natural capital. Critical natural capital "is to be understood primarily in terms of 'critical to the production and reproduction of human life,' and this points us in the direction of natural capital whose presence and integrity is preconditional for survival" (Dobson, 1998: 43). While the term was originally used to represent the portion of natural capital that provides important and irreplaceable services for human societies, its meaning has been broadened by a series of recent contributions (Ekins et al., 2003).[52] For example, Brand identifies six "domains of criticality" that each refer to ways in which natural capital can be critically important: (1) socio-cultural; (2) ecological; (3) sustainability; (4) ethical; (5) economic (6) having to do with human survival (2009: 608). The aim is to distinguish natural capital that must be preserved without substitution from the natural capital that it is not essential to preserve in its existing form.

The concept of critical natural capital is a useful addition to the metric of the non-diminishment view, especially to the delineation of the limits to substitution that productive potential permits. In short, critical natural capital points to precisely such a limit. In terms of the non-diminishment view, the idea is that a range of the present generation's opportunities rely directly on the existence of natural capital. These include religious, aesthetic, cultural, historical, scientific, educational and even recreational opportunities (Chiesura and de Groot, 2003: 225). The destruction or dissipation of such natural capital over one generation would constitute a significant contraction of the opportunities available to its successors. The non-diminishment view therefore requires that a range of critical natural capital be sustained by each generation to ensure that it does not reduce the range of opportunities available to its successors.

While the notion of sustaining critical natural capital helps fill out the metric of the non-diminishment view and the limits to substitutability that it permits, bringing the two together has added benefits that run in the other direction. The non-diminishment view helps explain why critical natural capital should be preserved intergenerationally. The importance of some natural capital to presently existing individuals is, of course, relevant to intragenerational principles of justice. However, despite often

[52] For the original usage see (Turner, 1993: 11); for a catalogue of the broadening efforts, see (Brand, 2009: 608ff).

repeating the idea that critical natural capital should be preserved for the sake of future generations, this idea does not have an explicit foundation in the literature. This is precisely what the non-diminishment view provides, supplying a normative foundation for the intergenerational duties to sustain critical natural capital.

The sustainability literature and the concept of critical natural capital help delineate the limits to substitution that productive potential permits. These limits are especially helpful when thinking about what justice requires with respect to climate change and its mitigation. Because critical natural capital must be preserved in itself, not substituted for some other opportunity-sustaining capital, no generation can justly run down its inherited critical natural capital, since there is no way to do so without diminishing its successors' range of opportunities.

One final point is in order. In what follows, I refer both to critical natural *and non-natural* capital. While the sustainability literature focuses on critical natural capital, the thought here is that there is some proportion of non-natural capital that is as critical to a given generation's opportunities as some natural capital is. Critical non-natural capital, then, refers to the proportion of non-natural capital that a generation must sustain in its original form to preserve an undiminished range of opportunities for future generations. Examples of this might include historical artefacts or cultural practices that are both generative with respect to each generation's opportunities and irreplaceable. In sum, critical natural and non-natural capital represent an important limit on the substitutions that any given generation can make to its inheritance, on the view of intergenerational justice as non-diminishment.

§

Alternative metrics

In a discussion of the metric of intergenerational justice, it would be remiss of me to omit a discussion of some other existing metrics of justice. In this section, I compare resourcism and the Capabilities Approach with the idea of opportunities measured using productive potential, which is at the core of the metric of non-diminishment. Before that, I first address and set aside welfarism.

I address welfarism first because it is a significant, but ultimately flawed metric of intergenerational justice. Welfarism measures opportunities according to the welfare that they stand to secure for individuals. On this view, requirements of justice should be put in terms of human welfare, understood as the quality of human lives (Dworkin, 2000: 12). There are two oft-discussed problems with welfarist

principles. The first is the problem of expensive tastes, which follows from the fact that, due to their preferences, some people require more costly goods than others do to achieve the same level of welfare (Cohen, 1989; Dworkin, 2000: 48–58). The second is the problem of adaptive preferences, which is that welfarist principles are implausibly insensitive to important features of human welfare, particularly its resilience. To use Dworkin's example, Tiny Tim should receive no advantages to compensate for his frailty because he is satisfied with the course of his life (2000: 60).[53] The latter is especially troubling in the intergenerational context. In short, it looks like welfare-based principles leave far too much room for a given generation to act in ways that disadvantage its successors, on the expectation that those mistreated will come to accept their disadvantage (Page, 2006: 58–9). Furthermore, insofar as welfare is, in part, a function of preferences, it seems that discharging intergenerational welfare-based principles will require an inaccessible knowledge of future individuals' preferences (Page, 2006: 56).[54]

Deficiencies with welfare-based principles lead some to adopt a resourcist metric of justice (Dworkin, 2000: chap. 2; Rawls, 1999: section 15). Within this family of views, resources are "all-purpose means" that enable citizens to pursue their interests (Rawls, 2001: 57–8).[55] Resourcists reject the welfarist notion that justice should be directly concerned with individuals' welfare and that it should be used to express the distribution of advantage and disadvantage by a given set of social arrangements. Instead, they argue that resources – the means with which individuals find themselves equipped under a given set of social arrangements – should be the focus of justice.

Some take resourcism not to be a comprehensive metric of justice. The problem is that in some cases, resources are not of fundamental concern (Cohen, 1989: 918 ff). Consider cases where people can move their limbs perfectly well, but not without pain due to arthritis (Cohen, 1989: 919). The

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[53] One way of finessing these problem so that welfare-based principles survive is to refer to opportunities for welfare (Arneson, 1989: 85). I cannot address this line of reasoning here, except to say that thinking in terms of effective options reproduces the counterintuitive problems of expensive tastes and adaptive preferences.

[54] This is a formally similar argument to one of Rawls's *intra*generational anti-welfarist argument, which is that welfare is inappropriate as a metric of justice because it relies on knowledge that is not publicly verifiable (Rawls, 1993: 181 see also Clayton and Williams, 1999: 451). In the intergenerational case, however, the inaccessibility is stronger, in the sense that the relevant information about future generations is simply non-existent.

[55] While the Dworkinian conception of resources is a close cousin to this, he emphasizes the hypothetical procedures through which the value of a given set of resources is established, which will depend on the preferences of the participants in the hypothetical procedure (Dworkin, 2000: 65 ff). In other words, roughly speaking, Dworkin's view of resources is even more general, encompassing everything for which individuals will pay (in restricted circumstances of equal purchasing power).

resourcist diagnoses the claim as one where the afflicted have claim to extra resources to compensate for their unusual difficulty in moving. Cohen suggests that this is insufficient: "it seems not coherently egalitarian to cater only to the difficulty of moving and not independently to the pain which moving occasions" (Cohen, 1989: 919). The general point, based on Cohen's example, is that resourcism has limits with respect to diagnosing disadvantage.

Rather than rehash the debate about the limits of resourcism here,[56] I focus instead on the question of whether productive potential is a resourcist metric.[57] Resources, understood narrowly as material goods and wealth, certainly are an important part of productive potential. For example, a generation influences its successors' productive potential when it depletes non-renewable resources or consumes renewable ones at a level or in a way that diminishes the capacity for these resources to renew. However, as should be clear from the discussion above, a wider range of entities influence productive potential. Social and political arrangements, for example, are an important part of a given generation's opportunity-enhancing inheritances and therefore it is an important part of what that generation should in turn preserve for the sake of future generations. At least at first glance, impersonal resources, as defined by Dworkin, capture the latter: "Impersonal resources are parts of the environment that can be owned and transferred: land, raw materials, houses, television sets and computers and various legal rights and interests in these" (Dworkin, 1990: 37).[58] The social and political arrangements are not themselves resources, but they do determine the distribution of impersonal resources that will obtain amongst their members. With that in mind, a convinced resourcist might wish to interpret Barry's view (and the concept of productive potential) as a variant of resourcism. On this interpretation, productive potential refers to the resources, broadly conceived, that members of a given generation have. We might then update a passage cited from Barry above along resourcist lines: productive potential is equal if two generations possess the resources required to pursue the same opportunities with the same effort.

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[56] For example, Dworkin responds to Cohen's critique with the distinction of personal from impersonal resources (Dworkin, 2000: 297, see also 2004), which Cohen in turn argues is insufficient (Cohen, 2004). I simply include these here to note how the debate unfolds; I do not discuss it in detail because it does not help my discussion of the metric of the non-diminishment view.

[57] Page interprets Barry's view as resourcist (2006: 60 ff).

[58] In contrast, "Personal resources are qualities of mind and body that affect people's success in achieving their plans and projects; physical and mental health, strength, and talent" (Dworkin, 1990: Section IV, 37).

Matching productive potential with resourcism is not a perfect union. For one, it seems to me to be heavily revisionist to take the non-diminishment view, which is primarily concerned with the comparison of opportunities available to different generations, and interpret it as concerned with individuals' resources, howsoever conceived. This point comes into sharper relief with the introduction of capabilities as a further metric of justice.

The Capabilities Approach outlines the key capabilities that individuals should have as a matter of justice. Capabilities are things that people can choose to do or be (Nussbaum, 2011: 20). An individual has a capability X if that individual is free to achieve a particular set of interrelated functionings, where functionings are "the various things a person may value doing or being" (Sen, 1999: 75). Capabilities reflect a "person's freedom to lead one type of life or another" (Sen, 1992: 40). The concept of human dignity is important to this metric: "the basic idea is that some living conditions deliver to people a life that is worthy of the human dignity that they possess, and others do not" (Nussbaum, 2011: 30). Capabilities protect "areas of freedom so central that their removal makes a life not worthy of human dignity" (Nussbaum, 2011: 31). In other words, insofar as justice requires respect for individuals' human dignity, justice requires that each and every person meet a threshold of the ten capabilities (which I discuss in more detail in the next section) (Nussbaum, 2011: 6).

These remarks resemble Barry's reasoning for introducing productive potential: "The important thing is that we should compensate [future generations] for the reduction in opportunities to produce that are brought about by our depleting the supply of natural resources, and that compensation should be defined in terms of productive potential" (Barry, 1991c: 263). As already discussed, productive potential refers to what a given generation can do with its inheritance, adjusted for the relative ease or difficulty (i.e. effort) of a given option. Thus, we might say that non-diminishment requires each generation to preserve an undiminished range of opportunities for its successors, where an opportunity is a capability as just defined. To again update a passage of Barry's cited above: productive potential is equal where two generations possess the capabilities required to pursue the same opportunities with the same effort.

I cannot here trace the distinctions between resources and capabilities, as this would take me too far from the overall aim of reconstructing and developing the non-diminishment view.[59] It should be

[59] For other who do so, see (Anderson, 2010: 88; see also Williams, 2002).

clear, however, that the metric of non-diminishment, based on Barry's remarks on intergenerational justice, has features that link it to both the metric of resources and of capabilities. That said, there is one reason why we might consider the metric of the non-diminishment view to be more closely related to the Capabilities Approach. The reason is that both place the primary importance on what individuals can do with their just entitlements. Both emphasise that justice should be concerned with what individuals can themselves choose to do, as articulated by the notion of opportunities and capabilities. Moreover, we might also think that the similarity between the metric of non-diminishment and resourcism rests on the fact that any plausible metric of justice must be concerned in some way with resources. The difference between a resourcist theory of justice and intergenerational justice as non-diminishment is that the latter neither takes the distribution of resources to be of primary importance nor does it take resources to be of sole importance. Because of the similarity between the Capabilities Approach and non-diminishment, I develop the relationship further in the next section, using a list of capabilities to flesh out the metric of non-diminishment.

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Which opportunities matter? Integrating the Capability Approach

The final question that I address in this section on the metric of non-diminishment asks: which opportunities matter? The Capabilities Approach, as it has been developed by Nussbaum (e.g. Nussbaum, 1997, 2003, 2011), enumerates a list of functionings that can easily be coupled with the non-diminishment view to help specify which opportunities matter.

The question of which opportunities matter might strike some as an unnecessary question or even one that is entirely out of keeping with the view as I have been discussing it. After all, what matters from the perspective of intergenerational justice is the range of opportunities that each generation inherits, as this determines their duties to future generations. In this context, there is no need for a theory that outlines the sorts of opportunities that are valuable to individuals.

Against this line of reasoning, I take answering this question to be quite important to specifying substantive intergenerational duties, including those of just mitigation, for four reasons. First, the list of capabilities (figure 3.1) helps determine what opportunities actually matter to individuals. Without this, the notion of an 'inherited range of opportunities' remains underspecified. To describe the full range of opportunities that some inheritance affords a given generation, we need to know the ends to which individuals might put this inheritance, if they so choose. In other words, each capability protects a particular functioning in which individuals have an interest.[60] Knowing the ends in which individuals have an interest helps determine the range of opportunities that a given generation's inheritance has enjoyed and therefore also what that generation owes its successors.

1. *Live a life of normal length, without premature end*
2. *Live with bodily health, with good health, nourishment and shelter*
3. *Live with bodily integrity, with free movement, free reproductive choice, and freedom from violent and sexual assault*
4. *Exercise one's senses, imagination and thought, informed by education and freely undertaken*
5. *Experience emotions freely*
6. *Exercise one's practical reason in controlling one's life*
7. *Affiliate oneself freely with others and be treated with equal concern and respect in those affiliations*
8. *Show concern for other species*
9. *Play*
10. *Control one's political and material environment*

Figure 3.1. Nussbaum's Capabilities (Nussbaum, 2011: 33–4).

Second, the list of capabilities helps sustain the productive potential of a total package of goods. Put negatively, the thought is that productive potential becomes unhelpfully unmoored if no guidance is available about the opportunities that future generations might value. When substituting some non-natural capital for some natural capital, for example, it is important to know the various interests that the natural capital helped the depleting generation secure, for this will determine both whether the substitution is just and the different opportunities that the substitute non-natural capital should secure.

Third, the list of capabilities reinforces the basic justification for intergenerational justice as non-diminishment. The line of reasoning behind non-diminishment emphasises intertemporal impartiality, where no single generation has special claim to enjoy the sum total of its predecessors' efforts, where that enjoyment will deprive its successors of the same opportunities. Using the Capabilities Approach to help specify a given generation's range of opportunities provides an

[60] On the connection of capabilities and interests, see Williams (1987: 96).

independent reason for non-diminishment, for it shows why opportunities matter to individuals. With this in mind, non-diminishment unified with the Capability Approach reflect intertemporal impartiality in a second way, where opportunities matter equally across generation because of the capabilities (i.e. the functionings in which individuals have an interest) that they protect.

The question of which opportunities matter, then, requires an answer beyond simply, 'the range of opportunities that each generation inherits.' In sum, this list of ten capabilities enumerates a series of ends in which individuals have an interest or, more specifically, ends that individuals have an interest in having the opportunity to pursue. Considering it here helps fill out the metric of the non-diminishment.

Two final points are in order. First, I want to note at this stage that I will return to this list towards the end of this chapter, when I outline some of the ways in which climate change stands to contract the range of opportunities available to future generations (and therefore why justice requires the present to undertake significant mitigation for the sake of future generations).

Second, there is another reason for considering the question of which opportunities matters, one which takes us beyond the non-diminishment view and into the proportional view. One of the key differences between Barry's reconstructed non-diminishment view and the close cousin that I defend below (the proportional view) is that the latter requires some improvements, in certain cases, where a generation must not only sustain a range of opportunities, but also improve the range for future generations. This last requires an independently defined list of opportunities that matter to individuals (instead of one simply defined by inheritance) to help determine what exactly constitutes a just improvement.

3.3.4. The proportional view

The non-diminishment view has much to recommend it: it provides a plausible, intergenerational development of equality of opportunity that coheres with the just requirement of intertemporal impartiality. That said, there are several problems to which it has no answers. In this section, I present a series of examples to press on what I take to be weaknesses of the non-diminishment view. I then use this discussion to articulate the proportional view as a view of intergenerational justice that retains the insights of the non-diminishment view without reproducing its flaws.

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> *Costless benefits*. Generation G_1's inheritance affords it productive potential that supports a given range of opportunities. The principle of non-diminishment holds that G_1 should do what it can to ensure that generations $G_{2\text{-}n}$ have at least the same productive potential supporting an undiminished range of opportunities. Suppose that, due to some fortunate discovery that comes at no cost to anyone, G_1 can increase the productive potential it leaves for its successors, thereby increasing the range of opportunities that they will enjoy.

The principle of non-diminishment permits, but does not require, G_1 to make the choice that increases the opportunities available to its successors. Barry takes this to be a virtue of the principle: it "underwrites the asymmetry that many people (including myself) feel between making successors better off, which is a nice thing to do but not required by justice, and not making them worse off, which *is* required by justice" (Barry, 1978: 244). While I do not question the asymmetry between making others better and worse off in every context, it is a problem in the intergenerational circumstances with which I am concerned. There is simply no reason why justice should be limited to restraining generations in cases where they might make one another worse off. Instead, as a value that impartially adjudicates between individuals' claims, justice should require that the present generation produce costless improvement for future generations' opportunities. The reason for this follows from the basic equality between individuals, across generation, and the equal importance of their interests to themselves. No one would object to a given set of people improving their own opportunities, where doing so imposed no costs on others; we recognise what it means to others to fulfil their own interests because we also have interests that can be similarly fulfilled. This shared recognition is important in this case. Justice applies to the example, as outlined above, because it involves one set of people choosing for others with profound implications for their interests. Here, the just choice is to improve the opportunities available to future generations ($G_{2\text{-}n}$) out of respect for the importance of their interests to them, a type of importance that is familiar to G_1. The fact that I am considering *opportunities* to secure interests reinforces this claim, since it is up to future generations to avail themselves of the improved opportunities or act as if the improvements have never occurred.

This problem shows that the non-diminishment view is insufficiently demanding. The prospect of costless gains shows that justice requires more than non-diminishment alone. If one takes future generations to value their interests to the same degree as those alive today value theirs, then there is

reason to consider that justice requires the present generation to improve the opportunities available to future generations when doing so comes at no cost to anyone.

Are there limits to the requirement that a generation secure costless benefits for its successors? The most obvious example of a limitation arises in cases where some or all of the relevant generations are extraordinarily well off. Consider again the *Costless Benefits* example articulated above, but this time with the added stipulation that every generation involved (G_1-G_n) is very well off. If G_1 leads fantastic lives and will secure the same productive potential and range of opportunities for its successors to choose equally fantastic lives for themselves, why should justice still require that G_1 secure the costless benefit as well? I must admit that I do not have a clear sense of how to draw the limit in this case, perhaps because it lacks the urgency that requirements of justice usually have, since the parties involved are all so well-off. That said, the idea that there should be a limit to just intergenerational improvements is itself plausible and has been argued for by other authors (e.g. Gosseries, 2001: 324–6).

To clarify this issue, consider the following example.

> *Amended Costless Benefits*. G_1 has the same option to costlessly improve the range of opportunities available to its successors. However, in this case, these improvements are not generic benefits, but instead will support generation $G_{2\text{-}n}$'s pursuit of justice and help it establish just institutions.

Here again non-diminishment permits, but does not require, G_1 to make the choice that increases the range of opportunities available to its successors and that decreases the effort that its successors will need to establish just institutions. The addition of the last half of the sentence is clarifying. Before, when simply considering generic benefits, it seems that justice might not always require that a generation produce costless benefits, at least when the generations involved are tremendously well off (though I think that this is an easy bullet to bite). In this case, what justice requires is clearer because the costless benefits are not generic improvements. Rather, the choice for G_1 is between improving the opportunities for its successors to live under just institutions and not bequeathing these improvements. In this case, justice clearly requires G_1 to choose the costless benefit, even if that generation and all its successors are well-off.

This example might strike some as proving a trivial point: of course justice requires that agents act to establish justice, especially when this is possible at no cost to anyone. Trivial, perhaps, but the non-diminishment view does not lead to this conclusion. The non-diminishment view of justice requires each generation to sustain productive potential that secures an undiminished range of opportunities for future generations. It is possible that a given generation will help its successors move closer to just institutions, but this will be as a by-product of that generation's efforts to secure just institutions for itself (for example), not directly for the sake of future generations. The point is that the non-diminishment view does not lead to the conclusion that generations might have intergenerational duties of justice to contribute to their successors' opportunities to pursue justice. While *Costless Benefits* suggests that intergenerational justice should extend beyond non-diminishment, the idea that justice requires producing generic improvements might be too general and is therefore unclear. *Amended Costless Benefits* shows that when we consider instead improvements that directly support future generations' efforts to establish just institutions, then it seems that their predecessors do in fact have duties of justice to produce such improvements.

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Consider next the following example.

> *Inexpensive Benefits*. Generation G_1's inheritance affords it productive potential that supports a given range of opportunities. The principle of non-diminishment holds that G_1 should do what it can to ensure that generations $G_{2\text{-}n}$ have at least the same productive potential supporting an undiminished range of opportunities. Suppose that, due to some fortunate discovery, G_1 can increase the productive potential it leaves for its successors, thereby increasing the range of opportunities that they will enjoy. However, doing so will impose some minimal costs on G_1.[61]

Again, the non-diminishment view holds that it is permissible, but not required, for G_1 to generate these improvements. In this case, however, the fact that this view does not produce a requirement is less troubling. The key shift between this example and the previous two is that the improvement to future generations' opportunities comes at a cost to G_1. This creates a presumption against the thought that G_1 should produce the improvement for the sake of its successors, unlike in the *Costless Benefits*

[61] I leave 'minimal costs' deliberately vague and address this below.

example above. This presumption is particularly strong if, as I considered above, the relevant generations are all very well off.

At first glance, the analysis of this case turns on how minimal the costs to G_1 are. Once this is established, it might seems that what justice requires will depend on the extent of the costs as compared to the extent of the improvements. I want to resist this line of reasoning, where the simple weighing of costs and benefits determines what justice requires. Notice first that the nature of the benefits matters too. This is what the above comparison of the amended and unamended *Costless Benefits* examples shows: if the benefits in question directly affect generations' capacity to realise justice, then it seems clear that justice requires that G_1 generate the improvements. Second, it seems to me that the degree of costs it is reasonable to expect G_1 to incur will be defined by justice, not only in comparison with expected benefits. The following example clarifies these two points.

> *Amended Inexpensive Benefits*. G_1 has the same option to improve, at minimal costs to itself, the range of opportunities available to its successors. However, in this case, these improvements are not generic benefits, but instead will support generations $G_{2\text{-}n}$'s pursuit of justice and help them establish just institutions.

Here, the fact that the non-diminishment view does not generate a requirement is more troubling. The thought is that the prospect of contributing towards the realisation of justice generates greater reason for G_1 to produce the improvements in question, even at some cost to itself. But what cost is it reasonable for justice to require? One option is to weigh the costs against the value of the expected improvements to future generations' pursuit of justice. This raises a thorny issue: how can one assign a value to a given improvement to a generation's capacity to realise justice? It might be tempting to reinsert the concept of productive potential here, but it is in fact of no help. Productive potential is a way of measuring opportunities, expressing the range of opportunities that a given combination of goods and effort generates. Some increases to productive potential will contribute to the pursuit of justice; others will not. It simply depends on the nature of the improvement. In other words, justice does not always require a greater range of opportunities; therefore, productive potential, as a metric for measuring and comparing changes to opportunities, does not help evaluate the justice of a range of opportunities (except where justice requires non-diminishment of opportunities, which requires precisely the sort of metric that productive potential provides).

Notice that the present argument is quite similar to Rawls's just savings principle (Rawls, 1999: §44). This principle of justice holds that each generation should save according to a hypothetically justified schedule, where "all previous generations have followed the same schedule" (Rawls, 2001: 160, see 1993: 274 for a similar statement). The justification of this claim draws on a range of features from the Rawlsian theoretical apparatus. In-depth engagement with this particular view of intergenerational justice would take me too far afield from my present project of developing the proportional view of intergenerational justice. Instead, I raise the just savings principle as an example of a conception of justice that requires that a given generation avoid making its successors worse off *and* contribute some benefits as well, even at some cost to that particular generation. More generally, this supports my contention that justice as non-diminishment is insufficiently demanding. As explained above, I take the interest that individuals have in living within a just society to lead quite directly to the idea that intergenerational equality of opportunity, properly understood, requires that the present generation undertake the costs and improve future generations' opportunities in the example outline above.

The argument of this section can be summarised as follows. In addition to non-diminishment, justice requires that the present generation improve the opportunities available to future generations, as long as the costs to itself are reasonable *and where the improvements support future generations' pursuit of justice itself*. Furthermore, justice also requires that the present generation improve the opportunities available to future generations when doing so is costless. The general point is that the demands of justice are not purely negative, restraining individuals from making each other worse off. Instead, justice demands that each generation stand in the right relationship with its successors, which requires that the present generation sustain and improve the range of opportunities for future generations, especially where those improvements aid in their pursuit of justice.

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> *Unexpected Devastation.* Generation G_1 inherits a given range of opportunities. Through no fault of its own, an unexpected, exogenous event makes it unable to leave even an undiminished range of opportunities for its successors. For example, an asteroid impact destroys significant non-natural capital accumulated over the long term and reduces the natural capital available by rendering it practically inaccessible.

This case draws out another limitation of the non-diminishment view. Here the problem is that non-diminishment is too demanding, being insensitive to events within a generation that might affect its

intergenerational duties. In the discussion of the metric of the non-diminishment view, I argued that one of its most significant virtues is the way that it scales according to the circumstances of each generation. That is, its demands increase as human innovations lead over time to the accumulation that consequently increases the range of available opportunities. In general, the thought is that intergenerational justice should be sensitive to what each generation can do for its successors. This thought, applied to the case at hand, shows that diminishment is permissible in certain circumstances.

The idea here is not necessarily one of an emergency scenario of complete devastation. Rather, it is conceivable that some event, entirely unforeseen and outside of human control, should prove burdensome to one generation to the point that sustaining its inheritance for the sake of its successors requires that intragenerational injustices go unresolved. The proportional view of intergenerational is sensitive to this possibility.

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Consider next:

> *Imposing costs.* Generation G_1's inheritance affords it productive potential that supports a given range of opportunities. The principle of non-diminishment holds that G_1 should do what it can to ensure that generations $G_{2\text{-}n}$ have at least the same productive potential supporting an undiminished range of opportunities. Suppose that G_1 can increase the productive potential it leaves for its successors, thereby increasing the range of opportunities that they will enjoy, supporting their pursuit of justice and contributing to the future establishment of just institutions. However, doing so will impose some minimal costs on G_3.

This example differs in important ways from the others in that we are now considering whether the present generation can impose costs on another generation for the sake of other future generations. On these grounds, unlike in the other case, non-diminishment prohibits the present generation from acting, since it will impose costs on a future generation and thereby likely diminish the opportunities available to that generation. If I answered the second example with reference to a cost-benefit analysis that weighed potential improvements against the costs required to generate those improvements, then I would be bound to do the same in this case. Instead, in the response that I offer above, I argue that when a given generation tries to work out what it owes other generations, proper consideration of the

latter's interests means that it should both leave an undiminished set of opportunities for future generations *and* improve the set of opportunities when it is either costless or contributes to future generations' pursuit of justice (or, conceivably, both).

This third example strains this requirement because the choosing generation is not the same as the generation that will have to bear the costs of the choice. The concern is that, at first glance, it is unjust for one set of people (G_1) to sacrifice the set of opportunities available to another set of people (G_3) for the sake of the opportunities available to a third group ($G_{4\text{-}n}$). Those born in the disadvantaged generation may claim that intertemporal impartiality has been violated, since they happen to have been born in a generation with reduced opportunities.

One response is to frame this as a case of triage (for a discussion of distributive justice in case of emergency triage, see Page, 2007b). The thought is that if G_1 lacks the means to improve the opportunities available to all its successors, but can improve those available to *many* of its successors, then G_1 should do so, on the condition that the unfortunate generation (G_3) enjoys a sufficient range of opportunities. Some take this to be a virtue of intergenerational sufficiency (e.g. Page, 2007b: 12–3). However, I am unconvinced because this line of reasoning appears to justify the denial of justice to some for the sake of others' pursuits. While it is in one way better that G_3 should have sufficient opportunities, compared against costs that mean G_3 will have its opportunities constrained below the range that supports a sufficient level of well-being, this does not license G_1 to impede G_3's pursuit of justice, even if doing so improves their successors' pursuit of the same.

A second framing of this example draws the problem out more sharply. Let us say that the costs that G_3 will have to bear are transitional costs: G_1 initiates a series of reforms that will eventually make the world more just for $G_{4\text{-}n}$. The various costs of this reform, however, such as social upheaval, reduce the range of opportunities available to G_3 to less than those of G_1 and G_2, but not below a level that threatens to reduce the well-being of G_3 below some level of sufficiency. Here the costs seem more clearly problematic, since they are directly linked to the improvement of others' opportunities. It seems that the opportunities of some will depend on the arbitrary fact of the timing of their birth: the members of G_3 are simply unlucky to have been born into this unfortunate generation. Moreover, their interests are effectively being set back for the sake of their successors' interests, which violates intertemporal impartiality. That is, G_1's choice is one of temporal *partiality*, preferring those born after G_3.

To some, this might seem to be a bitter pill: the cost of intergenerational justice based on intertemporal impartiality might turn out to be significant improvements to some later generations' pursuit of justice itself. However, I am not sure that it is in fact so difficult. Instead, it seems to me to be an acceptable extension of the ideas that have appeared throughout both the reconstruction of non-diminishment and the present discussion of its limitations. To stand in the right relationship with future generations, each generation should not diminish the inheritance that it in turn passes on, while also showing due consideration to future generations' interests by doing what it can to contribute to their pursuit of justice. The prospect of significant gains at the cost to some should not license deviation from these requirements. Indeed, this is an extension of a powerful intragenerational idea, that "[each] person possesses an inviolability founded on justice that even the welfare of society as a whole cannot override" (Rawls, 1999: 4). We might think that each generation possesses a similar inviolability that cannot be justly sacrificed for the sake of its successors.

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I offer the following as a summary of this discussion:

> *Intergenerational justice as proportionality of opportunities:* each generation should ensure that it leaves for its successors a range of opportunities that is in proportion with the range of opportunities that it inherited, where proportionality is defined by non-diminishment plus costless improvements and improvements that contribute to future generations' pursuit of justice (at a reasonable cost to the contributing generation).
>
> *The proportional view applied to mitigation:* the present generation should mitigate climate change to the point that it leaves a proportional range of opportunities for future generations, where the proportional range: (1) is undiminished from the range of opportunities inherited by the present generation; (2) includes costless benefits for future generations; and (3) includes reasonable contributions to future generations' pursuit of justice.

3.3.4.1. The proportional view and population size

In this section, I consider the relevance of population size to the proportional view of intergenerational justice. My aim is to articulate some of the key challenges that arise when thinking about the effects

of population size on a theory of intergenerational justice of the sort that I defend. I should also add that the arguments contained in this section apply to any principle of intergenerational justice belonging to the same family as the proportional view or the non-diminishment view (i.e., principles of just savings).

Barry treats population in a distinctive fashion:

> Sustainability requires at any point in time that the value of some X per head of population should be capable of being maintained into the indefinite future, on the assumption that the size of the future population is no greater than the size of the present population. (Barry, 1999: 109)

One way to read this passage is as arguing that to work out what intergenerational justice requires – that is, to work out what the non-diminishment view requires of a given generation – one must assume either a constant or diminishing population. One might take the thought to be that population size is a parameter of justice that must be held constant for two reasons. First, doing so helps with the theoretical exercise of determining what justice requires. Second, population size (on this view) is not something that justice influences, but rather is something that influences justice itself (others take this view, e.g. (Wolf, 2003: 288)). Against this view, I take the idea that population size is an external constraint on justice to be incorrect. The population of any given generation is the product of its predecessors' choices, so it is reasonable to ask whether those choices diminish, maintain or enhance the range of opportunities available to future generations. It therefore appropriate to judge those choices more or less just.

In any case, Barry does not make this mistake, as he writes: "Treating future population as parametric is in effect assuming it to be beyond human control. But any such assumption is obviously false" (Barry, 1999: 109). With that in mind, I take Barry's point to be as follows: to understand what intergenerational justice requires of a given generation, one must determine some quantity that constitutes its opportunity-generating holdings and aim to sustain that for future generations. Population size is an important variable here, since it determines in part how far these holdings will go. (Roughly: a set quantity of holdings secures a greater range of opportunities as population size decreases.) The assumption of a constant (or diminishing) population ensures that intergenerational justice does not become unduly burdensome, where an ever-increasing population imposes increasingly onerous duties on each generation to preserve the range of opportunities that they inherited for their successors.

Note that this produces a sliding scale, where the relevant population size is that of the generation that is trying to determine its duties of intergenerational justice. In a sense, then, the view is familiar: the maintenance of productive potential to protect an undiminished range of opportunities for future generations is still crucially important and Barry takes population size to be a key variable in making that determination. To round out the argument, Barry draws on some (pessimistic) empirical claims about both the role of increasing population size in contemporary injustice and the detrimental effects that future increases will have on future human life (and on non-human life (Barry, 1999: 111)). Indeed, it seems that Barry takes these to be good reason to limit procreative freedom and thereby limit population growth or even shrink the population (Barry, 1999: 110).

I take Barry's view to sit partway between the simple (and mistaken) view that population size is a parameter of justice and population size falls entirely within the jurisdiction of justice. On his view, justice only enters the picture when thinking about population size to avoid creating an implausibly burdensome theory of intergenerational justice. There is an interesting exegetical point: in the paper where Barry discusses population size most directly, he cites J.S. Mill's *Principles of Political Economy* on the perils of an overcrowded world, which Mill himself integrates with the discussion of population size in the chapter "Of the Stationary State" (Mill, 2008[1848]: book IV, chap. VI) This is a useful clue to explaining Barry's view. It seems likely to me that Barry thinks that describing some steady state of justice will include setting an optimal population size where intergenerational duties amount to minimal adjustments to productive potential that flow from the principle of non-diminishment. Two points are in order here. First, justice in a steady state is a different question from the one with which I am concerned. Second, while a just steady state does not require a stable population, it certainly helps. But it is of course conceivable that a generation could make other adjustments to ensure that it complies with the demands of intergenerational justice, adjustments that permit significant population growth.

That last point directs us to the basic problem with Barry's approach, which is that the relationship between intergenerational justice and population size is far deeper than he assumes. That is, population size should be conceived of as an important output of any conception of intergenerational justice. Take first the plausible thought that the opportunities available to a given generation are a function of three variables: its population, the average level of individuals' consumption and the technologies

available (Caney, 2018: 6ff).[62] In other words, the extent to which a given set of holdings generates opportunities for a given generation depends on the number of people alive, the level at which they consume and the technologies through which the level of consumption is met. On this view, population size is only one variable that a given generation can manipulate to ensure that it leaves a range of opportunities for its successors that meets the demands of the proportional view. Crucially, procreative choices (and the policies that influence them), rather than taken as given, become an important component of intergenerational justice. Should members of a given generation G_1 avail themselves of an opportunity for unlimited procreation, then they will have to be sure that the resources and technologies bequeathed to G_2 secure for them the right range of opportunities.

This raises difficult questions about procreative restrictions (for recent work on the subject, see Caney, 2018; Conly, 2016; Reider, 2016). However, we need not direct our attention solely at these questions, for there are many other policy tools that can influence population size and that are relevant to intergenerational justice because of that fact. I take it that there are a range of social, political and institutional choices that inevitably, but indirectly, influence individuals' procreative choices. Family planning is obviously influential; evidence shows that educational policies and policies influencing factors of the labour force such as gender composition are also important. Baudin and Gobbi separate these into two categories, with the former constituting "proximate determinants" of population size and the latter constituting "deep determinants" of the same (Baudin and Gobbi, 2016: 400–1). They argue that without denying the importance (practical and moral) of proximate determinants, deep determinants are far more influential because they determine how many children an individual plans to have, rather than when to have children (Baudin and Gobbi, 2016: 407–9). Thinking about the relationship between justice and population size need not force one to consider only blunt tools that directly restrict procreative freedom by, say, limiting individuals to one child each. Indeed, on the view that deep determinants of population size lie in areas of policy not traditionally associated with reproduction and population growth, there appears to be and enormously wide range of social and institutional choices where considerations of population size might be relevant.

With all this in mind, population size complicates any effort to discharge duties of intergenerational justice like those required by the proportional view. On the face of it, this might turn out to be a boon:

[62] It is perhaps surprising that Barry misses this point when thinking about population size, given his treatment of productive potential, where he notices that what a generation can do with a set of resources depends on the effort required to use them to secure a particular opportunity, which itself depends on that technological arrangements that are available.

rather than having to deal with demographic changes, whatever they turn out to be, generations should in fact make choices about population (de-)growth that can help them meet the demands of intergenerational justice. In short, this looks like another lever available to be pulled as needed in the pursuit of justice. That said, there are two difficulties that arise. First, many policies that aim to adjust population size are intensely controversial, not least because of their history (for illustrative examples, see Bashford and Levine, 2010; Gordon: 2002). While controversial, we might think that they are not intractable philosophically, not least because the questions are relatively well-defined. Second, there is an immensely broad range of policies that influence deep determinants of population size, so considerations of intergenerational justice become bound up with a host of other justice-related questions.

An example will help illustrate that last point. Imagine that a generation decides to institute policies to help slow population growth as a means of ensuring that it passes on a range of opportunities that is in proportion to the range it inherited. What policies should it target? Some members, aware of the importance of deep determinants, might suggest the abolition state-funded public education, for it incentivises procreation by lowering the cost of having children. Two responses are in order: first, there are good justice-based reasons not to abolish state schools that have nothing to do with intergenerational justice.[63] Second, following Baudin and Gobbi, insofar as a well-designed state school system can help with the gender composition of the labour force, it may turn out to be an important mechanism that helps slow population growth. Therefore, in the end, it may turn out that abolishing education is unjust. However, though the result in this case seems to be the right one, we should not take the argument to be as simple in every case. In other words, it may turn out that in other cases what seems just from an intragenerational perspective may turn out to be unjust once we consider the demands of intergenerational justice.

I can now articulate the problem that population size poses for the proportional view.[64] Population growth has the potential to produce intergenerational injustice where one generation leaves a diminished range of opportunities for its successors by growing the population and thereby reducing the productive potential available to them. Indeed, population *reduction* might prove to be an effective means of discharging principles of intergenerational justice. More generally, answering questions about

[63] At least as it is defined here. Justice between age groups, another form of intergenerational justice, is of course relevant here too.
[64] And, as stated above, savings principles more generally.

population size is an important part of further efforts to determine what intergenerational justice requires. Crucially, those questions are not unidirectional, asking how population size constrains intergenerational justice. Instead, we might think of them as multidirectional: to what extent does controlling population size help a given generation discharge its duties of intergenerational justice? What means of exerting this control are permissible? What is the relative weight of population-related intergenerational duties, compared to other reasons of justice (such as those raised in the education policy example above)? I have suggested in this section that population size is an important constituent of the list of variables that we should consider when thinking about intergenerational justice. I have also suggested that it is particularly far-reaching in the issues that it implicates. Because the deep determinants of population size are so wide-ranging, intergenerational justice becomes bound up in any effort to determine what justice requires with respect to many social and political institutions (in addition to better-defined issues of procreative justice). The following offers a compelling summary of the challenge of population size for theory of intergenerational justice:

> The real crux of the population question is the quality of people's lives: the ability of people to participate in what it means to be really human; to work, play, and die with dignity; to have some sense that one's own life has meaning and is connected with other people's lives. That, to me, is the essence of the population problem. (Cohen, 1998: 39)

3.4. Mitigation and the principle of proportional opportunity

I set out at the start of this chapter to outline the basis for intergenerational duties of just mitigation. There is one final piece of the puzzle that remains, namely, an outline of some of the ways in which climate change will (unjustly) foreclose opportunities for future generations to pursue their interests. Building on my discussion of the human impacts of climate change in chapter 2, I outline a representative sample of some combined climate hazards and human vulnerabilities that threaten to damage future generations' interests.

In each of the cases outlined in figure 3.2 below, climate change will diminish the range of opportunities available to future generations, relative to the opportunities that the present generation

enjoys. Because of this, the view of intergenerational justice as proportionality requires the present generation to mitigate climate change.

Climate hazard	Human vulnerability	Capabilities threatened
Sea level rise	Populations in low-lying, exposed areas (e.g. coastal zones, small islands)	Opportunity to live a healthy life of normal length due to disrupted livelihoods; opportunity to control one's environment and live according to one's life plan by occupying land of political, historical or cultural significance
Rising ocean temperature; loss of Artic sea ice	Susceptibility of coastal communities reliant on coastal ecosystem services	Opportunity to live a healthy life of normal length due to loss of ecosystem provisioning; opportunity to live with concern for other species
Rising land temperatures	Susceptibility to food insecurity, particularly amongst subsistence farmers; limited ability to cope, especially amongst the elderly and female-headed households	Opportunity to live a healthy life of normal length due to loss of livelihoods and inability to cope due to exhaustion of social networks; opportunity to use sense, imagination and thought as educational systems become inaccessible
Changes to precipitation patterns	Susceptibility to loss of or damage to ecosystems and their provisioning, regulation, and cultural services	Opportunity to live a healthy life of normal length due to loss of ecosystem provisioning; opportunity for emotional attachment as cultural and historical association lose the ecosystem services upon which they rely

Figure 3.2. Climate change and setbacks to future generations' interests (Nussbaum, 2011: 30ff; Oppenheimer et al., 2014 section 19.6.2).

Four final points are in order. Do the non-diminishment view and the proportional view differ in what they require of the present generation with respect to mitigation? Admittedly, the difference in this case is fine, for non-diminishment will require moderate-to-high mitigation just as surely as proportionality does. That said, since proportionality requires improvements, it will change the nature of intergenerational duties of just mitigation in two ways. Where the present generation has a choice between a policy designed to mitigate climate change and a policy designed to mitigate climate change *in a way that contributes to the pursuit of justice and the establishment of just institutions*, the proportional view will require the latter. While this difference appears quite straightforward, it has significant practical

consequences. The proportional view requires that the present generation incorporate policies designed to mitigate climate change into a larger effort to redress injustice. In contrast, non-diminishment has no similar implication. In some cases, the proportional view will sometimes result in more stringent mitigation targets. In other case, it will simply require different sorts of policies than non-diminishment, requiring those that synergise with efforts to combat other injustices. That said, I readily accept that non-diminishment and the proportional view converge on a similar result in the case of climate change mitigation. For one, this does not reveal a weakness in the proportional view, but rather reflects the fact that the one is a development of the other. The proportional view remains the superior view of intergenerational justice, one that should guide decision-making with respect to a much larger range of issues than climate change alone.

Second, the present argument allows for further analysis of the mitigation pathways outlined in chapter 2. Most obviously, it highlights the injustice of pursing the low mitigation pathway. First and foremost, this pathway stands to produce the greatest changes to the climate. It involves by far the latest date for peak emissions (after 2100) and therefore also the greatest quantity of anthropogenic emissions, with their very long-term climatic effects. Moreover, the temperature increase at 2100 stands to be 4.55ºC above the average global temperatures in 1980-2000 and, since radiative forcing will still be increasing, significantly more warming will occur. This pathway therefore generates every single one of the climate hazards listed above.

Third, the moderate-to-high mitigation pathway much better protects future generations' opportunities. Since this pathway involves quickly reaching peak emissions, as well as a rate of reduction that means that radiative forcing is falling at 2100, it represents the level of mitigation that the present generation has to undertake to ensure that it does not diminish the range of opportunities available to future generations, especially for generations in the further future (i.e. those born after 2300). Choosing to pursue this pathway is the only way in which the present generation can show adequate respect for the equal claim that every generation has to securing its interests.

Fourth, this chapter's discussion helps further explain my choice of moderate-to-high rather than simply high mitigation. I first touched on this point when explaining my choice of the term, but I want to be clear that I am not arguing for mitigation at all costs position or that mitigation (or climate change) is the only injustice that should concern those alive in the present. The reason for this approach should now be clearer. The justification for intergenerational duties of just mitigation rests

on a principle of proportional opportunities, where each generation should ensure that its successors inherit an undiminished range of opportunities and that it contributes, at a reasonable cost to itself, to future generations' pursuit of justice. The significance of mitigation is therefore an important determinant of the present generation's bequest to its successors. As such, it is part of a range of issues that are similarly significant, issues that are equally pressing from the perspective of intergenerational justice. Arguing for moderate-to-high mitigation reflects the fact that there are limits to the present generation's intergenerational duties of just mitigation, limits which are in part a function of other concerns of intergenerational justice, both those that have to do with climate change (such as investing in future generations' capacity to adapt to climate change) and those that do not (such as reforming the global institutions that cause global poverty).

3.5. Conclusion

In this chapter, I set out to defend the claim that the present generation has a duty to mitigate climate change for the sake of future generations. I claim that it is unjust for any given generation to take advantage of its temporal location. I argue that this leads to a principle of intergenerational equality of opportunity and that justice imposes intergenerational duties on each generation that are in proportion with its inheritance and what it can do for its successors. I take this view to best capture the correct understanding of generational responsibility, which holds that each generation should be responsible for how its members' lives unfold, no more and no less.

In the next three chapters, I consider a range of objections to my argument, clustered around three central issues, namely, (1) that relationships of reciprocity do not hold between present and future people (the problem of non-reciprocity), (2) that future people do not yet exist, and when they do come into existence, their particular identities are the result of present choices (the problems of non-existence and non-identity), and (3) that present knowledge of future states of affairs, including the effect of present actions on future people, is indeterminate (the problem of indeterminacy). To anticipate the end product, none of these problems proves decisive. That said, they provide important opportunities to develop my view of intergenerational justice as proportionality of opportunities. With that in mind, let us turn to the problem of non-reciprocity.

4. The problem of non-reciprocity

4.1. Introduction

This chapter discusses the relationship between the concept of reciprocity and intergenerational duties of just mitigation. This is the first of three problem chapters that each seek to answer problems that arise when considering the normative implications of a specific feature of intergenerational duties. These each amount to different ways of limiting the scope of justice to restrict the inclusion, or in some cases exclude, future generations from present just concern.

In this chapter, I consider the problem of non-reciprocity (Page, 2006: 99–131). This problem arises from the apparent lack of reciprocal relationships between distinct generations. I seek to answer the follow question: can a reciprocity-based approach to duties of justice grounds intergenerational duties of just mitigation? In response, I offer a qualified defence of the claim that reciprocity can indeed support intergenerational duties of just mitigation.

Two preliminary points are in order. First, reciprocity is not the only possible basis of justice. For this reason, this chapter contains two perspectives on reciprocity, one internal and one external. The majority of the chapter focuses on the internal perspective, where I define the concept of reciprocity, explain the problem that arises when linking it to the proportional view of intergenerational justice, and then lay out ways of answering the problem. The key feature of this internal perspective is that it operates on the assumption that reciprocity is in fact a suitable basis on which to try to defend intergenerational duties of justice. In contrast, I also consider reciprocity from an external perspective, where I recognise some of the limitations of reciprocity-based justice and so do not grant the assumption that reciprocity is a suitable basis for justice. My defence of the claim that reciprocity can indeed support intergenerational duties of just mitigation is qualified because I adopt both these perspectives. In addition to developing this argument from the *internal* perspective, I also argue that, from the *external* perspective, the intergenerational extension of reciprocity appears to rely heavily on the idea of mutual respect, diminishing the significance of reciprocity itself.

Second, reciprocity has a long history in political theory, appearing even in Plato's *Republic* (Weale, 2013: xii; see also Plato, 1941). This chapter does not contain a comprehensive discussion of the many

conceptions of reciprocity (and the prospect of the intergenerational extension of each). Rather, I focus primarily on providing a plausible outline of the concept and developing the 'fair reciprocity' interpretation. While I spend a few short pages outlining and setting aside the prominent alternative (reciprocity as mutual advantage), I focus on fair reciprocity both because it fits best with the proportional view and because it is more plausibly extended intergenerationally than its alternative.

The chapter proceeds as follows. In section 4.2, I outline the concept of reciprocity, focusing on the 'fair reciprocity' interpretation. In section 4.3, I explain how fair reciprocity appears to lead to something similar to the proportional view of intergenerational justice, yet runs into the problem of non-reciprocity. In section 4.4, I then show how fair reciprocity can be extended intergenerationally, using the notion of indirect reciprocity and the stewardship model of intergenerational justice. I also argue, from the external perspectives, that that means of intergenerational extension diminishes the importance of reciprocity.

4.2. Reciprocity

In this section, I lay the groundwork for the subsequent discussion of how the non-reciprocity problem appears to undermine intergenerational duties of just mitigation based on the proportional view that I outlined in the previous chapter. I define reciprocity, introduce some different conceptions and defend its importance to justice, particularly just mitigation. I also explain the distinction between what I have called the internal and external perspectives,

At its most general, reciprocity is a "principle of equivalent return" (Barry, 1991b: 212 citing a seminar with A.R. Radcliffe-Brown). Put otherwise, reciprocity refers to the norm that "[r]eturns are expected: good for good received, hostility for hostility" (Becker, 1986: 73). The many examples of reciprocal relationships are united in their embodiment of the idea of *quid pro quo* (Barry, 1989a: 465). Of course, such a norm can, and indeed does, apply to as wide a range of circumstances as there are human experiences. Moreover, depending on the meaning of the circumstances in which it operates, the concept of reciprocity takes a different sense: "conceptions of reciprocity vary by the kinds of social relationship they are intended to regulate" (Sangiovanni, 2007: 27).

4.2.1. Two perspectives on reciprocity

For those concerned with intergenerational justice, as I am, there are two perspectives that one can take with respect for reciprocity. First, there is the internal perspective. As already mentioned, most

of this chapter approaches the problem of non-reciprocity from this perspective. It rests on the assumption that reciprocity is an appropriate foundation for duties of justice (including duties of justice). Second, there is the external perspective. It does not similarly grant the importance reciprocity to duties of justice. The reason that I introduce these two perspectives at this point is that they provide important context to the problem of non-reciprocity. To give the problem its due, the bulk of the chapter proceeds on the internal perspective; that said, the external perspective is no less important for my conclusion.

There is an important alternative to reciprocity-based justice, which we might call "subject-centered conceptions of justice" (Buchanan, 1990: 231). To outline this alternative, I first need to explain the concept of strategic capacities. These consist in individuals' capacity to harm or benefit another, providing the means through which any given individual can influence other individuals' behaviour (Buchanan, 1990: 228). Strategic capacities are key to understanding reciprocity-based justice. Even on the general definition of reciprocity given above, this point is clear enough: if reciprocity involves returning like for like (i.e. a benefit for a benefits and a harm for a harm), and if duties of justice are grounded in relationships of reciprocity (i.e. relationships of mutual benefit or harm), then justice is a matter of individuals' strategic capacities. Thinking according to the internal perspective accepts this. In contrast, thinking from the external perspective does not, since it rejects the central role that reciprocity has with respect to duties of justice. Instead, one might argue that duties of justice flow from the notion of fairness, "according to which treating persons as such fairly requires redressing, within limits, those morally arbitrary disadvantages that significantly impede their flourishing" (Buchanan, 1990: 234). Alternatively, one might maintain that duties of justice flow from the idea that individuals owe each other equal concern and respect (Buchanan, 1990: 234-5). I stress that these are not strategic capacities, that is, they have nothing to do with what individuals can do in exchange for one another; rather these two proposals take certain features of individuals as intrinsically important. On this view, justice entails treating individual in the right ways for the right reasons, not about complying with an agreement between the relevant parties.

The proportional view of intergenerational justice, as I explained it in chapter 3, rests on the subject-centred foundation of intergenerational impartiality. It does not follow, however, that I can simply ignore the problem of non-reciprocity. For one, providing an argument that extends reciprocity intergenerationally helps broaden the appeal of my argument to those who take reciprocal relations to be an important part of justice. This justification for examining non-reciprocity is especially important

because, as I shall explain, reciprocity can be extended intergenerationally and that one plausible model of intergenerational reciprocity (the stewardship model) leads to conclusions that are quite similar to the proportional view. The key reason for this near-convergence is that both the proportional view, as explained in the previous chapter, and intergenerational reciprocity as stewardship, as explained in this chapter, rest on the idea of proportionality between a given generation's inheritance and its duties of justice to future generations. I call this a *near* convergence because there are key differences between the proportional view and the stewardship model, especially with respect to their fundamental justification.

In sum, I investigate the problem of non-reciprocity from the internal perspective both because it broadens the appeal of my argument and, more importantly, because it leads to conclusions similar to the proportional view, though with a different theoretical foundation. That difference is the reason why my defence of the claim that reciprocity can ground intergenerational duties is qualified. For those who look to reciprocal relationships to help identify duties of justice, there is an answer to the problem of non-reciprocity. To those who prefer the subject-centred approach, akin to the line of reasoning developed in chapter 3, thinking from the external perspective allows us to see that reciprocity, and the stewardship model, might in the end turn out not to be crucial to the proportional view of justice.

4.2.2. The concept of reciprocity

Any conception of reciprocity must specify three properties of the reciprocal exchange that underpins any given reciprocal relationship: (1) the fittingness of a between an initial benefit (or burden) and the return benefit (or burden); (2) the proportionality between initial and returned benefits or burdens; (3) the substitutability of different possible returns.

Fittingness refers to the suitability, relative to one another, of the goods exchange within a reciprocal relationship. It is not, however, always clear what exactly constitutes a good; what is good to one person may not in fact be good for another. One response is to stipulate that reciprocal exchanges of goods must in fact be good for all parties to the exchange (and similarly for bads) (Becker, 1986: 107). However, this approach appears problematic. Consider a case where the present generation invests in what it thinks are effective mitigation strategies, but, due to unforeseeable circumstances, these strategies end up exacerbating climate change (constituting what we might call mal-mitigation (Sidi, 2012; Warren, 2011)). Furthermore, let us say that this generation makes that choice out of respect for the demands of intergenerational reciprocity. On the view of fittingness that goods must *in fact* be

good for all parties, it appears that this generation has not fulfilled its part of the bargain. It thus appears that this standard of fittingness implies that the rightness or wrongness of an action depends partly on factors outside of the relevant agent's control. With that in mind, we might prefer a standard of fittingness that holds generations to perform the action for which there is the best evidence that it will do for future generations what reciprocity requires.

There is a further complication. Consider the following example (based on Becker, 1986: 111ff). I have £100, £10 of which I invest in planting a tree that will generate benefits for both me and my neighbour. Intending to act reciprocally, my neighbour, who has £1000, spends £10 on planting a second tree of the same species. There are several different perspectives from which to evaluate this exchange. First, we both invested the same amount of money. This might mean that the exchange is fitting. However, I invested 10% of my total wealth, whereas my neighbour invested 1%. It might seem like the relationship is not (or perhaps less) fittingly reciprocal. Though it does not solve this issue, it is useful here to introduce the concept of *proportionality* in reciprocal relationships. In the context, proportionality refers to the idea that the goods (or burdens) exchanged within a reciprocal relationship should be of roughly equal (i.e. proportional) value (Becker, 1986: 82). With this in mind, fitting reciprocal exchange means, in part, proportional exchange. But as the example just outlined shows, the value of a given exchange can take a number of different meanings. I already discussed one relevant distinction: should the value of an exchange be considered in absolute terms (represented above by the figure in £) or should the value of an exchange be considered relative to each party's resources? There is a further question as well: should the parties' relevant preferences count? For I might value this particular species of tree quite highly, enjoying its aesthetic value as well as the shade it provides, whereas my neighbour, who rarely ventures outdoors, only enjoys its beauty. Or even more simply, I might just like the tree more than my neighbour. Due to our particular preferences, it seems that I simply get more out of the tree than my neighbour. Even though the absolute value of the exchange is exactly proportional – we each spent £10 – there are a number of ways in which this exchange might in fact appear to be disproportionate: an apparently objective, proportionate exchange can be disproportionate (1) relative to our individual resources and (2) relative to our individual preferences.

Consider an amendment to the scenario. Let us say that my neighbour, not being the outdoorsy type, does not care for trees. However, recognizing that my effort requires reciprocal effort, my neighbour erects a £10 statue. This raises a question: is such substitution permissible within a reciprocal

relationship? Let us stipulate, for the moment, that the exchange is fitting and proportional in each of the ways just discussed. Does the substitution of one good for another matter in itself? This further complicates the notion of a fitting reciprocal exchange. On the one hand, one might be tempted to say that substitution does not matter *in itself*. After all, if it is all the same to me that my neighbour has contributed a statue, rather than a tree, then where is the problem? On the other hand, other scenarios do make it seem that the type of contribution matters. For example, if I volunteer at the school where both my neighbour and I send our children, and the neighbour aims to act reciprocally by making a donation to hire someone to do equivalent work at the school, I might object that this substitution invalidates the reciprocal exchange because of the nature of the burdens undertaken. Here, as above, I do not aim to settle the problem, but rather simply to point out that establishing a fitting and proportional reciprocal exchange raises the problem of substitution.

4.2.3. Does reciprocity really matter: presumptive goods

Some doubt that reciprocity works in the way that I have been describing. Does the conferral of a benefit by one agent upon another really generate a duty for the latter to benefit the former? That question targets the assumption that the acceptance of benefits can, at least in some circumstances, generate duties for the person accepting the benefits.[65] As I understand it, the objection contains three separate problems: (1) where a benefit generates a duty depends on the reason for conferring it in the first place; (2) the cost of providing the fitting return will rule out some duties; and (3) the preferences of the recipient of the initial benefit should not be ignored (Nozick, 1974: 94-5; see also Arneson, 1982). Consider the following example:

> Suppose some of the people in your neighborhood (there are 364 other adults) have found a public address system and decide to institute a system of public entertainment. They post a list of names, one for each day, yours among them. On his assigned day (one can easily switch days) a person is to run the public address system, play records over it, give news bulletins, tell amusing stories he has heard, and so on. After 138 days

[65] Most notably, it figures in Rawls's "principle of fairness", which itself draws on H.L.A. Hart (Rawls, 1999 96-8; 301-8). The objection that I explain follows from Nozick's objection to the principle of fairness. His purpose is to consider the problem of free-riders within the context of a social arrangement governed by the principle of fairness (Nozick, 1974: 92ff). In contrast, my purpose is to scrutinize the idea that the acceptance of benefits can generate duties. While the latter relates to the former in some ways, I aim to avoid importing the details of this particular Rawls-Nozick debate that are not directly relevant to my purpose.

> on which each person has done his part, your day arrives. Are you obligated to take your turn? (Nozick, 1974: 93).

Insofar as the concept of reciprocity holds that individuals owe fitting and proportional return for that which they receive from others, the concept would indeed hold that the person scheduled for the 139th day should in fact take part. Here, the three aforementioned problems arise. First, it appears to be possible for any given individual to generate duties for another for any reason, including those to which one has not consented. In Nozick's words: "Must you mow your front lawn as often as your neighbors mow theirs?" (Nozick, 1974: 94). Second, surely the cost to me of participating in the entertainment system is relevant to whether I am duty-bound to take part. At the very least, if there is another activity that I could undertake on the 139th day that exceeds the benefit of the year-long entertainment, it seems, on this view, I am permitted to do that instead (Nozick, 1974: 94). Third, even if there is in fact no such activity, it may be that there is some other activity that I would *prefer* to do. Indeed, there may be some other cooperative venture that I would prefer to the public address system (Nozick, 1974: 94-5). On this objection, there appears to be no reason why my preferences should be overruled by the fact that some group of people happen to have benefitted me in some way.

To respond to this objection, consider the following scenario, one that reflects some of the key dynamics of climate change. A group of three hundred and sixty-five people (including me) rely on a shared, unpolluted atmosphere. Limiting atmospheric pollution requires daily maintenance of possible sources of pollutants. Some of the group decide to form a maintenance committee, which assigns to every individual a day upon which they should contribute to the atmosphere-preserving maintenance. It is easy to swap the date of one's duty with another's. When my day comes, should I participate?

There are some key differences between this and the public address example. Most importantly, an unpolluted atmosphere is a far more important good than listening to Nozick's public address system. In fact, this good is what some refer to as "presumptively beneficial" in that it is a good "that all members of [a] community want, whatever else they want, regardless of what their rational life plans are in detail" (Klosko, 2004: 39; see also Klosko, 1987). Presumptive goods are indispensable to individuals' welfare and it is the conferral of these goods that triggers considerations of reciprocity. On these grounds, I should participate in the atmosphere preservation scheme just described. The reason for this difference from Nozick's case lies in the type of good in question. In the former, the good (which is sometimes referred to as a "discretionary good" (Klosko, 2004: 44)) is insignificant to

the point that it is quite apparent that reciprocal duties do not follow. In the latter, however, the same is not true, because the atmosphere clearly qualifies as a presumptive good, as it is indispensable (Page, 2007a: 237). Another important feature of an unpolluted atmosphere is that it is a public good in that it is non-excludable; that is, this good cannot be enjoyed by some without being enjoyed by all (Page, 2007a: 236). Presumptive public goods are a core example of goods whose conferral triggers duties of reciprocity, since these are goods from which everyone *will* benefit and from which everyone is assumed to *want to* benefit.

It is most clear that reciprocity matters in cases where a group of people together secure presumptive public goods. There are further questions about reciprocity in other circumstances, such as with respect to excludable or discretionary goods. However, I set those aside, for the importance of reciprocity in such case is less clear. Additionally, and more importantly, climate change mitigation and the good it secures (a stable, or less unstable, climate) is a presumptive public good, and this particular case is my primary concern. Given the projections discussed in chapter 2, it is reasonable to assume that a stable climate is desirable to individuals, no matter their particular life plans. Mitigation therefore secures a presumptive good. Moreover, it secures a presumptive *public* good because its benefits are non-excludable: individuals will benefit equally from any effort to secure a stable climate.

4.2.4. Conceptions of reciprocity

With the concept of presumptive public goods in hand, the relevance of reciprocity becomes even more clear, since climate change mitigation appears to secure presumptive public goods associated with a stable climate. In this section, I engage with two conceptions of reciprocity, namely, reciprocity as mutual advantage and reciprocity as fairness. After introducing the former, I quickly set it aside, for two reasons. First, it diverges quite significantly from the proportional view of intergenerational justice. Second, the prospects for its intergenerational extension are not good.

4.2.4.1. Reciprocity as mutual advantage

On the view of reciprocity as mutual advantage, reciprocal relationships arise when individuals engage in fitting and proportional exchanges *that advance the self-interest of each*. While this conception of reciprocity is well-established and has a long history (e.g. Hume, 1975[1751]), it is not especially relevant to the proportional view of intergenerational justice. Moreover, as has been argued elsewhere (Barry, 1991a: 244–7; Page, 2006: 105 ff), efforts to extend reciprocity as mutual advantage intergenerationally have not proven especially successful. I offer a brief discussion of this conception

here for the sake of providing a comprehensive outline of reciprocity and to justify my choice to set this one aside.

The idea behind reciprocity as mutual advantage is that rational individuals will only agree to a given moral system if it affords each individual the maximum utility that is compatible with the utility afforded all other parties to the agreement (Gauthier, 1986: 167). Why should a given individual care about the utility afforded other individuals? Or, more basically, why should a given individual agree to enter into a moral system that limits the utility available to that individual according to the utility available to others? The reason is that social cooperation increases the pool of resources available to any given member, compared to what would be available to each, were they to live apart from other people. While it is not necessarily true that all societies are cooperative ventures whose material product exceeds the (counterfactual) total material product of the same individuals living in a non-social arrangement, societies that are arranged according to a moral system to which each member has rationally agreed will be more productive than the counterfactual non-social state of affairs (Gauthier, 1986: 11). In short, "the rational person […] seeks the greatest satisfaction of her own interest" (Gauthier, 1986: 7); rational persons will recognize that living in a society governed by a moral system affords any given individual the greatest satisfaction of their interest (Gauthier, 1991). In sum, on this view, reciprocity defines moral relationship as mutually advancing individuals' self-interest. What matters to this view of reciprocity are individuals' strategic capacities, or (as noted above) the extent to which individuals can harm or benefit one another.

As already noted, the prospects for extending this view intergenerationally is not good. For one, why should a generation of self-interested utility maximisers care to benefit future generations by, for example, sustaining a bequest that is undiminished in its productive potential, compared to their own inheritance? Some appeal to the idea of overlapping generations (e.g. McCormick, 2009), arguing that the interaction of different generations *as age groups* (e.g. the young and the old) means that the bargain supported by reciprocity as mutual advantage will extend through time. While I recognise the conceptual possibility of extending reciprocity as mutual advantage intergenerationally, it does not possess the resources needed to ground intergenerational duties of just mitigation (let alone intergenerational duties more generally). The reason is that the duties that it generates will always be weak. For example, with mitigation in mind, even if an iterated social compact would project concerns of reciprocity over time, the benefit to the present generations of continuing to emit GHGs is simply

too great, especially since "the sanctions that proximate future generations can bring to bear seem no match for the gains made by ignoring them" (Page, 2006: 106).

Another way of extending reciprocity as mutual advantage is to appeal to duties owed to contemporaries, but 'with respect to' future generations. (Page, 2006: 115). The idea is that the duty holds between members of the present generation, but discharging the duty entails acting in a certain way with respect to future generations. As time passes and each generation contains a system of cooperation that, in part, benefits future generations out of concern for them and their interests, this idea will generate a *chain of intergenerational concern*, where the concern that the members of a given generation have for their successors translate into actions that protect their successors interests.

One immediate weakness is that not all members of ever generation will in fact have such a concern. For them, how are duties owed to contemporaries and 'with respect to' future generations in their self-interest? Furthermore, some people will care only for their own children (and perhaps grandchildren and great-grandchildren). While they wish that there be sufficient investment in climate change mitigation for the sake of their children, they would also prefer to avoid personal expenditure (Sen, 1967: 113), which leads to the prospect of free-riding.

Even if we set those two problems aside, there is a further, more decisive objection, which is simply that the extension of reciprocity as mutual advantage is quite thin. In the constant negotiation between self-interested parties, the only way to generate a chain of concern that secures duties in the present to mitigate climate change is to appeal to the following chain: "We should cease this emission, as it is in our interest to put the next generation in the position to negotiate with the following generation, to negotiate with the following generation…" iterated n-number of times until the predecessors of the generation to suffer the (as of now) far off impacts of climate change can tell the future (potential) sufferers that they are part of a cooperative scheme that mitigate climate change. The same idea can be put conversely: any one of the worst affected generations can complain to its immediate predecessor that it did not hold *its* immediate predecessor to hold *its* immediate predecessor, etc., to mitigate climate change. All this is meant to occur as part of a reciprocal scheme of mutual advantage.

As a basis for intergenerational justice, the line of reasoning just described is implausible thin. Moreover, it departs significantly from the proportional view of intergenerational justice. For those reasons, I set it aside and instead turn to the idea of fair reciprocity, both as a superior candidate for

intergenerational extension and as a conception that resembles the proportional view and intergenerational impartiality.

4.2.4.2. Fair reciprocity

The core idea within fair reciprocity is that individuals should return a benefit to whoever benefits them *as a matter of mutual respect*. Conversely, individuals should not benefit from the actions of others without generating some benefit in return, that is, without doing their fair share (Rawls, 1999: 96). Reciprocal relationships are ones where individuals cooperate with one another and contribute to one another's well-being. Unlike reciprocity as mutual advantage, which uses the prospect of mutual benefit to constrain individuals' strategic capacities, reciprocity as fairness takes mutual benefit as an expression of mutual respect.

This might not seem distinct from reciprocity as mutual advantage. After all, it might be that I should return a benefit to my benefactors out of respect for their strategic capacities, or because of the desire to advance my self-interest by protecting against harm or participating in a system of cooperating for mutual advantage. The key difference between this and fair reciprocity is that the reason why an individual should act reciprocally is not due to a prudential weighing of interests but rather out of respect for fellow participants within a cooperative exercise. On this view, part of the defence of reciprocity as fairness is that it expresses an underlying requirement of mutual respect (White, 2003: 62). When someone contributes to my well-being, I should in turn contribute to theirs out of respect for them, and more particularly, for the good they have done me. If I fail to do so, I treat them in an objectionably instrumental fashion, exploiting my benefitted position (White, 2003: 63). In other words, a social arrangement that permits certain individuals to benefit from others' activities without returning a fitting and proportional return fails to establish the relationships of fair reciprocity between its citizens. [66]

[66] As White points (2003: 62), this idea can in fact prove too much: redistribution from those able to contribute (e.g. those who are able bodied) to those who, through no fault of their own, cannot contribute to some scheme of cooperation (e.g. those who are not able bodied) appears, at least on the face of it, to constitute a social arrangement where some benefit from a cooperative scheme without contributing to it (see also Barry, 1995: 50–1). However, at least intuitively speaking, this is a virtue, not a vice, of any social arrangement. I return to this problem in the conclusion.

4.3. Fair reciprocity and the proportional view

Does fair reciprocity lead to something similar to the proportional view of intergenerational justice? To determine if it does, several connections need to be established. The first has to do with the presumptive goods condition of fair reciprocity. Does the proportional view protect presumptive goods for individuals? I think that the answer here is clearly yes. As discussed in the previous chapter, the proportional view requires that generations sustain a proportional range of opportunities for their successors, where proportionality refers to each generation's inheritance, plus some improvements where these are costless or aid in the pursuit of justice. While this implies that some substitutions are permissible (where productive potential remains undiminished), the extent of this permission turns out to be quite limited. For example, each generation must sustain critical natural capital in its many forms, because it secures an important range of opportunities for generations and because it cannot be replaced. I also suggest that some proportion of non-natural capital is subject to the same restriction, where that proportion is equally vital and irreplaceable.

Critical natural and non-natural capital clearly are presumptive goods because of their indispensability. Beyond this, however, each generation's inheritance contains many more presumptive goods than critical natural and non-natural capital alone. Every generation relies on its predecessors for a great deal of the opportunities that it enjoys, beyond the opportunities that flow from irreplaceable (i.e. critical) goods. Recall the capabilities listed in chapter 3: the extent to which the present generation enjoys each of these capabilities is in large part a function of its inheritance and what this allows it to do. Insofar as presumptive goods are assumed to be beneficial to their recipient, regardless of rational life plan, it appears then that each generation's inheritance contains a wide range of presumptive goods that secures the opportunities that it will have to pursue its interests.

Fair reciprocity requires that individuals return a benefit to those who benefit them as a matter of mutual respect. The extent to which generations benefit from the actions of their predecessors, as well as the nature of such benefits, raises the prospect that generation generate fitting and proportional returns. Here, however, we run into a problem. For the predecessors of a generation are responsible for its inheritance. How can that generation generate a fitting and proportional return for its predecessors? This constitutes the non-reciprocity problem as it undermines the proportional view of intergenerational justice. In the next section, I outline the problem in detail, subsequently proposing the concept of indirect reciprocity as a means of securing intergenerational fair reciprocity.

4.3.1. The non-reciprocity problem

The core of the non-reciprocity problem is that the correct sort of relationship does not hold between generations. The problem is that separate generations lack the capacity to generate equivalent returns for one another (Barry, 1989b: 189, 1991a: 244–7). In other words, relationships of fair reciprocity do not appear to hold across generations. As was made clear in the previous chapter, generations inevitably benefit from the choices of their predecessors. Fair reciprocity, since it requires that individuals generate fitting and proportional returns for benefits received, requires each generation to do so in return for its inheritance. The problem is that it cannot; no generation can benefit a previous one. With that in mind, the problem with connecting the proportional view of intergenerational justice to fair reciprocity is that no generation can in fact produce reciprocal benefits for its predecessors in return for the benefits received. Fair cooperation therefore cannot occur between generations and, for this reason, fair reciprocity cannot in the end ground the proportional view. The intergenerational context is simply not one where generating fitting and proportional returns leads to duties of justice, or so it seems.

Return to the example of climate change mitigation. Let us assume for the moment that the present generation decides to pursue climate change mitigation to the extent required by the moderate-to-high mitigation pathway. This choice will improve the range of opportunities available to future generations, especially when compared with the other mitigation pathways that require less mitigation. Fair reciprocity tells us that those future generations should generate a fitting and proportional return. But they cannot do so for the sake of the present generation. Indeed, because of the time scale of climate change, many of the generations who will most benefit from the present generation's mitigation efforts (i.e. those generations whose opportunities are most threatened by the prospect of climate change) will only exist in the further future, with many intervening generations between the present and them. The question is thus: can fair reciprocity be revised to accommodate the structure of justice between generations?

4.4. Answering the problem: indirect exchange and the stewardship model

In this section, I introduce the notion of indirect exchange and show how it enables the intergenerational extension of reciprocity. This in turn leads to the stewardship model of intergenerational justice, a reciprocity-based approach to intergenerational justice that can support the proportional view.

Reciprocity, as I have discussed the concept thus far, implicitly requires direct exchange. Indeed, as explained in the discussion of the concept of reciprocity above, reciprocity is an ideal that governs relationships by specifying the type of exchange that any given party to a reciprocal relationship should aim to uphold. I begin this section by introducing the notion of indirect exchange, as it is key to the intergenerational extension of fair reciprocity. As we shall see, indirect exchange underpins the revision of fair reciprocity to support intergenerational duties of justice.

Unlike a direct exchange which involves two agents (or sets of agents), indirect exchange includes three. The idea is that "a person or institution, A, discharges a duty to another person or institution, C, by benefitting a third person or institution, B, according to what can reasonably be expected to be C's bidding" (Page, 2007a: 232-3). This type of exchange appears to show that A and C can enjoy a relationship of reciprocity despite only being able to impact each other's life through B, that is, despite only being able to impact each other's life indirectly (Page, 2006: 108). The basic idea is that "the obligation to reciprocate […] does not evaporate whenever direct, mutual exchanges are impossible" (Becker, 1986: 230). At first glance, intergenerational, indirect exchanges appear well-suited to grounding intergenerational duties. For example, the present generation might invest in climate change mitigation for the sake of the next generation out of respect for the choices that the previous generation made that benefitted us.

The turn to indirect exchange cements my turn away from reciprocity as mutual advantage. The reason is that this understanding of reciprocity is simply incompatible with indirect exchange. After all, each generation participating in a system if intergenerational indirect exchange has powerful self-interested, utility-maximising reasons to consume its inheritance with no regard for its successors. While it is true that universal participation in a scheme of intergenerational indirect reciprocity might increase the wellbeing enjoyed on average by each generation, when a given generation participates in this scheme, it always forgoes the greater benefits that would be enjoyed if it were to ignore future generations' claims entirely. Of course, the intragenerational situation is quite different: it may well be true that, in some cases, individuals best pursue their self-interest through cooperation with others. A given individual's choice to forgo the immediate gains of non-cooperation is in that person's self-interest when the deferred benefits will in fact be worth more than that which was previously foregone. The key is that this all happens across one person's lifetime. The intergenerational case is relevantly disanalogous in that the benefits to participating in a scheme of intergenerational cooperation will be enjoyed by future generations. While each generation will hope that its predecessors participated in a

scheme of indirect reciprocity between generations, reciprocity as mutual advantage does not secure the conclusion that their predecessors will do so; neither does it ensure that the hopeful generation will.

Reciprocity as fairness is not subject to the same problems to which self-interest leads. The reason for participating in a scheme of indirect reciprocity between generations is that doing so is fair. That is, doing so is fitting and proportional return for the benefits inherited from previous generations.

4.4.1. The stewardship model

Based on indirect exchange, the stewardship model provides a solution to this apparent problem (Page, 2006: 119). This model takes each generation to be stewards over the goods it inherits from its predecessors, with duties of intergenerational justice requiring it to maintain its inheritance for its successors. The thought is that, out of respect for its predecessors' efforts and the benefits thereby generated, the present generation should steward its inheritance for the sake of its successor, who will then be required to do the same. The reciprocal relationship, in this case, are indirect, with the present generation discharging duties of fair reciprocity by benefitting its successor, in return to the benefits received from its predecessors. It is by this means that fair reciprocity establishes a "pattern of collaboration across many generations in a common scheme of justice" (Barry, 1989b: 201).

Burke is often taken to be a proponent of this model of intergenerational reciprocity. In his view, the state is a partnership that secures that which is in individuals' greatest interest ("it is a partnership in all science; a partnership in all art; a partnership in every virtue and all perfection" (Burke, 1987[1790]: 85). Crucially, no single generation can secure these individually. Instead, each generation is part of a tripartite contract between the living, the dead and those who are yet to be born (Burke, 1987[1790]: 84-5). A particular feature of Burke's view distinguishes it from other proponents of the view, which is that, for him, the value of reciprocal relationships in society is more than the sum of their value to particular individuals. In other words, reciprocal relationships, and the community that they together create, have in themselves a value that is not derived solely from the value of relationships to those that enjoy them. This adds an extra element to intergenerational duties. For it seems that a given generation owes the next generation duties both with respect to that which was inherited *and* with respect to the value of preserving a particular community (Page, 2006: 120).

The stewardship model need not take this communitarian turn. Instead, we might simply say that justice requires that each generation acts as stewards of its inheritance, preserving opportunity-

securing productive potential for its successor as a fitting and proportional return to its predecessors. In schematic terms, the present generation (G_2) discharges its intergenerational duties to its predecessor (G_1) by treating its successor (G_3) in a way that is proportional to the way it was treated by its predecessor.

While this might appear successful in the case of general intergenerational duties, some might object that duties of just mitigation will not follow because climate change is a novel problem. After all, the present generation's predecessors did not expend much, if any, effort to mitigate climate change. If what the present owes its successors must be fitting and proportional to its original inheritance, then where does the justification of duties of just mitigation come from? The mistake behind this objection is the assumption that duties of just mitigation should be isolated from the full range of intergenerational duties.[67] The correct approach takes duties of just mitigation to follow from the general opportunity-preserving efforts of the present generation. Rather than seek to reproduce its inheritance for the future, the present generation must first establish the extent to which it has enjoyed opportunities to pursue its interests (as defined by the Capabilities Approach), thanks to its predecessors. Then the present generation should aim to preserve a proportional range for its successors, which will in turn involve important duties of stewardship, especially with respect to critical natural and non-natural capital.

With the stewardship model in mind, we can ask, what is a fair return for a generation's inheritance? That is, what is a fitting and proportional return for the inherited opportunities that a given generation enjoys and to whom does that generation owe the return? Out of respect for the stewarding choices made by its immediate predecessor, the present generation should in turn steward its inheritance for the sake of its immediate successor. This is quite similar to the proportional view. Put generally, in both cases, justice requires sustaining inheritance. One can even see how just improvements – one of the key distinguishing features of the proportional view – might also be built into the stewardship model. Indeed, the benefits that trigger duties of intergenerational reciprocity might include just improvements as I describe them in the previous chapter.

In response, some who favour the subject-centred approach to justice might fall back on more general reasons to reject the relevance of reciprocity to justice. One might argue that the requirement to

[67] It is useful here to recall the discussion of isolationism, in chapter 2, of which this objection is a version.

contribute to schemes of cooperation objectionably excludes those who, through no fault of their own, cannot contribute (Barry, 1995: 34). Let us return to the atmosphere maintenance committee discussed above. Imagine that an individual cannot physical contribute because of some congenital ailment. It seems that this person cannot help but unjustly enjoy the benefits of others' work, since fitting and proportional return it apparently impossible. There is, however, a response to this objection: part and parcel of proportionality in returns is that what one must do should also be in proportion to what one can do as a matter of fairness. In other words, part of the idea of mutual respect underlying fair reciprocity is both that no one should benefit from a cooperative scheme without contributing to it *and* that no one participating a cooperative scheme should demand participation from someone benefitted by the scheme beyond which that person can supply.

4.4.2. Stewardship, impartiality and just mitigation

It is useful to take stock of the argument thus far. Justice as reciprocity requires agents to generate fitting and proportional benefits in return for those who benefit those same agents. For reciprocity to have this significance, it must apply to presumptive public goods, that is, goods in which everyone can be reasonably assumed to have an interest and goods that are non-excludable. Most importantly, given my concern with intergenerational duties of just mitigation, only reciprocity as fairness can be extended intergenerationally. The reason is that this is the only interpretation of reciprocity (as opposed to reciprocity as mutual advantage) that fits with the idea of indirect reciprocity. With all that in mind, this leads to the stewardship model of intergenerational justice, where each generation stewards its inheritance for the benefit of its successor and in return for having been benefitted by its predecessor. I have already suggested how this applies to climate change mitigation. For one, a stable climate clearly is a presumptive public good as it is in everyone's interest and it certainly is non-excludable. It there meets the requirements that goods must meet to trigger considerations of reciprocity. Furthermore, the novelty of climate change is not a problem: once we realise that mitigation is but one part of the overall package that the present generation bequeaths to the next generation, it becomes a natural component of the present generation's stewardship.

The difference between the proportional view of intergenerational justice and the stewardship model is not necessarily in what they imply for climate change mitigation, but rather it lies in the line of reasoning that each employs to generate duties of just mitigation. On the stewardship model, the present generation should mitigate climate change as part of its effort to steward its inheritance for the sake of its successor. That is, to preserve the presumptive public good of a stable global climate,

the present generation should mitigate climate change. The reason that it should steward it inheritance in the first place is a matter of fairness: mutual respect for individuals across time means participating in the system of intergenerational stewardship. That is, it would be disrespectful for the present generation to leave climate change unmitigated (or indeed to pursue a pathway other than moderate-to-high mitigation).

This I argue is a compelling answer to those who take reciprocity seriously and who are therefore directly concerned with the problem of non-reciprocity and the implication that it rules out the possibility of intergenerational justice. In short, this is the answer to the non-reciprocity problem from the internal perspective.

One way to return to the external perspective would be to canvass a range of objection to justice as reciprocity from a variety of different context. Instead, I maintain my focus on the case of climate change mitigation. As noted already, the different between the proportional view and the stewardship model is in the line of reasoning that each uses to generate intergenerational duties of just mitigation. More specifically, while I take the two to share a similar foundation in equal respect, I take the proportional view, without reference to reciprocity (as it is developed in the previous chapter), to provide a more direct argument from this foundation to the conclusion that the present generation should undertake-moderate-to-high mitigation.

From the external perspective, the problem with the stewardship argument summarised above is that it contains an unnecessary shuffle.[68] More specifically, the unnecessary component is the stewardship model of intergenerational justice. The problem is that that argument contains three components where two would suffice. Roughly speaking, it proceeds as follows. (1) The present generation should mitigate climate change; (2) the present generation's duties of just mitigation are part of its intergenerational duties of stewardship; (3) the present generation's duties of intergenerational stewardship express the underlying requirement of mutual respect between generations.

In contrast, the proportional view omits (2), proceeding directly from the idea that the present generation should mitigate climate change to the moral requirement of mitigation out of mutual respect between generations. Of course, the connection between those two requires significant

[68] I borrow this term from Rawls, who uses it to characterise Hume's argument that Locke's appeal to consent to political authority is an unnecessary shuffle, since both consent and political authority rely for their justification on public utility (Rawls, 2007: 169–73).

development, which I offer in my defence of the proportional view. In the end, we might ask, what is the purpose of (2)? Those already convinced of the importance of reciprocity to justice will have reasons why this step of the argument is necessary. My present claim, however, is that considering the case of climate change mitigation, and especially the prospect of extending reciprocity intergenerationally to support the claim that the present generation should mitigate climate change for the sake of future generations, suggests that reciprocity might not be of fundamental moral importance. The reason is that it relies heavily on the idea of mutual respect between generations, using this to explain why generations should act for the sake of their successors (that is, act as stewards). The thought is that the aim is not necessarily to fulfil the requirements of reciprocity, but rather to ensure that each generation respect the equal claim of other generations. Why then worry about what fair reciprocity requires when an alternative (the proportional view) explains how to respect the equal claims of other generations without reference to the mechanism of indirect reciprocity? From the external perspective, it seems at the very least that the appeal to fair reciprocity misidentifies the source of intergenerational duties.

The key point out of all of this is that the problem of non-reciprocity does not impede the formulation or justification of intergenerational duties of just mitigation. Insofar as reciprocity represents a value that some take to be of central importance when determining what justice requires, this chapter outlines and answer the problem that relationships of reciprocity to not appear to hold across generation. The answer has effectively been to show that they can, through indirect reciprocity, and that this support the stewardship model of intergenerational justice. While this line of reasoning leads to conclusions that are similar to those that I reach on the basis of the proportional view, the difference between these two arguments leads to a question about the importance of reciprocity to intergenerational justice. Again, that said, on either view, justice requires that the present generation undertake significant climate change mitigation for the sake of future generations.

4.5. Conclusion: reciprocity and its alternatives

In this chapter, I have explained how one understanding of reciprocity (fair reciprocity) can be extended intergenerationally. With the idea of indirect reciprocity in mind, this understanding of reciprocity leads to the stewardship model of intergenerational justice. From the internal perspective, this answers the problem of non-reciprocity. From the external perspective, however, the heavy appeal to mutual respect within the stewardship model seems to undermine the significance of reciprocity.

This is especially the case when it is juxtaposed with the proportional view, which proceeds in a subject-centred way, from the requirement of mutual respect between generations to the conclusion that the present generation has duties of just mitigation.

In the next chapter, I turn to two problems that plague theories of intergenerational justice of any stripe. The problems of non-existence and non-identity each separately undermine the ability for the present generation to act in ways that respect future individuals' claims. While I argue that neither problem is decisive, there are two further upshots of considering these problems. First, it helps defend intergenerational duties of just mitigation based on the proportional view from existing objections to intergenerational justice. Second, it helps further develop the view by, among other things, specifying the features of future individuals that are of present just concern.

5. The problems of non-existence and non-identity

5.1. Introduction

Up to this point, intergenerational justice as proportionality of opportunity requires that the present generation undertake significant climate change mitigation for the sake of future generations. On this view, justice requires that each generation sustain an undiminished range of opportunities for its successors, as well as contribute improvements, when those improvements are costless or in the pursuit of justice. I have also argued that these duties of just mitigation not only withstand the problem of non-reciprocity, but in fact can be grounded in reciprocity as fairness. That said, given the possible weaknesses of reciprocity as a basis for justice, I recognise that there is reason to prefer a subject-centred approach to intergenerational justice. In this chapter, I turn to the problems of non-existence and non-identity. At first glance, both appear to show that duties of just mitigation, especially those based on a subject-centered conception of justice, do not hold between generations. The first, the problem of non-existence, follows from the fact that future people do not yet exist. How can someone who does not yet exist possess the necessary features to ground moral claims against others? The second, the non-identity problem, follows from the fact that decisions made in the present determine, in part, exactly who will be born in the future. How can justice require the present generation to mitigate climate change for the sake of future generations, when any such decision will change who will come into existence?

My central aim in this chapter is to outline what effects these two normative problems have on intergenerational duties of just mitigation. Importantly, I argue that neither problem grounds any decisive objection to intergenerational duties of just mitigation based on the proportional view. First, while the problem of non-existence does not rule out intergenerational duties, it changes the way we should explain the normative analysis of present actions with enduring effects, particularly with respect to the normative concepts that can be correctly used in this context. This problem shows that because future generations do not yet exist, duties of intergenerational justice that apply to present actions and choices must be based on the duty-generating properties of future generations when they come into existence, rather than concepts such as rights or interest in the present. Whilst this restriction might seem intuitive, it has been ignored by some thinkers who are skeptical of the possibility of intergenerational duties (De George, 1979). Second, I argue that the non-identity problem further

restricts the concepts to which one can appeal when formulating and defending intergenerational duties of just mitigation. I argue that present choices and actions should be evaluated according to the way that they respect, or fail to respect, future generations *as a class of individuals* with normatively relevant interests. This represent what I call *the hybrid view,* as it synthesises a group of arguments about how to respond to the non-identity problem. In general terms, I defend what is sometimes referred to as a *wide person-affecting view* (Parfit, 1984: 396–401), that the present generation ought to respect future generations as a class of individuals with shared interests.

This is a chapter in two parts. I address the problem of non-existence first and non-identity second. My treatment of each has a parallel structure. In their respective sections, I begin by laying out the problem in detail, then I outline and evaluate possible responses, concluding in favour of a specific strategy. I refer to 'responses' to these problems as a neutral way of setting out that there is a variety of strategies for dealing with each problem. For example, some consider that the non-existence of future people to rule out the possibility that they have rights (e.g. Macklin, 1981). I settle in favour of the response that takes the problem of non-existence to show that future individuals' will have rights when they come into existence and that this is enough to constrain present actions and choices. Similarly, some consider the non-identity problem to rule out any appeal to existing normative concepts when evaluating many action with enduring consequences (e.g. Boonin, 2014; Heyd, 1992, 2014), while others consider the problem to make no difference to how moral agents should act (e.g. Parfit, 1984). My conclusion sits somewhere in between these two: in arguing that the non-identity problem shows that the present ought to respect the normative relevant shared interests of future people, rather than, for example, particular future identities with particular normative relevant properties, I argue that the non-identity problem changes the way we explain what we owe the future and, therefore, how we should understand our intergenerational duties of justice.

5.1.1. Distinguishing non-existence and non-identity

Because the two problems at hand are closely related, it is important to outline precisely the differences between them, for they have different implications for intergenerational duties of just mitigation. With that in mind, I first introduce the concept of *identity-fixing actions* and then use it to distinguish between non-existence and non-identity.

Some actions have effects that endure over time, whilst some have effects that erode and disappear quite quickly (O'Neill, 1996: 117–8). As this is a thesis on intergenerational justice, I am primarily

concerned with actions that have enduring effects. Based on Parfit (1984: 356), actions with enduring effects can be further broken down into two categories: either an action is "identity-fixing," meaning that the action in question influences which particular individuals come into existence, or the action does not have any identity-fixing properties (Kumar, 2009: 252).

The crucial property distinguishing identity-fixing actions is that individual identities are closely linked to the timing of their conception. The basic idea is that identity-fixing actions influence the time at which future individuals are conceived. This is the Time-Dependence Claim, that "[i]f any particular person had not been conceived within a month of the time when he was in fact conceived, he would never have in fact existed" (1984: 352)[69]. Each person is the result of the combination of two sets of genetic material. The timing of this combination, whether it is through two individuals' choice to conceive a child or through *in vitro* techniques, will change the genetic material that goes into creating the new individual. An action that influences the timing of conception thus influences the genetic makeup of the future individual, changing that future individual's identity. The Time-Dependence Claim is also far-reaching in the sense that a wide range of actions seem to influence the timing on individuals' conception. Anything from my parents' choice about when to start trying to conceive a child, to my decision to leave home 10 minutes late can, at least in principle, be identity-fixing. Of course, the latter would have to be part of a longer causal chain, influencing the people I meet and the choices I make about my relationships. Nonetheless, it can be just as identity-fixing as explicitly procreative choices.

The present generation's choice of mitigation pathway is an identity-fixing choice, in that whatever is in fact chosen will influence the timing of future individuals' conception which, as just explained, will in turn determine which identities will come into existence. In other words, the choice to pursue a particular mitigation pathway will bring a particular set of people into existence, people who would not have existed had any other mitigation strategy been pursued (Page, 1999). As I explain below with reference to the non-identity problem, the ramifications of this fact extend to what we owe future generations.[70]

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[69] This is in fact a second formulation of roughly the same idea by Parfit, one that aims to avoid certain controversies about personal identity. Since those are not relevant for my purposes, I focus on the formulation included above.

[70] Differences in the language with which the non-identity problem is discussed is one source of confusion within debates about the problem's implications. I prefer to refer to the concept of identity-fixing actions to distinguish between sets of

As shall become clear over the course of this chapter, the problem of non-existence applies to any appeal to intergenerational duties, whether in the context of identity-fixing actions or not, whereas the non-identity problem only undermines intergenerational duties as they apply to identity-fixing actions. From this, it follows that the problem of non-existence applies to a larger set of possible actions that the non-identity problem does. At first glance, then, it seems *practically* more significant since it applies to a greater number of actions. In contrast, the non-identity problem has proven to be more significant *theoretically*, both as it can be interpreted in a range of ways, undermining a wide range of theories, and as it has proven particularly intractable. The majority of this chapter critically engages with the non-identity problem, as well as responses to it, since it proves to be such a theoretically resilient problem.

This leaves two final preliminary questions: why discuss non-existence at all? And why discuss it in in conjunction with the non-identity problem? On the first question, as I argue in the next section, the problem of non-existence does have implications for intergenerational duties, helping establish some of the distinctive *intergenerational* features of intergenerational duties. On the second question, discussing them together helps explain their similarities and, more importantly, their differences. I stress that they pick up on two different features of intergenerational duties and have different implications for their justification and formulation. With these preliminary points out of the way, let us turn to the problem of non-existence.

5.2. The problem of non-existence

This section has three components: first, I outline the problem of non-existence in detail. Second, I distinguish two possible means of answering the problem, one that appeals to the *present* rights of future generations and one that appeals to the *future* rights of future generations. Third, I conclude in favour of the second of these two solutions.

5.2.1. The problem in detail

At the core of the problem of non-existence is the simple claim that future people, since they do not yet exist, do not possess the properties required to generate moral claims against others (De George,

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future people, as this seems to me to be straightforward. For example, the present generation can minimally mitigate climate change, leading to one set of future people, or it can undertake moderate-to-high mitigation strategies, leading to a different set of people. In contrast, some refer to actual vs. possible people, or actual vs. possible worlds (e.g. Carter, 2001; Heyd, 2009; Huseby, 2010; Roberts, 2009). This can lead to metaphysical confusions and so I avoid it wherever possible.

1981; Elliot, 1989). This problem straightforwardly rules out the possibility of intergenerational duties: if it is correct that future people do not have the properties required to generate duties for others, it appears that the present generation does not owe duties of just mitigation to future generations.

This should not be confused with a closely related metaphysical problem about non-existent entities and whether it is possible to make coherent claims about things that do not exist (e.g. Crane, 2011). To deny intergenerational duties owed to future generations on purely metaphysical grounds is "committed to denying such obvious facts as that the present could causally influence the future [and] that present people could be great-grandparents of purely future people" (Routley and Routley, 1978: 157; see also Feinberg, 1980b: 181). It would settle the normative question of intergenerational duties by conceptual fiat, ignoring, rather than answering, powerful intuitions about the present generation's responsibilities to future generations, given the effects that the former can have on the latter.

As I understand it, the problem of non-existence has three components:

(1) Future people do not yet exist;
(2) Non-existence rules out the possession of property X;
(3) Property X is necessary for moral agents to be the object of duties.

therefore

(4) Those presently living do not owe duties of justice, including duties of just mitigation, to future people.

If some property X can be successfully defended in the context of these three, then it would follow that there are no intergenerational duties. The problem of non-existence is thus more than a simple assertion of the metaphysical difficulties with thinking about non-existent entities. It is a normative problem about what a given agent ought to do, out of respect for some other agents, given that the latter have yet to come into existence.

5.2.2. When do future individuals have rights?

There are two types of responses to the problem of non-existence:

(A) Future people do not yet exist, but their rights do;[71]

(B) Future people will have rights when they come into existence.[72]

Both of these responses focus on premise (2) of the argument (non-existence rules out the possession of property X). (A) simply denies that (2) is true. That is, responses to non-existence of the type (A) do not concede that it follows from the present non-existence of future people that they do not have rights that must be presently respected. In contrast, (B) concedes that (2) is true, but presents an alternative line of reasoning that supports constraining the present generation's action for the sake of future generations.

5.2.2.1. Respecting the present rights of future people or the future rights of future people

Do future generations have rights in the present? Can the existence of a right precede the existence of its bearer? To answer this, note first that the existence of a right depends on two things: (1) a principle outlining the right and (2) the presence of the relevant circumstances to trigger that principle (Elliot, 1989: 161).[73] On the interest-based theory of rights (presented in chapter 1), at first glance, it might seem possible for future people to have rights in the present. By way of illustration, let us take the (rough) principle that individuals have the right not to be harmed by others. Even though future people do not yet exist, it is reasonable for the present generation to respect their right not to be harmed, out of respect for their interest in not being harmed. Moreover, while the bearer of such a right does not yet exist, it appears reasonable to assume that someone will come into existence who will in fact bear this right. On this argument, there will be people who will bear the rights that the present generation can now violate by not mitigating climate change.

However, there are two problems with the idea of respecting the present rights of future people. The first has to do with the distant future. The conclusion of the previous section relies on the assumption that there will in fact be people in the future. In the near future, this assumption is not particularly problematic. However, this assumption may become more tenuous as our focus extends further into the future. This problem applies directly to issues surrounding nuclear power generation and the

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[71] Referred to as the "Non-concessional View" (Elliot, 1989: 160) or the "present-rights-of-future-people" (Gosseries, 2008: 454).

[72] Referred to as the "Concessional View" (Elliot, 1989: 160–1) or the "future-rights-of-future-people" " (Gosseries, 2008: 455).

[73] To be clear, in the cited work, Elliot does not endorse a response to non-existence of type A, but rather pursues an answer that falls under B. That said, I take this conceptual point to be quite useful in developing the current position.

storage of radioactive waste over time. The period of time over which this waste remains dangerous extends far into the distant future, and so some will be tempted to argue that nuclear power generation violates the present rights of people in the distant future. However, uncertainty about human existence that far into the future destabilizes the assumption that there will be beings whose rights can be violated and thus undermines the justification of the present rights of future people.

This objection is not especially decisive, particularly given my focus on climate change. More generally, some may take the present rights of future people as adequately justified in core intergenerational cases and that the distant future represents a boundary case that does not undermine the core theory. In any case, I will return to the relevance of uncertainty and uncertain assumptions to intergenerational justice in the next chapter, as part of the larger discussion of indeterminacy. With that in mind, I set aside this objection and focus instead on one that I take to be more significant. This is the problem that appealing to the present rights of future people requires ascribing rights to merely possible people who never actually come into existence (Gosseries, 2008: 453). To be clear, the view is that future people can have rights now, even though they do not yet exist, where these rights are "contingent on the future existence of some person who will then be the bearer of the right" (Elliot, 1989: 161). The problem with this, though, is that not all the people who, at the present moment in time, *might* come into existence will *in fact* exist. In other words, from the perspective of the present generation, the idea of respecting the rights of future people includes all those who might come into existence. To say, then, that future people have present rights ascribes rights far too widely, including both actual people and possible (but never actual) people. The problem is that this requires actually existing people to restrict their rights for the sake of rights held by possible people who never actually come into existence. In short, this is an absurd requirement, since it would hold actual people to restrict their behaviour for the sake of no one.

The line of reasoning based on the present rights of future people is therefore not promising. Instead, the more sensible view is that future people will have rights when they come into existence, along with their interests. The idea is that when future people come into existence, they will have certain interests, and it is up to the present generation to avoid making choices that will inevitably setback such interests thereby violating future generations' rights.[74] The key point is that the problem of non-existence

[74] For the concept of inevitable rights violations, I draw on Woodward(Woodward, 1986: 821–2, see also 1987). To be clear, the discussion in those articles focuses on non-identity, not non-existence. Despite this, I take the concept of

shows that when considering what, if any, the present generation owes future generations, one must consider the future interests or future choices of individuals and whether a given action, taken in the present, will respect or violate these. In the case of climate change, then, the present generation should do what respects future generations' rights, which means pursuing the moderate-to-high mitigation pathway.

In the end, as those who have denied the possibility of intergenerational duties of justice have claimed, rights only belong to actual people (Macklin, 1981: 151). However, it does not follow from this simple claim that nothing must be done for the sake of future generations. Instead, duties of intergenerational justice, including duties of just mitigation, rest on reasonable expectations about future generations and making choices in the present that avoid inevitably violating future generations' rights.

5.2.6. Summary

The problem on non-existence clarifies the nature of the interests that underlie intergenerational duties. With that in mind, the proportional view must appeal to the interests that future generations will have, when they come into existence. What matters is that the present generation does now what best protects a reasonable range of opportunities for future generations to pursue their own interests. While this problem is significant in the sense that it affects a wide range of intergenerational duties, its theoretical significance is to push proponents of intergenerational duties to think clearly about what properties of future generations matter before they come into existence.

The discussion of the problem of non-existence leads directly to the non-identity problem. The issue is that contemporary efforts to respect particular future individuals may result in their never having existed: actions made to respect future individuals' rights might "deprive the rights of their bearers" (McMahan, 1981: 125). It is to the non-identity problem that I now turn.

5.3. The non-identity problem

In this section, I have three aims: to explain the problem, consider a range of possible responses, and defend one in particular. I begin with an outline of the problem in detail. The purpose of this detailed outline is to lay out the problem at its most extensive and in its most significant form, where it appears to rule out appealing to the concepts of harming and benefitting, as well as rightful and wrongful

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inevitable rights violations to be relevant here as well. I return to Woodward later, discussing his response to non-identity below.

treatment, when thinking about what the present owes future generations. This formulation may not be compelling as it is. However, my aim is not to develop an iron-clad, perfectly compelling conception of the problem, but rather it is to develop a conception of the problem with the widest possible theoretical significance. Further along in this section, when I discuss responses to the non-identity problem, I will press the weakness of this wide formulation. I take this approach because it suits my present purpose of establishing what, if any, implications follow from the non-identity problem for intergenerational duties of just mitigation. After providing this outline, I next explore different responses to the non-identity problem. I first consider, and reject, a range of responses, before defending one, which I call *the hybrid view,* as it synthesises several existing contributions. With that view in mind, I argue that the present generation should respect what I call the shared interests of future generations as classes of individuals who have normatively relevant features in common. In general terms, I argue that the non-identity problem forces attempts to justify and formulate intergenerational duties of just mitigation to appeal to a particular type of reasons – wide person-affecting reasons – that take future generations as a class of individuals who share normatively salient features to which the present generation should respond.

5.3.1. The problem in detail

First appearing in a number of different thinkers' work (Parfit, 1984; see also Adams, 1979; Bayles, 1976; Kavka, 1981; Schwartz, 1978), the non-identity problem is a theoretical puzzle that significantly restricts what kinds of moral duties can apply across generations.[75] It is the problem of "how to treat future persons given that any attempt to treat them better may result instead in their never being born" (Velleman, 2008: 221). At the core of the non-identity problem is the following claim:

> an act which is a necessary condition of an individual's existence cannot make that person better or worse off.

Being made better or worse off has different implications for other, related normative concepts, so the significance of this relatively simple claim depends on arguments about these related concepts, such as harms, wrongs or rights, to name a few. Before turning to these, however, I will first explain the core claim.

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[75] The origins are far older: Adams cites Leibniz articulating the quasi-non-identity claim that individuals should not regret the presence of evil in the world, since it is a necessary condition of their own existence (Adams, 1979: 53).

As discussed above, there are two types of actions with enduring consequences, those that are identity-fixing and those that are not. I introduced the distinction at that early stage to distinguish between the problems of non-existence and non-identity. There I explained that the problem of non-existence arises with respect to all actions with enduring consequences, whereas the non-identity problem only applies to the normative analysis of identity-fixing actions. It is to the latter claim that I now turn. Given the discussion of the impacts of climate change in chapter 2, one general reason for choosing to mitigate climate change (that is, for choosing a moderate-to-high mitigation pathway) is that it is better for future generations; put conversely, leaving climate change unmitigated will make future generations worse off. Notice, as explained above, that these choices are identity-fixing. As the above discussion of the Time-Dependence Claim made clear, this means that both choices affect the timing of future individuals' conception, changing the identity of those who will come to exist. Each alternative will lead to an entirely different set of future people. This leads to a puzzle: if the present generation chooses to mitigate climate change for the sake of making the actual members of future generations better off than in an alternative world of unmitigated climate change, it will in fact make no one better off. The reason is that the choice to mitigate is a necessary condition in the causal chain that leads to future individuals' existence. Choosing to leave climate change unmitigated is not worse for those who inherit a world with a changing climate; if the present generation were to mitigate climate change, then that particular set of individuals simply will not exist. The present generation cannot claim to be making future generations better off by mitigating climate change, since if it does, it will simply create an entirely new set of future individuals, rather than making the same people better off. The same is true of the choice to leave climate change unmitigated: if the present generation chooses to leave climate change unmitigated, it will not have made anyone worse off. To be clear, the non-identity problem applies to choices along the full spectrum of mitigation pathways that lie between the two extremes of high-to-moderate mitigation and low mitigation. What matters is that any effort to act for the sake of future people appears to be futile because such efforts bring a different set of individuals into existence, rather than improve the lives of a given set. For many, these are counterintuitive claims (and I shall shortly discuss the relevance of intuitions in section 3.2.2). The core claim of the non-identity problem thus directly undermines one intuitive way of thinking about the present generation's choice with respect to climate change mitigation. The core claim also has significant implications for a wide range of normative concepts. In the following section, I develop the core claim of the non-identity problem into a line of reasoning that seriously undermines intergenerational duties of just mitigation.

Given the counter-intuitive nature of the core claim of the non-identity problem, one might try to diminish the scope of this problem by pointing out that not all actions are identity-fixing and thus there may still be a range of intergenerational normative issues where the non-identity problem does not apply. As discussed in section 1.2.2. above, despite the apparent intractability of the problem, it does not apply to action that are not identity-fixing, which diminishes its importance, at least in the sense that it does not apply to a subset of intergenerational normative questions. On this view, the problem becomes less important, since it does not apply to a range of important normative questions. This effort, however, is unsuccessful for two reasons. First, the Time-Dependence Claim indicates that the personal identity is highly sensitive to the timing of conception. It does not take much, in other words, for an action to end up changing who comes into existence. With that in mind, most actions are, at least in principle, identity-fixing. Second, procreative decisions – e.g. decisions about whether to have children, when to begin trying and how many to have – are an important class of decisions where the non-identity problem is absolutely unavoidable. In other words, procreative decisions are explicitly about who to bring into existence and so the problem that choosing one alternative over another appears to be better for no one is unavoidable. I will shortly discuss procreative decisions, in the context of larger-scale identity-affecting decisions, in section 3.2.

5.3.1.1. Three premises and a first conclusion

The core claim articulated above generates a series of claims that together constitute the full non-identity problem, which I discuss in this section, as well as the next two. Based on breakdowns of the problem offered in Boonin (2014) and Page (2006), I distinguish eight different components of the non-identity problem. Again, to be clear, my aim is to set out the problem in its most extensive form.

In the following two tables, I lay out two parallel conceptions of the problem, one that focuses directly on climate change and one that focus on the proportional view more generally. In the column on the non-identity problem applied directly to climate change mitigation, I present the problem both with reference to benefitting and harming. There are two reasons for that. First, the two are normatively quite different. For one, the possibility that an act should make others worse off carries a normative significance that the possibility that an act should make others better off does not carry (Frankfurt, 2015: 26). Second, responses to non-identity do not always function in the same way, with respect to both forms of the problem. One clear example of this related to efforts to to reconsider the notion of harm in a way that is immune to the non-identity problem.

As I have explained it, the initial claim leading to the non-identity problem is the Time-Dependence Claim, since this fact about the relationship between the timing of individuals' conception and their personal identities gives rise to the possibility that acts be identity-fixing. This leads to the idea that the present generation cannot make future generations better off, either by mitigating climate change or by sustaining a range of opportunities. Harming, as well as benefiting, are both significant concepts when it comes to normative evaluation of actions and states of affairs. At first glance, then, one normative implication of the non-identity problem is that it rules out appealing to benefit and harm when formulating intergenerational duties. Figure 5.2 summarises this line of reasoning.

Climate change mitigation[76]	**The proportional view**
P1 – Time-Dependence Claim: the composition of a given generation is sensitive to changes in the timing of individual members' conception.	P1* – Time-Dependence Claim: the composition of a given generation is sensitive to changes in the timing of individual members' conception.
P2 – The present generation's GHG-emitting activities do not make future generations better or worse off than they otherwise would have been.	P2* – The present generation's contributions to future generations' opportunities do not make them better or worse off.
P3 – For the present generation's GHG-emitting activities to harm or benefit future generations, they would have to make them better or worse off than they otherwise would have been.	P3* – For the present generation's contributions to be beneficial, they would have to make future generations better or worse off.
C1 – Choosing to leave climate change unmitigated is harmful for no one; mitigating climate change is beneficial to no one.	C1* – Choosing to discharge intergenerational duties of justice based on the proportional view is neither beneficial nor harmful for anyone.

Figure 5.1. Breaking down non-identity: three premises and a first conclusion

[76] I should also note that, though I develop the non-identity problem in terms of a binary choice between mitigation and no mitigation, this is only part of the question: as explained at the outset of the thesis, I am concern with whether and how much justice requires the present generation to mitigate climate change for the sake of future generations. I focus here on the binary issues to outline the problem clearly. However, the problem still arises when thinking about the scale of mitigation. What matters is that mitigating more and sooner for the sake of avoiding harm or to benefit future generations still problematically appears to be for the sake of no one.

5.3.1.2. Three premises and a further conclusion

In addition to harming and benefiting, wrongful and rightful treatment are important concepts to the justification of intergenerational duties of mitigation. Figure 5.3 lays out how the apparent inability for the present generation to harm or benefit future generations leads to the conclusion that moderate-to-high mitigation is not required, while the low mitigation pathway is not an injustice. Similarly, this apparent inability also undermine the proportional view of intergenerational justice, releasing the present generation from duties to sustain the opportunities of future generations.

Climate change mitigation	**The proportional view**
P4 – if unmitigated climate change does not harm future generations, it does not wrong future generations; if it is better for no one, then the present generation is not required to mitigate	P4* – if intergenerational duties of justice based on the proportional view neither benefit nor harm anyone, then the present generation is not required to mitigate climate change
P5 – if the present generation leaves climate change unmitigated, it does not wrong anyone in particular; if the present generation is not required to mitigate climate change for the sake of future generations, it does not wrong anyone in particular by not mitigating climate change	P5* – if the present generation is not required to mitigate, then it does not wrong anyone in particular by not mitigating climate change.
P6 – if unmitigated climate change does not wrong anyone, it is not wrong	P6* – if forgoing mitigation does not wrong anyone, it is not wrong
C2 – the present generation's choice to leave climate change unmitigated is not morally wrong	C2* – justice does not require the present generation to sustain a range of opportunities for future generations, as well as contribute some improvements

Figure 5.2. Breaking down non-identity: three more premises and a further conclusion

I must stress that these two lines of reasoning indicate the degree to which the non-identity problem can be extended. They may seem too quick at points. For example, harming and wronging may not be coextensive, as that line of reasoning seemed to assume in P4/P4*. As mentioned at the outset of this section, the idea here is not to give a decisive formulation of the non-identity problem that is

unassailable, but rather, to set up the full problem in a way that it is at least plausibly defended. As initial formulations, these lines of reasoning raise the issues relevant to understanding the implications of the non-identity problem for just mitigation.

5.3.1.3. Summary

The central aim in this chapter is to outline the implications of the problems of non-existence and non-identity for intergenerational duties of just mitigation based on the proportional view. The primary form that these implications take is as restrictions or changes to significant normative concepts, such as harming or wronging. At this stage of the discussion of non-identity, it appears that, when formulating intergenerational principles, appeals to harming and benefitting *and* appeals to rightful or wrongful treatment are both ruled out. This is a significant problem both for those concerned with justifying mitigating climate change for the sake of future generations, as well as more generally, for those concerned with other intergenerational issues, such as public debt or constitutional arrangements. The balance of this chapter looks at a variety of efforts to respond to this problem, some of which offer the prospect of rescuing intergenerational duties from non-identity. In contrast to the problem of non-existence, which admitted a relatively decisive answer, and thus has limited implications for normative duties more generally, the non-identity problem proves resilient, generating greater implications for intergenerational duties.

Note that the purpose of canvassing different responses to the non-identity problem is not necessarily to *solve* it. For some, the non-identity problem is a single problem for which we might seek a solution (e.g. Boonin, 2014 chap. 1, especially 19-28). Against this view, I understand the non-identity problem as a series of claims that, taken together, undermine seemingly plausible appeals to particular *normative concepts* in the formulation of particular duties, especially intergenerational duties. I do not consider it to be a problem to be solved, then done away with, but rather I consider it to be a problem that changes the way in which different normative concepts (e.g. harming, wronging, etc.) can be used to formulate normative duties, particularly intergenerational ones. Precisely what these implications are will depend on the strength of the particular claims, which is what the different responses to non-identity canvassed below aim to establish. Some may see the full non-identity problem as I articulate it and wish to solve it in the sense of doing away with it, since the conclusions, particularly C2/C2*, might seem intuitively unacceptable. In contrast, I do not consider the problem to be a unified entity

to be rejected as a whole. Instead, since each component appeals to normative concepts familiar from questions that have nothing to do with non-identity, I assess these components individually.

5.3.2. Preliminary (1): the relevance of intuitions

Many authors refer to their own intuitions about the non-identity problem, or various components of it; some authors even take intuitive plausibility to be a crucial test for the entire problem (Boonin, 2014 chap. 7; Roberts, 1998: 28 i.a.). I take a different view of the non-identity problem, one that neither takes it as a unified whole, nor considers intuitive judgements to be particularly important, let alone decisive. Instead, it is "a conceptual constraint regarding the conditions for making any moral judgement" (Heyd, 2009: 10). In examining the implications of the non-identity problem for the comparison of the present generation's two choices with respect to climate change mitigation, I aim to outline what, if any, conceptual constraints are raised by the non-identity problem. In other words, the basic effect of the non-identity problem is to restrict the ways in which different moral theories can appeal to particular moral concepts when discussing justice between those alive in the present and those not yet born. Regardless of whether I or anyone else finds any of this plausible and intuitive (or implausible and unintuitive), the non-identity problem has implications for how we develop, explain and justify moral judgements. Some might think that non-identity problem has tremendously restrictive implications for moral theories (e.g. Boonin, 2014; Heyd, 1992; Schwartz, 1978), leaving very limited space for discussing duties owed to future generations, while others do not (e.g. Kumar, 2009; Reiman, 2007; Woodward, 1986). The point is not that the non-identity problem is intuitively troubling. Instead, it presents challenges that rule out the appeal to certain moral concepts and forces revisions to others. By the same token, as mentioned above, the non-identity problem is not so much a problem to be overcome, but rather is simply a source of constraints for intergenerational duties of justice (as well as moral and political theories more general). It is a simple fact that many actions are identity-fixing. The relative plausibility of a given theory of intergenerational justice depends on whether it explains what duties of justice hold across generations, despite the fact of identity-dependence. With all this in mind, I now turn to different responses to the non-identity problem, that is, different views on what the problems implies for intergenerational duties.

5.3.3. Preliminary (2): illustrative cases

In this section, I introduce two illustrative examples that figure prominently in the literature on the non-identity problem and to which I make reference below. I take these to be supplements to the main problem of climate change mitigation. Including them illuminates particular points and helps embed my arguments in the existing literature.

The literature on non-identity has generally developed two types of problems. One type includes large-scale choices, such as the choice between mitigating and not mitigating climate change. The other focuses on smaller-scale individual choices, such as procreative decisions. Take, for example, Parfit's example of a 14-year old mother:

> This girl chooses to have a child. Because she is so young, she gives her child a bad start in life. Though this will have bad effects throughout this child's life, his life will, predictably, be worth living. If this girl has waited for several years, she would have had a different child, to whom she would have given a better start in life (Parfit, 1984: 358).

This is a small-scale, procreative case. In other words, it is about an individual's action in relation to a single future person.

The large scale choice often discussed in the literature refers to a generation's choice between Depletion, where a it can improve the quality of life for those alive over the next 300 years but cost subsequent generations significant quality of life, or Conservation, where it forgoes benefits of Depletion and avoids its costs (Parfit, 1984: 361–2). Of course, this example is quite close to the central case of climate change mitigation. I include it here to recognise its importance of the literature, but will stick to climate mitigation in the rest of this chapter.

5.4. Responding to the non-identity problem

5.4.1. Accepting the conclusion

One clear option, when confronted with the non-identity problem, is to accept its conclusion. Perhaps this problem really does reveal a mistake in moral thinking, based on an until-recently underappreciated fact about how one generation can affect the lives of other generations. The implications of this response are significant: if leaving climate change unmitigated is neither harmful nor wrongful, and mitigating climate change is neither beneficial to anyone nor required, then there

seems to be no basis upon which to ground intergenerational duties of just mitigation. More generally, there appears to be little room for developing intergenerational duties on any subject.

For instance, David Heyd defends the view that an act that is a necessary condition of an individual's existence cannot be bad in any way for that individual. He argues that problems such as the non-identity problem mean that we ought to distinguish a special category of ethics, which he calls genethics, to develop normative theories capable of coherent guiding identity-fixing choices and actions. Genethics is "the field concerned with the morality of creating people, that is, decisions regarding their existence, number and identity" (Heyd, 1992: xii). It refers to future states of affairs that are neither non-moral, nor beyond human control, yet there remains significant doubt about their moral significance (Heyd, 1992: 21–2). In contrast, ethics, on Heyd's view, has to do with promoting the values such as justice, happiness, virtue, amongst others, for existing people, while genethics refers to the promotion of these values by creating new people (Heyd, 1992: 22–3). Heyd distinguishes genethics from ethics because of the distinctive issues found within the former, of which the non-identity problem is one prominent example. With this distinction in mind, Heyd defends the principle of generocentrism, which holds that "genesis choices can and should be guided exclusively by reference to the interests, welfare, ideals, rights and duties of those making the choice" (Heyd, 1992: 96). With respect to the choice being mitigation and leaving climate change unmitigated, this principle would allow normative deliberation to consider the present generation only. Heyd's generocentrism is a notably strong form of bullet biting: for him, genesis problems "can be solved only by reference to actual people" (Heyd, 1992: 89). Notice that Heyd directly references the consequences of his view for existing normative concepts: justice, happiness and virtue all fall within the scope of ethics, not genethics.

Another reason for accepting the conclusions of the non-identity problem is that they simply are plausible (Boonin, 2014 chap. 7). While Boonin does not use this argument as a reason to generate a new category of choices, as Heyd did with the concept of genethics, the implications of his view are equally significant for the prospect of intergenerational duties grounded in normative concepts such as harming or wronging. After considering responses to the problem such as the ones I discuss below, Boonin writes "what eventually came to strike me as implausible is the claim that it is positively immoral to conceive a child whose life will be worth living simply because you could instead have easily conceived a different child whose life would have gone even better" (Boonin, 2014: 234–5). Boonin does present a number of cases that purport to show that the conclusions of the non-identity

problem are not so implausible after all. However, they all represent the individual version of the non-identity problem. At the very least, this significantly undermines the relevance of his conclusions for arguments such as mine, which examine choices that trigger the collective version of the problem. Moreover, this is in itself an implausible argumentative strategy. Compare the paradigm case of individual non-identity – the 14-year old mother – with the paradigm case of collective non-identity – the question of whether to mitigate climate change. The agents involved in these two questions have very different properties. Parents making decisions that affect their potential children can adduce reasons in making those decisions that are simply inadmissible or, worse, irrelevant to collective agents making decisions that will affect generations in the distant future. Parents have some degree of personal prerogative with respect to their children. For example, it is at least plausible that parents should owe special duties to their own children as *their* children and have a certain lee-way in how they can permissibly influence their children's' lives. Neither of these is plausible when considering non-overlapping agents separated by significant distance in time; relying entirely on the plausibility of the individual non-identity problem is simply insufficient to show the plausibility of the non-identity idea problem as it applies to non-overlapping generations.

The general point is that the justificatory standard for an individual's choice is different from the justificatory standard behind a conception of justice and how this value determines the way in which institutions should distribute advantages and disadvantages. My point is not that it is necessarily a mistake to consider responses to the non-identity problem, as applied to duties between individuals. Rather, it is a mistake to assume that the case of duties between individuals is sufficiently analogous to the case of duties of justice between generations to support transporting a response to non-identity from the former to the latter. Boonin himself draws precisely this distinction: "the case of Wilma [a case of individual non-identity] involves principles of individual morality while the case of the wealthy society [a case of collective non-identity] involves principles of public policy" (Boonin, 2014: 220). However, despite drawing this distinction, he does not take it to rule out transporting conclusions about the morality of one woman's actions to the context of public policy (i.e. the collective context) (e.g. Boonin, 2014: 224).

With the internal problems of Boonin's view in mind, I set it aside. Heyd's view, however, is more resilient. In fact, it effectively represents the 'default' view. If no fault can be found with the reasoning presented in section 3.1, then perhaps Heyd is right and person-affecting normative concepts do not

apply to so-called genethical choices. Undermining this position therefore depends on the responses below and their capacity to limit the implications of the non-identity problem.

5.4.2. Beneficence

This section examines the argument in Parfit (1984) that the non-identity problem shows that intergenerational duties should be grounded on *impersonal reasons of beneficence*. There are two central components to this section. First, I explain the concept of beneficence and evaluate reasons why intergenerational duties should be conceived entirely according to this concept. Second, I outline how, on Parfit's view, the non-identity problem leads to the conclusion that reasons of beneficence should be conceived in impersonal terms. Before turning to those arguments, it is important to distinguish three concepts: narrow person-affecting principles, wide person-affecting principles and impersonal principles. These constitute three different ways of identifying who should be of fundamental moral concern. The two person-affecting views are intuitively familiar, since they both hold that what matters, for moral theories, is the way in which they affect people (Parfit, 1986: 370). On the narrow person-affecting principle, what matters are the implications of moral theories for particular persons; on the wide person-affecting principle, what matters are the implications of moral theories for people in general (Holtug, 2008: 10, 2010: 158; Parfit, 1984: 393–401; Temkin, 2003: 23–4). In contrast, impersonal principles hold that what matters is the value that moral theories produce (Heyd, 2009: 5; Parfit, 1984: 386–7). This value need not be attached to persons; it need not be better *for* anyone.

There are several reasons for considering this response to the non-identity problem. For one, it represents the dominant position in the literature on duties between generations (Kumar, 2009: 252). More importantly, if the arguments considered in this section are correct and intergenerational duties should be conceived in impersonal terms, then there are significant implications for the proportional view of intergenerational justice. For one, the view would have to be heavily reformulated to rest on reasons of beneficence, as opposed to the person-affecting reasons offered in chapter 3. The effect of such a reformulation would be substantial: it would transform the proportional view from a view resting on respect for the basic equality of people, independent of when they exist in time, to a view concerned only with the extent to which individuals must benefit one another. That said, I argue in this section against the idea that the non-identity problem should force this upon theories of intergenerational justice.

5.4.2.1. Some initial implications of the non-identity problem

To explain Parfit's understanding of the non-identity problem, I first need to add some distinctions to the concept of identity-fixing actions. Parfit distinguishes between three types of choices that have enduring consequences: first, "Same People Choices" affect neither the number nor identities of particular future people; second, "Same Number Choices" fix the particular identities of future people but does not change their number; third, "Different Number Choices" fix both (Parfit, 1984: 354-5). In the terms I have been using up to now, the latter two are identity-fixing choices while the former is not.

In Same Number Choices, Parfit endorses

> *The Same Number Quality Claim, or Q*: If in either of two possible outcomes the same number of people would ever live, it would be worse if those who live are worse off, or have a lower quality of life, than those who would have lived. (Parfit, 1984: 360)

This claim provides the means to object that we ought not to make a choice that lowers the wellbeing of future persons, even if it is a necessary condition of those persons existence. In individual cases such as the 14 year old potential mother, this principle provides a reason to delay having a child, as this will lead to a state of affairs where the person who lives will enjoy a better quality of life than in the state of affairs produced by not delaying conception.

Claim Q limits the implications of the non-identity problem, at least with respect to Same Number Choices, by undermining P2/P2* and therefore C1/C1*. It supports the judgement that leaving climate change unmitigated is worse and mitigating climate change is better, *whoever future generations turn out to be*. This principle judges what the present generation should chose in terms of the goodness or badness produced in each, without relying on the concept of wrongful or rightful treatment. Notice that Q does not attach the value found in states of affairs to particular people. In other words, it does not claim that it would be worse *for particular people* to have a lower quality of life, but rather that is would simply be *bad*.

The problem with Q is that it does not scale particularly well. The choice between mitigating climate change and leaving it unmitigated, for example, is a Different Number Choice, meaning that the choice will affect the number and identities of future people. While Q appears to show that, at least in cases such as the 14-year-old mother or the two medical programmes, the non-identity problem makes no

difference (Parfit, 1984: 367–9), it does not apply to different number cases, and such cases represent many important intergenerational problems. Parfit argues that a principle similar to Q is needed, which he calls Theory X (Parfit, 1984: 372–3). Theory X will support normative judgements based on the goodness and badness of particular alternatives without attaching that goodness and badness to particular individuals. I shall shortly consider problems with this conception of Theory X below. However, I first want to note one important feature of Parfit's response to the non-identity problem: he has taken the problem to mean that, when justifying and formulating intergenerational duties, we ought to appeal to the concept of beneficence. Beneficence refers to the part of morality that has to do with the values of goodness and badness, howsoever these are conceived (e.g. as preference satisfaction and dissatisfaction, or pleasure and pain, amongst others). Utilitarianism and consequentialism more generally are two families of theories that take beneficence to provide an exhaustive basis for morality. Parfit's claim is narrower: he argues that the non-identity problem implies that intergenerational duties should be grounded in beneficence. For my purpose of justifying and formulating intergenerational duties of just mitigation, if Parfit is correct and intergenerational morality should be thought of in terms of beneficence as a result of the non-identity problem, then it follows that my project of justifying and formulating intergenerational principles of just mitigation should appeal to beneficence as well. It is to this question that I now turn.

5.4.2.2. Should intergenerational normative problems be analysed exclusively in terms of beneficence?

Parfit argues that future generations fall under the part of morality that is concerned with what he calls "beneficence" and that beneficence should not be thought of in person-affecting terms (Parfit, 1984: 370–1). The Principle of Beneficence refers to "our general moral reason to benefit other people, and to protect them from harm" (Parfit, 1984: 371). This is not to say that some moral questions are not answered by appeal to other concepts, such as rights. However, as a direct result of the non-identity problem, Parfit's view is that Theory X, which is a conception of beneficence, is the only principle that can correctly govern intergenerational normative duties. With this in mind, should intergenerational normative problems be analysed exclusively in terms of beneficence? In this section, I argue that it should not, on both external and internal grounds. For one, it is not clear that beneficence is the only basis for intergenerational duties. Moreover, even on the assumption that it is, there are further problems internal to a beneficence-based conception of Theory X.

To begin, Parfit explicitly contrasts appealing to individual rights with appealing to a principle of beneficence. Those are taken to cover different areas of morality, with only the latter capable of

cogently dealing with intergenerational normative issues. The reason is that when an apparent rights violation is a necessary condition of the existence of a future person, it is reasonable to assume that this person will waive the apparently violated right (Parfit, 1984: 364ff, 1986: 354–64). The concept of rights-waiving is quite simple: when I ask someone to marry me, I waive my right to privacy, at least insofar as it applies to my relationship with the person I have asked to marry (Parfit, 1984: 364). Similarly, when I play in a football game, I waive my right not to be (at least inadvertently) harmed for the sake of a competitive game. These are both instances where I waive a protection of a core personal interest in favour of pursuing another end in which I also have an interest. Now consider the case of the 14-year old mother. The key difference between this and the two examples just presented is that the apparent rights-violation – the mother's choice not to delay conception, thereby worsening her future child's life – is also a necessary condition of that child's existence. We may wish to appeal to the child's right against being set back in how her life will go, but the non-identity problem appears to block this objection, since surely the future child will be thankful that the woman conceived the child when she did, since had she not, she would have had a different child entirely. Just as my competitors reasonably expect me to waive my right not to be harmed during a football game, so might the mother say that she expects her child to waive the right against having her life prospects set back. After all, the alternative for that child is not a better life, but never existing at all.

This problem scales quite directly to large-scale, collective cases. We might wish to appeal to the prospect of violating the rights of future generations by leaving climate change unmitigated to support the normative judgement that this act is wrong. However, if the people who inherit unmitigated climate change "knew the facts, they would not regret that we acted as we did" (Parfit, 1984: 365). They would instead waive their rights that appear to be violated by those who left climate change unmitigated. In general terms, the fundamental idea of rights waiving is that an individual cannot simultaneously claim to have had a right violated while being thankful that it has been violated.[77]

[77] It is worth recognizing that there an interpretive issue about whether Parfit really endorses the strong claim that intergenerational duties should appeal only to a Theory X, which is itself a conception of beneficence, or whether he aimed to show that *many but not all* cases involving intergenerational duties would require a theory of beneficence in some way immune to the non-identity problem (Woodward, 1986: 807). Compare the statement that any objection to an act that appears to make people worse off in a Difference Number case "cannot appeal only to people's rights" with the later claim that "to solve [the non-identity problem] we need a new theory of beneficence"(Parfit, 1984: 378; 451). Following Woodward, there certainly are passage in *Reasons and Persons* that support the stronger claim, as well as in a reply to Woodward published by Parfit (Parfit, 1986: 854-62). Interpretive issues aside, however, the question of whether focusing entirely on Theory X is the correct way to respond to the non-identity problem is an important issue in itself. Moreover,

There are three reasons to reject this general claim. First, it is coherent to be satisfied with an achievement, yet express regret that it falls short of an ideal (Woodward, 1986; for a similar idea, see Velleman, 2008: 268). To see why, consider the distinction between states of affairs and actions. Return again to the case of the 14-year old mother: the choice to have a child at that age is an act; the existence of a new human being (her child) with worsened life prospect is a state of affairs. The act can be wrongful without the state of affairs being regrettable, particular from the perspective of the child. (As long as the child's life is worth living,) it is possible for the child to recognize the wrongful action while simultaneously enjoying the life that she does have.

Consider also the following principle, which seems to underpin Parfit's view that future generations will waive their right when the right-violating act is a necessary condition of their existence:

> R: If a state of affairs q is a necessary condition for a state of affairs p, then if one does not (or ought not rationally to) regret that p, one ought not rationally to regret the q. (Woodward, 1986: 824)

On its own, such a principle has the problematic implication that the victim of a clearly wrongful action (e.g. an assault) ought not to regret this, in cases where the victim ends up better off once returned to full health (Woodward, 1986: 825).The general point is that R implausibly ignores that individuals can object to q as an *action*, rather than simply a *state of affairs*. With this in mind, the concept of rights-waiving seems to require the running together of acts and states of affairs in a way that they ought not to be.

Second, the appeal to future individuals' lack of regret as effectively consenting to the rights violations necessary for their existence leads to a problematic circularity. The problem is that rights-waiving assumes that the consent of future individuals matters. Part of the basic issue animating the entire debate is that alternative choices populate the future differently and so it is not clear how to set the boundaries on our moral community. Yet, if the consent of future people is taken to matter, then the question of the scope of our moral community has been implicitly settled to include future people. Before the choice of an alternative is made, the question of who populates our moral community has not been settled, in part because who will exist in the future is not settled. It would be circular to settle

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adopting this focus on the grounds of the problem of rights-waiving, as Parfit at least *appears* to have done, is suspect, for the three reasons I present below.

the moral question of what alternative to choose by saying that the ensuing member of our moral community will waive its rights when they are violated.

Third, it is not clear what we ought to make of the idea of retrospective consent or "no regret" without appealing to the background disagreement about what the present owes future generations (Woodward, 1986: 824). To see why, take the following dilemma. On the one hand, future people may know their Parfit, and see no grounds to regret an action that violated their rights but also lead to their existence. What do we make of their view? The problem is that we cannot answer that question without resolving the debate about the implications of non-identity. On the other hand, future people may endorse one of the responses to the non-identity problem discussed below that appeals directly to concepts of wronging and rights-violations. Again, whether this view is correct relies on the more fundamental question about whether the rights of future people ought to receive any consideration in present moral reasoning, or whether they can be disregarded on the reasonable expectation that the rights will be waived. The dilemma, then, is that whatever position one takes with respect to rights-waiving will depend on the resolution of the prior debate about the non-identity problem and what we owe future people. Right-waiving does not settle this debate.

There are three reasons to doubt that intergenerational morality should be understood solely in terms of beneficence. If understanding intergenerational morality really did require developing a theory of beneficence, Theory X, then the non-identity problem would have significant implications for moral theory, but the problem would be easily circumvented: "Impersonalism dismisses the charge of nonidentity by simply denying the person-affecting nature of value (rights, justice, equality, etc.)" (Heyd, 2009: 7). I have offered three reasons for doubting that Theory X will suffice. In addition to these, it is worth reviewing two internal problems with important candidates for Theory X. Theory X can take two forms: it can either seek to bring about the highest total value in the world or the greatest average enjoyed by any given individual. Both have significant problems. The first, the "Impersonal Total Principle" (Parfit, 1984: 387), runs into the Repugnant Conclusion. The problem is that this principle justifies producing an ever-larger population, as long as the total quantity of value increases with every addition, right to the point that the world is populated by an enormous number of people with lives that are barely worth living (Parfit, 1984: 381–90). The second principle, an Impersonal Average Principle, runs into the Mere Addition Paradox, where it is impermissible to add another person to the world if that addition lowers the overall average amount of value carried by any given individual (Parfit, 1984: 420).

In sum, there are both external reasons and internal reasons to reject the idea that the non-identity problem implies that intergenerational duties should only appeal to impersonal reasons of beneficence. Externally, there are three reasons why the non-identity problem does not rule out non-beneficence-related normative concepts from issues of intergenerational morality. Moreover, the development of any Theory X leads to two serious internal problems. With all that in mind, it is not clear that the choice between mitigating climate change and leaving climate change unmitigated should appeal only to impersonal reasons generated by a Theory X. This in turn implies that the non-identity problem does not show that the proportional view, as outlined in chapter 3, can only be formulated in terms of beneficence. That is, beneficence does not crowd out other sort of reasons in the intergenerational context. The next section goes further, discussing non-beneficence grounds for intergenerational duties.

5.4.3. Respecting future generations: a hybrid view

In this section, I construct and defend what I call *the hybrid view*, which I take to provide an answer to the non-identity problem. The hybrid view is crucial to defending the proportional view from objections grounded in the non-identity problem.

The argument in this section targets the second half of the non-identity problem as I present it above, from premise 4 through 6. The hybrid model provides an alternative foundation for the judgement that the present generation should mitigate climate change out of respect for the proportional view, one that relies neither on the idea that the presence of a harm is necessary to establish the presence of a wrong nor on the idea that particular individuals must be wronged by a given act for that act to be morally wrong. As already noted, I take this to be a wide person-affecting view, where what matters are the implications for people in general (as opposed to specific persons, which would be a narrow person-affecting view). When Parfit introduced this notion, he rejected it, not least for the reason that wide person-affecting principles still run into problems such as the Repugnant Conclusion (Parfit, 1984: 398 f). However, as already discussed, intergenerational duties need not necessarily be duties of beneficence. Parfit notes another feature of wide person-affecting principles that is relevant here: "The Wide Principles are not wholly familiar. They cannot claim to be our ordinary principle about effects on people's interests" (Parfit, 1984: 397–8). Again this, one of the key contributions of the hybrid

view, is to specify more precisely the nature of future individuals' interests, then integrate it with a line of reasoning that justifies duties across generations, including duties of just mitigation.

5.4.3.1. Future individuals' interests

How should we conceive of future individuals' interests? The basic claim is that the interests of future persons – who *do not* exist with particular identities, since they have yet to be born – differ from the interests of present individuals – who *do* have particular identities (Reiman, 2007: 84–5). To see how, we first need to distinguish between how people can differ in their "properties" (e.g. "one is tall and the other is short") and how they can differ in their particular identities (Reiman, 2007: 83). Reiman uses the example of twins to illustrate this distinction because, even if they are identical twins with identical properties, each is still a separate particular (2007: 83). Properties fall into the two further subcategories of "personal properties" and "worldly properties," where the former describes features of a person, such as height, and the latter describes a feature of the world that future person is born into, such as a polluted atmosphere (Reiman, 2007: 83). Future people thus have an interest in possessing certain properties, personal and worldly, and not others (Reiman, 2007: 84). Crucially, future people do not have a similar claim to being *particular people*. In contrast, as an already existing person, I have claims that depend on my unique identity as a particular individual, in addition to claims to certain personal and worldly properties. For example, since I am working on a PhD, I have interests that flow from this personal project *of mine*; I also have interests in worldly properties, such as not living in a world with a polluted atmosphere. Before my existence, however, I did not have the former, since my specific identity did not exist. It does not follow that previous generations could not have known that any person, born into a situation such as mine, will have an interest in certain personal and worldly properties. In other words, the particular individuals that future people turn out to be is not relevant to the present consideration of what is in their interest. The present generation should consider the worldly and personal properties in which future people will have an interest. On this view we need not, and even should not, treat future people "as if they have interests before they exist or even timelessly, that they can only have once they exist" (Reiman, 2007: 70).

Since Reiman is working within a Rawlsian framework, duties of justice rest on what the parties to the original position would agree to. In his view, the original position "is a device that is capable of identifying the rights of future people against currently living people and the correlative duties of currently living people to future people" (Reiman, 2007: 80). When using this device to ascertain what rights people, present and future, have, it becomes clear that future individuals' interests in having

certain personal and worldly properties (and in not having others) ground rights that present people should respect. The non-identity problem does not undermine this appeal to rights because the particular identities of future people are irrelevant. Intergenerational normative duties are thus generated by an appeal to the rights of future individuals, based on their personal and worldly properties. It follows that an act that wrongs no specific individual is still wrong. Present actions can fail to respect future generations' rights, as they are grounded in future individuals' interest, or so the argument goes.

5.4.3.2. Normative types

The idea that individuals in general have an interest in certain personal and worldly properties requires development. We might ask: How can a set of future persons share an interest in a worldly property? After all, the set's very existence will result from its predecessors' many choices, including those relevant to climate change. With that in mind, it looks like the interest in a stable climate amounts to an interest in not existing, at least for those possible future people who will only come to exist in a world where climate change is left unmitigated, an interest which I take to be absurd. Given this implausible implication, I need a way of appealing to future individuals' interests in a wide sense – that underpins a wide person-affecting approach. The idea is to develop a conception of wrongful action that is not tied directly to the wrongful treatment of particular individuals, but is rather tied to the wrongful treatment of classes of individuals who share normatively relevant characteristics (Hare, 2007; Kumar, 2009; Page, 1999).

Consider the following example (Kumar, 2003: 103).[78] I am walking down the street when a drunk driver speeds by, unbeknownst to me. Thankfully, nothing happens to me, or to anyone else, and the driver makes it home without incident. There are several relevant normative features of this case. The drunk driver has put me at great risk that I have done nothing to incur. My particular identity does not matter: every pedestrian was put at similar risk and therefore equally wronged. Indeed, any human being in the same situation as me would have been similarly wronged. It happens that *I* have been

[78] Kumar explicitly ties his view to a contractualist conception of wronging (Kumar, 2003: 105, 2009: 262). On this view, agents wrong one another when they act in a way "that is disallowed by principles for the general regulation of behaviour that no one could reasonably reject as a basis for informed, unforced, general agreement" (Kumar, 2009: 263). The principles fix what considerations individuals "legitimately expect" from one another (Kumar, 2003: 106). As he explicitly recognizes, however, the idea that what individuals owe one another as a matter of normative duty relies on the type of individuals under consideration, is not necessarily tied to the contractualist account of wronging (Kumar, 2003: 105). I follow this suggestion and do not attach this response to the non-identity problem to contractualism.

wronged because I was walking down the street. But the features of the scenario which support the judgement of wronging are generic, in this sense that they would apply to any moral agent in my same circumstances. In other words, I as a pedestrian-who-is-vulnerable-to-reckless-drunk-drivers am the type of person who is owed consideration by those who contemplate driving home from the pub.

This example points to the general concept of a *type of individual*, understood as a "cluster of normative relevant characteristics" that define what moral concern a given individual is owed by others (Kumar, 2009: 261). Importantly, "a type of person is not a particular, fully determinate person" (Kumar, 2009: 261). Of course, this example does not directly address the question because the drunk driver's wrongdoing is not a necessary condition of my existence. However, it is a simple example that provides the conceptual resources to tackle such a case. To be clear, the idea is that wrongdoing flows from the disregard shown by a particular moral agent to the normatively salient feature of others. With this in mind, let us turn to the case of the 14-year old mother. In this case, before conceiving a child, the potential mother can readily recognise the type of person that her child will be, whoever that turns out to be: in prospect, her child is a member of a class of individuals (possible children). The mother has generic reasons, that is, reasons that apply to any moral agent in the same circumstances, to act out of respect for the interests that are attached to this class of future individuals. Given that it was stipulated in this example that conceiving a child right away, instead of waiting for several years, would provide the child with a bad start in life, it appears that the mother has wronged her child by failing to respond to normatively salient features of the child that are not linked to any particular identity, i.e., the *type* of person that her child will be.[79]

The idea of considering what one owes one's possible children, where one's children are a class of individuals who share certain normatively relevant features, scales quite directly to the problem of climate change mitigation. The key is to identify the normatively relevant characteristics that future generations share and that lead to duties of just mitigation on the part of the present generation, as well as intergenerational duties more generally.

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[79] Hare (2007) comes to a similar conclusion using a different, though related, line of reasoning, notably appealing to two senses in which we can speak of the 14 year old mother example. We can speak of her child, as in the particular child she has, or her child, as in the type of individual who will possess the features to be correctly referred to as her child. I rely on the reasoning used in the main body of the text, rather than Hare's, because the latter is open to the objection that it is an arbitrary feature of the English language that the phrase 'her child' can be parsed in (at least) these two ways and that there are not necessarily any normative implications of this distinction.

With respect to climate change, this key feature is the vulnerability to climate change and the adverse effects of living in an unstable climate. In one way, future generations are analogous to the pedestrian in the example discussed above. Here, the relevant description of future generations is as cohorts of individuals who are vulnerable to their predecessors' choices with respect to GHG emissions. This vulnerability does not depend on who exactly comes into existence. Rather, the present generation knows, in prospect, that whoever will live in the future will have to deal with the consequences of the choices made about mitigation in the present.

This idea returns us to Reiman's idea of future individuals' interests in some personal and worldly properties. A stable climate, for example, is a clear example of a worldly property in which future individuals have an interest. Furthermore, this interest can be subdivided into further, more precise interests, depending on more precise projections of worldly properties. For example, the assumption that some members of future generations will live in low-lying coastal settlements implies that some future people will have an interest in the worldly properties related to sea level. This provides the present generation with a general description of some future people ('people who will be vulnerable to sea level rise') that should guide present decision-making.

This also helps develop the proportional view and the structure of the intergenerational duties that it implies. I argued that this view requires that the present generation preserve for future generations a range of opportunities that is undiminished from the range that its inheritance permits it and that the present generation should also contribute some improvements to future generations' opportunities, where the improvements are costless or (more importantly) where they contribute to the pursuit of justice. The duties that this view generates rest on descriptions of types of future people, for instance as people who will rely on their inheritance to produce a range of important opportunities for them or as people who will have interests in the worldly property of more just institutions.

There is no need to make the move, which some do, to the view that the non-identity problem limits intergenerational duties to duties between overlapping generations, where generations are age cohorts (Gosseries, 2008: section II, esp. 463f). Indeed, generational overlap is irrelevant to the view under consideration. For duties to hold between two generations, what matters is that the earlier one has knowledge of the worldly properties that the later one will have. This leads directly to another problem, that the indeterminacy of the future might undermine intergenerational duties, a problem that I address in the next chapter, and so I do not consider it here.

In sum, the present generation can describe future generations according to the normative type of individuals that they contain, where normative type refers to the personal and worldly properties in which a given set of individuals have an interest. Since this description is available in the present and does not rely on any specific, fixed identities, the present generation can act for the sake of future generations by acting in ways that avoid violating or support future generations' pursuit of their interests, whoever they turn out to be.

5.4.3.3. Future generations' just complaints

At this point, a critic might object that the argument that I have been advancing misses the key point that future generations will not have a complaint against the present generation, whatever the latter chooses to do with respect to climate change mitigation, because of the non-identity problem. After all, whoever future generations turn out to be will depend in part on whatever choices are made in the present.

Against this objection, I argue that future generations will have a just complaint against the present generation, if the latter fails to pursue the moderate-to-high mitigation pathway (or diminishes the range of opportunities available to future generations). Take the following example. Viktor Frankl, a Holocaust survivor, suggests that he "developed certain resources of character, insights into the human condition, and capacities for appreciation" precisely because of his time spent in Nazi concentration camps (Woodward, 1986: 809). In one sense, then, Frankl's life goes better than it would in an alternative where he spent no time in Nazi concentration camps, despite the egregious violations to his rights that occurred there. Of course, the Nazis are not entitled to any moral credit for the goodness of his later life, despite their causal role in it. Indeed, even on the "heroic" assumption that the Nazis could foresee this effect, it would not excuse their actions (Woodward, 1986: 809–10). The idea here is that Frankl has *specific* interests that the Nazis violate in their treatment of him. Even if Frankl's general interest in wellbeing happens to be partially secured as a result of his experience, his specific interests remain violated since, crucially, the latter are not reducible to the former. While on the whole, he does not regret the state of affairs that obtains in his later life, he can still justly complain that he should not have been subjected to the horrors of the Holocaust, based on his specific interests, that is, interests of his that are not reducible, or derived from, his overall interest in wellbeing. (Rawls, 1999)

Before considering whether this concept helps in the case of climate change mitigation, it is worth briefly rebutting a methodological objection. Heyd argues that "*sui generis*" nature of the non-identity problem rules out appealing to analogies, such as the one employed by Woodward (Heyd, 2009: 5,9; Woodward, 1986: 808). Heyd argues that "applying theories of value and rights to the act of their creation is logically puzzling" in a way that rules out appealing to analogies to illustrate a given theory of value or rights and the way that it applies to acts that do not involve creating beings of value or that hold rights (Heyd, 2009: 5). This argument relies on a misunderstanding of the purpose of using analogies. Take again the example of Viktor Frankl. This case is chosen to show that an act can be wrongful even if it in fact ends up making the wronged party better off than if the act had not taken place. It illustrates a point about the relationship between the concepts of wronging and the concepts of benefits and harming that is relevant to the non-identity problem. The analogy simply justifies one way of understanding the relationship just mentioned. It is correct to say that, when using analogies in arguments concerned with non-identity, one must be careful not to ignore the unique problems that those cases raise. However, that is no different from making the general claim that analogies, to be successful, must be constructed so that their constitutive components are relevantly analogous. There is no reason in principle why careful appeal to analogy cannot help understand the non-identity problem. The idea of complaints grounded in specific interests might prove unhelpful when thinking about cases of non-identity, but this will not be because of problems inherent to the employment of analogies.

That objection set aside, I take the distinction between general and specific interests to be quite helpful for outlining a basis for intergenerational duties of just mitigation that resists the non-identity problem. To see how, consider the follow example, which puts the Viktor Frankl example in terms of climate change mitigation. Imagine that the present generation fails to mitigate climate change and so events unfold roughly as is projected to be part of the minimal mitigation pathway associated with RCP8.5. Average global temperatures will be over 6ºC above the average between 1986 and 2005, with significant changes to the global climate system, such as significant sea level rise of up to 7 m (Stocker et al., 2013: 74). As was developed more fully in chapter 2, this leads to a wide variety of threats to human health and wellbeing. Few of those alive at that time have interests that are untouched by climate change; a great many have significant trouble securing their own interests.

In this scenario, will future generations have a just complaint, when they come into existence? The critic who is convinced of the intractability of non-identity will want to say that they do not. The

problem is that such a complaint must amount to complaining that one exists at all. It is that last point that is mistaken, for future generations can complain that they have specific interests that their predecessors ignored, that is, interests that are not reducible to their overall interest in wellbeing. It is perhaps more accurate to say, in this intergenerational case, that specific interests are not reducible to any given individual's overall interest in existing. The complaint that future generations will have is that the present generation, by leaving climate change unmitigated, fails to respond as it should to the prospect of violations to future generations' specific interests. In other words, future generations can complain that, if the present generation leaves climate change unmitigated, it fails to recognise the interest that future generations will have in a stable global climate, which is an interest that is not reducible to their general interest in existing. More generally, if the present generation runs down critical capital or allows for non-natural capital to dissipate to the point that future generations' inheritance will permit then a narrower range of opportunities than the present generation enjoyed, then future generations will have a series of just complaints against each of the ways in which the present generation has failed to discharge its intergenerational duties of justice.

To get at this point in a slightly different way, consider the same example of minimal mitigation, but with the added assumption that, in addition to climate change, continued technological innovation has produced a variety of valuable improvements to human life. Again, few, if any, of those alive at that time have interests untouched by these innovations; a great many benefit from them. It seems to me to be a mistake to assume that the gratitude that future generations will feel in response to these innovations will simply be an appreciation that their predecessors made the particular identity-fixing discoveries that they did. Future generations should not just feel grateful for existing, but also for the fact that they benefit from their predecessors actions that created and sustained valuable inventions. Indeed, any given member of a future generation should recognise that this is true, regardless of who in fact comes into existence. In other words, the gratitude that future generations should feel towards their predecessors for sustaining valuable knowledge, social arrangements and technologies is not reducible to, or derived from, the gratitude that future generations might feel in response to their own existence.

5.4.3.4. Summary: the hybrid view

In this section, I have outlined and defended a hybrid response to the non-identity problem. I have connected three ideas: (1) future generations' will have interests in worldly and personal properties that are not attached to specific identities; (2) the present generation can use these anticipated

properties to describe sets of future people as normative types, thereby also describing what the present generation should do for their sake; and (3) future generations' specific interests help explain the complaints that they will have, should the present generation fail to act justly.

Together with the proportional view, the hybrid view leads to the following substantive conclusion. Justice requires that the present generation preserve a range of opportunities that is proportional to the range that it inherited in the first place, where proportionality is defined by non-diminishment and just improvements. That implies intergenerational duties that rest on the description of future generations as normative types, highlighting the normatively salient worldly and personal properties in which they will have an interest. Should those alive fail to mitigate climate change, future generations will have just complaints. These complaints are grounded in the specific interests that the present generation should reasonably expect that future generations will share, given the normatively relevant properties that they will share. This is the structure that intergenerational duties of just mitigation, based on intergenerational justice as proportionality of opportunities, should take.

5.5. Conclusion

In this chapter, I set out to establish what implications, if any, follow from the problem of non-existence and the non-identity problem for intergenerational duties of just mitigation. This yields a two-fold conclusion, which itself constitutes an important development of the proportional view of intergenerational justice. First, the problem of non-existence shows that intergenerational duties must appeal to the duty-generating properties that future generations will have when they come into existence. Second, the non-identity problem shows that intergenerational duties should appeal to the interests of future generations as classes, or types, of people who share normatively relevant interests. Taken together, these two help specify the normative concepts that can be used to ground intergenerational duties of just mitigation. Along the way, I made several formal points that bear repeating. For one, I take these two problems to be logical challenges to normative concepts. It is the implications of these challenges that matter, as they will restrict the use of particular normative concepts. I reject the idea that these two problems can be accepted or rejected as unified entities, particularly by appealing to their intuitive plausibility. While intuitions have an important role to play in moral and political theory, it overstretches their purpose to use them as grounds for evaluating these two problems. Moreover, it ignores the logical challenges that they raise for existing normative concepts.

There remains another significant impediment to the justification and formulation of intergenerational duties of just mitigation, which I call the problem of indeterminacy. In short, it refers to the problems that follow from the fact that, for those alive at any given time, the future is not fixed. As I discuss in the next chapter, this indeterminacy produces problems both for settling on what duties the present owes the future, as well as how these duties should be discharged.

6. The problem of indeterminacy

6.1. Introduction

This chapter discusses the relationship between indeterminacy and intergenerational duties of just mitigation based on the proportional view. Like the problems of non-reciprocity, non-existence and non-identity, indeterminacy poses a significant challenge. Put simply, though there is an ever-growing body of evidence that climate change poses a significant threat to the well-being of future people (as well as non-human animals), it remains true that many details about how the climate will change and what impacts those changes will have on the world's ecosystems and human societies have yet to be determined. In short, climate change projections are indeterminate; that is, for a variety of reasons, climate change projections do not establish precisely what will happen. Indeed, when introducing the process of climate change in chapter 2, I listed a range of sources of indeterminacy, including those within the climate system (e.g. climate sensitivity) and those external to it (e.g. future human behaviour). In the context of such indeterminacy, exactly what the present generation owes future generations is unclear. Recalling the previous chapters, even if the proportional view of intergenerational justice generates duties of just mitigation that resist the problems of non-existence and non-identity, the unavoidable indeterminacy of climate change projections raises important barriers to establishing what the present generation should do for the sake of future generations.

In one crucial respect, this chapter is different from the previous two. Unlike the problems of non-reciprocity, non-existence and non-identity, there is no single, coherent problem of indeterminacy. Instead, I split the problem of indeterminacy into two components. The first, *the general challenge of indeterminacy*, is an abstract problem. At its core, this is a challenge for different understandings of normative duties to provide guidance for agents who must act, despite not knowing with certainty what effect a given possible action will have. Answering this challenge is the key to defending any intergenerational duty, including the ones related to mitigation.

The second component of the problem of indeterminacy is really a set of three problems, each of which relates to a different sub-type of indeterminacy. In short, I take there to be three sub-types of indeterminacy: risk, uncertainty and ignorance. Each of these produces a different impediment to intergenerational duties of just mitigation, which I call *the problem of risk, the problem of uncertainty* and *the problem of ignorance.*

With all that in mind, in this chapter, I address two questions: How, if at all, does indeterminacy threaten intergenerational duties of just mitigation and the proportional view of intergenerational justice? And how, if at all, do risk, uncertainty and ignorance about climate change projections impede, restrict or otherwise undermine such duties?

My argument runs as follows. Against *the general challenge of indeterminacy*, I defend the general position that the indeterminacy of climate change projections does not itself ground successful, general objections to intergenerational duties of just mitigation, as I conceive of them. I develop *the pluralist view* of normative duties as a form of duty that extends intergenerationally, despite the challenge of indeterminacy, as I understand it. Against *the problems of risk, uncertainty, and ignorance,* I argue that none lead to the conclusion that the present should not undertake significant mitigation climate change for the sake of future generations. Furthermore, in this chapter, I also discuss an influential response to indeterminacy, the Precautionary Principle. As I discuss in section 3, a variety of theorists, as well as political actors, appeal to different versions of this principle. However, it is not without its flaws. Indeed, I consider some criticisms that have been levelled against the principle. While none of those are decisive, I argue that, for the purpose of justifying generational duties of just mitigation, the Precautionary Principle is severely limited.

The chapter proceeds as follows. In section two, I first outline the concept of indeterminacy and define its constituents (risk, uncertainty and ignorance). In section three, I lay out some indeterminacy-based objections to duties of just mitigation. I then, in section four, I turn to the Precautionary Principle as a possible response to these objections. In section five, I consider a different way of defending against the general challenge of indeterminacy, one that does not appeal to the concept of precaution. In section six, I then explore the extent to which my answer to the general challenge also provides answers to the problems of risk, uncertainty and ignorance.

6.2. What is indeterminacy?

It is, at this early stage, important to clarify exactly what indeterminacy is. It is to this task that I now turn. In this section, I aim to explain (1) the general concept of indeterminacy; (2) the different types of indeterminacy; and (3) the underlying concept of probability.

6.2.1. Indeterminacy

Indeterminacy describes states of affairs that are not fixed. It can be *epistemological (or subjective)* or *ontological (or objective)* (Gillies, 2000: 2). The claim that a given state of affairs is not fixed due to epistemological indeterminacy is an agent-relative claim. Epistemological indeterminacy arises when a given agent considers a particular state of affairs to be indeterminate because that agent has limited evidence or because that agent simply believes that the available evidence is in some way limited. In contrast, ontological indeterminacy is not agent-relative. The claim that a particular state of affairs is not fixed due to ontological indeterminacy is a claim about properties of that state of affairs, properties which mean that the state of affairs is inherently probabilistic.

Ontological indeterminacy is a forward-looking concept in a way that epistemological indeterminacy is not. Consider the example of two unweighted six-sided dice. There is a frequency with which rolling the dice and adding the results will produce a given number between 1 and 12. At time t1, in advance of rolling the dice, I do not know what number will appear once I have rolled the dice at time t2. That is, the state of affairs at time t2 cannot be fixed in advance (at time t1) because of features of the state of affairs that are inherently probabilistic. However, once the dice have been rolled, the state of affairs at t2 is fixed: if I rolled 7, then that is the state of affairs that obtains at t2.[80] Epistemological indeterminacy does not have the same forward-looking feature. For example, I might not consider the state of affairs at t2 fixed even in retrospect if, for example, the dice are old and well-used, making it unclear what side represents what number, or if I have mistaken beliefs about how to represent numbers with dots. Epistemological indeterminacy can thus exist where there is no ontological indeterminacy. The converse is also possible: a given agent can be certain about a given ontological indeterminacy.

It is worth noting that indeterminacy is not only a problem for *intergenerational* normative theory. After all, many features of the present are indeterminate, so any effort to draw a sharp line between the determinate present and the indeterminate future is futile (Routley and Routley, 1978: 152–3). That said, indeterminacy *must* be addressed when considering intergenerational problems, since there is no way to avoid the fact that an agent who complies with an intergenerational duty does so based on

[80] There may be boundary cases of ontological indeterminacy that do not have this forward-looking feature. Here I have in mind the observer effect in quantum mechanics, where measuring a state affects the nature of the state itself (Schommers, 1989). Such boundary cases do not pose a problem for the core cases that are relevant to outlining the problems that indeterminacy poses when thinking about intergenerational duties of just mitigation.

projections about the future, which will always contain some measure of indeterminacy. Moreover, present indeterminacies are often tractable in a way that indeterminacy about the future is not. Consider a normative duty that is conditional upon the behaviour of others. For example, for the vast majority of individuals, it is true that the emissions from their personal activities are too insignificant to be thought of as causing the harms of climate change. A basic harm principle – e.g. do not perform an act that harms others – therefore does not rule out any given individual's GHG-emitting activities. One possible solution to this problem is to propose a refined principle that holds individuals not to act in a way that harms others *as long as no one else acts equally harmfully*. On this principle, a given agent's normative duties are conditional upon the actions of others. This usefully illustrates the difference between *intra-* and *inter*generational indeterminacy. In the *intra*generational context, it is possible, perhaps through some political institutions, to ascertain with a high degree of certainty how others will act, and therefore it is possible to know what that principle holds any given agent to do. In the *intergenerational* context, that principle is more troublesome. The indeterminacy of future individuals' behaviour is significantly more difficult to reduce, making robust predictions about it unlikely. It is therefore not clear what that principle entails and whether, for example, it holds present individuals to reduce their personal emissions, given that future individuals might not also live sustainably. That example illustrates two points. First, it shows that while indeterminacy is relevant to *intra-* and *inter*generational problems, there are still differences between indeterminacy in the context of the former versus the latter. Second, the application of that principle to the intergenerational context is not meant to show that the principle is substantively incorrect, but rather that it is simply not clear what the principle implies for present agents, given the indeterminacy of the future.

One final point is in order. There are three ways in which indeterminacy is relevant to intergenerational duties of just mitigation. First, the future is not fixed; events have yet to unfold. When the present generation thinks about what justice requires be done for the sake of future generations, the latter (including who will exist, what states of affairs will obtain, etc.) is indeterminate in a very general sense because they are *future* generations. Second, climate change projections contain indeterminacies. In trying to formulate their intergenerational duties of just mitigation, the present generation will look to climate change projections and find that many of them are, in one way or another, indeterminate, in that they do not provide a complete, well-defined (i.e. determinate) picture of the future. Finally, the point of discharging intergenerational duties of just mitigation is for the present generation to sustain the range of opportunities available to future generations, with some improvements; however, the

present generation cannot be sure that a given act will have a given effect in the future. Each of these raises questions that require answers: what should the present generation do when the future, projections about the future (with respect to climate change), and the effects of its actions on the future are indeterminate? While I do not structure the chapter according to these three, my arguments provide an answer to these questions all the same. I note these three here to help explain the relevance of indeterminacy to just mitigation.

6.2.2. Sub-types of indeterminacy

In this section, I outline the three constituent components of the concept of indeterminacy: risk, uncertainty, and ignorance.[81] Following Frank Knight (1921: 233), *risk* and *uncertainty* are distinguished by the type of information available: if the numerical probability of an event is known, it constitutes a risk; if it is unknown, then the event constitutes an uncertainty.[82] In other words, a risk is a possible event to which a numerical probability can be assigned, whereas an uncertainty is a possible event to which no numerical probability can be assigned. The term risk refers only to negative events, or events that are in some way bad (Zimmerman, 2008: 21; see also Rescher, 1983: 5). Risk, in other words, is the threat of harm (Perry, 2007: 190). Any positive counterparts – i.e. possible events that are in some way good – are simply

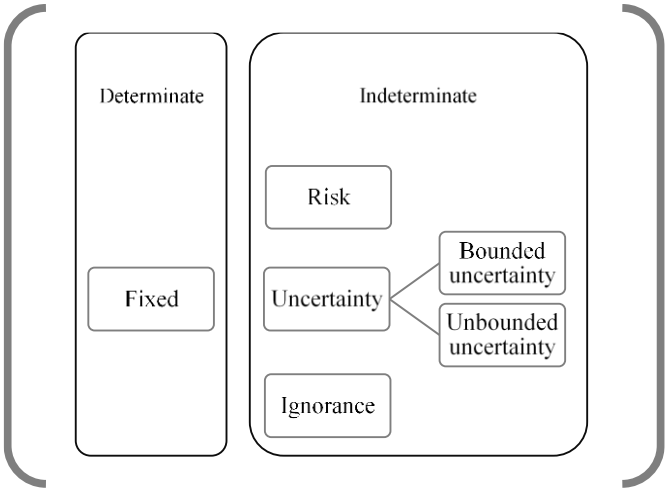

Figure 6.1. Types of indeterminacy

[81] A wide range of literatures deal with the concepts of risk, uncertainty and ignorance, and therefore a wide range of typologies of these concepts exists. For a typology that is close to the one presented in this chapter, see Harremoës et al. (2002: 188).

[82] It is worth nothing that the IPCC uses numerical probabilities to communicate uncertainties. The problem is that "natural language" is insufficiently precise and, perhaps more importantly, this imprecision hinders the communication of uncertainty, causing many to discount the importance of uncertainties (Kunreuther et al., 2014: 174). Some therefore argue that all of the entities to which the IPCC assigns numerical probabilities are risks (Gardiner, 2010: 54-5). This IPCC's approach to conversion of uncertainties into numerical probabilities is simply a communication strategy. It does not transmute uncertainties into risks. To anticipate the discussion in 4.1.3, the expert judgements contained in the IPCC assign *subjective* numerical probabilities to help communication of uncertainties. There still remains insufficient information to assign *objective* numerical probabilities and therefore the relevant possibilities remain as uncertainties.

chances. Uncertainties are different in the sense that they are possible events that can be good or bad. In other words, to suggest that there is a risk that P is to say that there is an adverse event that has a certain probability of occurring, whereas to say that it is uncertain whether P is to say that there is a possible event that might occur. A given risk is "the product of the disvalue of a bad outcome and the probability of its occurrence" (Moellendorf, 2014: 64). In other words, there are two feature of a risk: the possible hazard and its likelihood (Stirling, 2007: 309).[83]

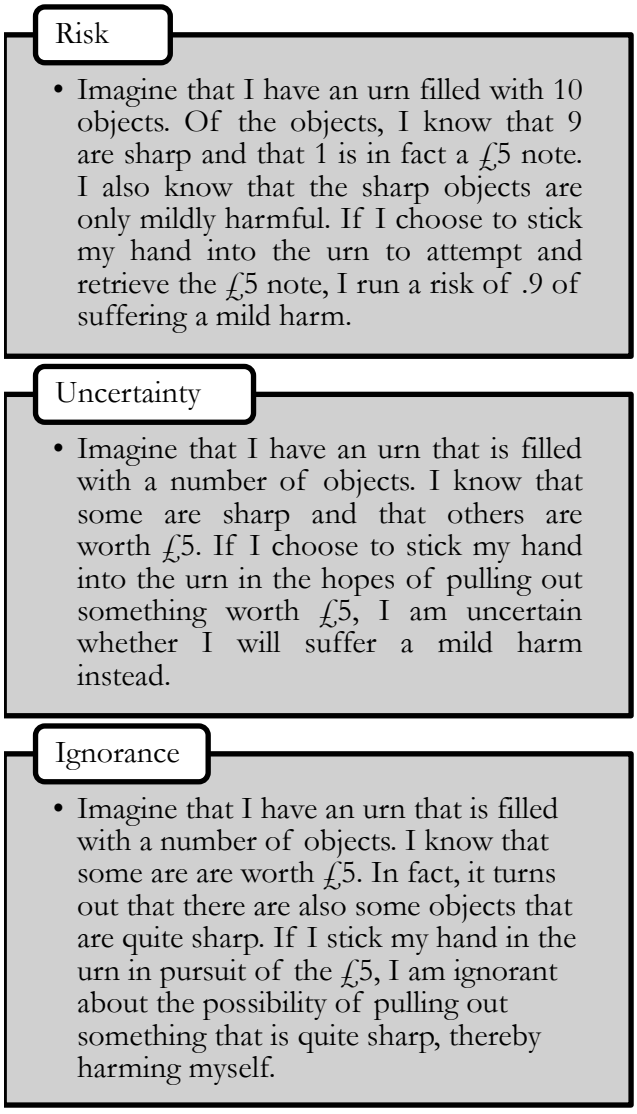

Figure 6.2. Illustrating risk, uncertainty and ignorance

It is important to distinguish *inter*generational from *intra*generational risk, as failing to do so conceals the ways in which approaches to dealing with the latter can be unsuitable to dealing with the former. One distinctive feature of intergenerational risk is that those affected by intergenerational risks are often not those who benefit from the risk-generating activity (Hartzell-Nichols, 2012: 932). Moreover, based on the definition of risk given above, intergenerational risk is quite rare, since many intergenerational problems are too ill-defined to support the attribution of numerical probabilities to possible outcomes (Hartzell-Nichols, 2012: 934). This leads some to conclude that risk and uncertainty should not be distinguished on the grounds offered above (Hartzell-Nichols, 2012: 934). The argument is that, particularly with respect to climate change, the concept of risk needs to be

[83] There are two further sub-types of uncertainty: bounded and unbounded. Bounded uncertainty refers to entities to which an upper and lower boundary of probability can be placed (Sunstein, 2007: 22). In contrast, unbounded uncertainties are events the probability of which is entirely unknown

expanded to include outcomes that I have labelled uncertainty. However, this temptation should be resisted and we should retain the distinction of risk and uncertainty as outlined above. The reason is more than pure semantics: maintaining the labels as such provides a more accurate outline of the concepts at hand, which are as follows. Risks are adverse events to which a numerical probability can be assigned; intergenerational risks refer to risks that are vastly separated in time from the risk-generating activity. Uncertainties are possible events to which no numerical probability can be assigned; intergenerational uncertainties are possible future events.

Another alternative is to use uncertainty to refer to a defined outcome with a numerical probability and ignorance to refer to the state that obtains when outcomes are defined without reference to probability (Bunzl, 2015: 27). The problem with this taxonomy is that it does not leave room for the concept of events that simply are not or cannot be defined in advance. This is what I refer to as *ignorance*. What marks ignorance as distinct from uncertainty is that it describes circumstances where outcomes are not well defined (Stirling, 2002: 42; see also Hacking, 1986; Wynne, 1992, 2002). For example, the "hypothetical possibility that natural variability might halt or reverse" the anthropogenic drivers of climate change refers to events to which no probability can be assigned and, moreover, that remains poorly defined (Allen, 2012: 16).[84]

6.2.3. A note on probability

Probability is a key concept to understanding indeterminacy. It is therefore crucial to be clear about exactly how I employ the term. This is particularly important given the trouble that the human mind has with the concept of probability, as well as the biases to which we are all predisposed when considering probabilistic situations (Tversky and Kahneman, 1974: 1124). In short, there are three types of probability: objective, subjective, and epistemic. This section clarifies each of those.

[84] Some would add a fourth subcategory to refer to the contingent social demands that are made of information. Wynne calls this indeterminacy (Wynne, 1992: 115). Stirling (2007: 310) calls this ambiguity, which is also a term Wynne uses later (2002: 461). This category is fundamentally of a different type than the risk-uncertainty-ignorance taxonomy that I defend. The idea of adding this fourth category is to highlight that scientifically generated information, with its various accompanying risks, uncertainty and ignorance, can be put to different uses, according to the social purpose of the relevant information (Wynne, 1992: 116). This in turn helps determine the various significances of risk, uncertainty and ignorance. I mention this additional category not to dispute it, but rather to note that the significance of risk, uncertainty and ignorance depends on its social significance and the uses to which the information will be put. That said, I do not include it as a fourth subcategory of indeterminacy: the social contingency of risk, uncertainty and ignorance is simply a feature shared by all three concepts.

Objective probability refers to the chance of a given outcome that results from a particular system (Gillies, 2000: 180–3; Hacking, 2001: 131–33; Mellor, 2005: 8). This type of probability is human independent in the sense that it is not directly controlled by human choice (Gillies, 2000: 180). Instead, it is a feature of the material world and it is the properties of the world that interact to generate this form of probability. With that in mind, an alternative term is physical probability (Mellor, 2005: 8). However, the term 'physical' is misleading in an instructive way, for objective probability describes systems beyond those that are obviously physical. For example, in psychology, the chance that a given human will retain arbitrary numbers diminishes as the numbers become longer(Mellor, 2005: 10–1). I can control the chance that I have of catching a disease by varying my exposure to it, but what chance is associated with what level of exposure is outside of my control.

Subjective probability refers to the strength with which a particular agent, individual, or collective, believes a given proposition (Gillies, 2000: 55ff; Hacking, 2001: 131–33; Mellor, 2005: 9). [85] This form of probability is thus entirely human dependent, since it refers to human beliefs. In other words, it is the level of credence that a given agent holds with respect to a given proposition. One of the key features of subjective probability is that it is a matter of degree. However, it may appear that subjective probability expresses an agent's endorsement of (or opposition to) a probabilistic proposition. The phrase "I think that it might rain later" admits of three possible meanings: 'I believe that it will rain later' or 'the available evidence shows that there is a greater-than-chance probability that it will rain later' or 'the nature of the climate system is such that there is some chance that it will rain later.' On the latter two, the phrase represents an agent's belief in epistemic and objective probability, respectively. Only the first phrase, which represents subjective probability, has a proposition in which an agent has some level of credence.

Another example might help to reinforce this distinction (Mellor, 2005: 13). Take a coin that either has two heads or two tails. I do not know which actually describes this coin. I might say that, when thrown, I give a 1/2 credence (where credence is a measure of the degree of belief in a proposition)

[85] Some criticize these terms ('objective' and 'subjective') as being "loaded," where objectivity is implicitly considered more desirable than subjectivity, which amounts to a synonym for prejudice (e.g. Hacking, 2001: 130). I should stress that my use of these terms (as well as their use by the authors cited in this section) does not appeal to or in any way trade on these possible connotations. In fact, the opposite is true. The subjective and objective perspectives are equally important to understanding decision-making in the context of indeterminacy, since they simply represent different forms of indeterminacy.

that it will land on heads. Objectively, this is incorrect: the coin either has two heads or two tails faces, so its objective probability of landing heads is either 1 or 0. Since I have no information about the coin, I have no evidence with which to form an *epistemic probability*.

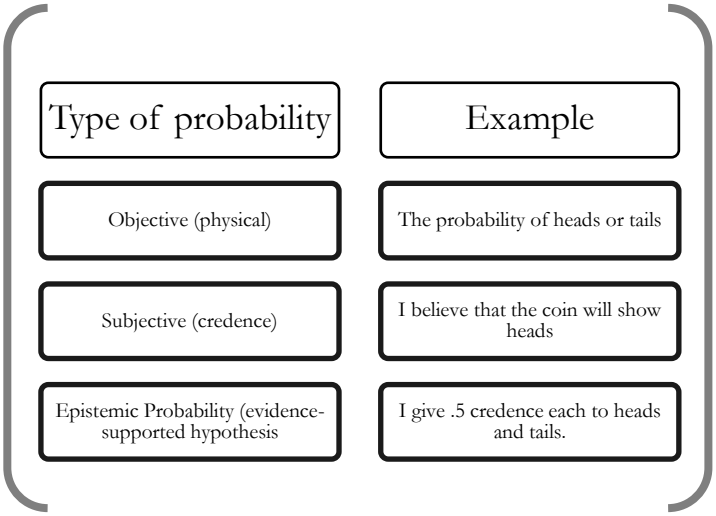

Figure 6.3. Illustrating types of probability

Epistemic probability is a third type of probability. It "measures how far evidence confirms or disconfirms hypotheses about the world" (Mellor, 2005: 8). For example, epistemic probability is key to both the standards of 'balance of probabilities' and 'beyond reasonable doubt' that are central to civil and criminal courts, respectively. Subjective and epistemic probabilities are also central to epistemological indeterminacies. Subjective probability allows a given agent to express the strength with which that agent believes that a state of affairs will obtain; epistemic probability allows a given agent to express the strength with which the evidence available to that agent supports a particular hypothesised state of affairs. In contrast, the concept of objective probabilities underpins ontological indeterminacy, since the latter is expressed in terms of the former.

Objective probability and subjective probability correspond quite directly to ontological and epistemic indeterminacy, respectively. When a state of affairs is not fixed, quite independently from what a given agent knows or thinks about that state of affairs, then that state of affairs is probabilistic. In contrast, when a state of affairs is not fixed in a given agent's mind, then it is subjectively probabilistic. Epistemic probability also produces epistemological indeterminacy. When a given state of affairs is considered indeterminate because the evidence only confirms (or disconfirms) a hypothesis probabilistically, then that indeterminacy is epistemological. Note that epistemic probability can be used to describe states of affairs that are either ontologically indeterminate or not in fact indeterminate at all. The fact that the quality of evidence only supports epistemic probability judgements does not change the underlying fact of the matter, which may or may not be indeterminate in the ontological sense.

Two final points are in order. First, not all probabilities have numerical values (Mellor, 2005: 16). That said, even probability claims that lack numerical values (e.g., X is improbable) still adhere to logical rules that apply to numerical probabilities (Mellor, 2005: 16–7). For example, an event with an objective probability of P(.1) has a lower chance of occurring than an event with a P(.9), which is equally true of an event that is 'very improbable' and an event that is 'very probable.' Of course, descriptors lead to fuzziness. Indeed, this is part of the rationale presented in the IPCC for the assignment of subjective numerical probabilities to uncertainties in the IPCC's AR5. That said, it does not follow that non-numerical probabilities are not useful, in the right circumstances. Some applications of probabilities (e.g. setting insurance premiums) require numerical probabilities; some do not. Second, these three types of probabilities do not always appear in isolation from one another. The discussion in this section presents these three as Weberian ideal types (Weber, 1949: 92ff), where the treatment of each in isolation aids in defining the categories without implying that real examples of probability do not combine each type in various ways. A given agent considering how to act, given a range of options, will in many circumstances have to confront probabilities of more than one type.

6.3. The general challenge of indeterminacy

In this section, I develop the general challenge of indeterminacy. As noted above, it is not attached to a specific sub-type of indeterminacy. Rather, as I explain below, it is a general challenge that undermines agents' effort to discharge their duties of justice in indeterminate contexts. Before outlining the challenge as I see it, I first canvass some arguments that appeal to indeterminacy to release the present generation from its intergenerational duties of just mitigation.

6.3.1. Arguments for prioritising the present

One line of reasoning that limits intergenerational duties of just mitigation on the grounds of indeterminacy is that *intra*generational duties between contemporaries should take priority over intergenerational duties between non-contemporaries because the quality of information about the former is superior to that which is available about the latter (Routley and Routley, 1978: 153). In its simplest form, this is not a particularly strong challenge: the "main ploy is to considerably overestimate and overstate the degree of certainty available with respect to the present and immediate future" (Routley and Routley, 1978: 152).[86] It is easy to see how this objection applies to the case of climate

[86] Indeed, this is a tactic used by some, such as Bjørn Lomborg (2001: esp. chapter 24).

change mitigation. After reading chapter 2, a critic might conclude that the case for climate change mitigation rests on tendentious empirical grounds, replete with indeterminacies. This interpretation simply misreads the facts. For example, while it is not clear exactly how much warming a given level of atmospheric GHGs produces, as well as what a given level of warming (or other changes) imply for human societies, it remains true that increases in atmospheric GHGs lead to changes in the global climate that threatens the interests of future generations. In other words, while the abstract point that, in general, less is known about future states of affairs than present ones is intuitively plausible, it does not follow that there are no intergenerational duties of just mitigation. Against the intuitively plausible abstract point are the empirical details of this particular case, which do support such duties.

A stronger version of this argument limits intergenerational duties of just mitigation on the grounds that future generations' interests are indeterminate (Kavka, 1981: 111; see also Ekeli, 2004; Golding, 1981).[87] Rather than focusing on the indeterminacy of climate change projections, this argument rests on the indeterminacy of future generations' claims. Of course, future generations will have some interests that those alive in the present cannot predict. To be especially charitable to this argument (perhaps implausibly so), one might even concede that a wide range of important interests are unknown: for example, it might turn out that sea level rise does not matter to future people because they do not have interests in feeling a sense of place or attachment to a particular area. Even with this (tenuous) concession, it does not follow that nothing is presently known about future generations' interests. The proportional view of intergenerational justice is particularly immune to this sort of objection. The reason is that duties of justice are largely (though not entirely, in the case of just improvements) defined by each generation's inheritance. Because of this, what a given generation should sustain depends on readily available information about that generation's inheritance and the opportunities that it has secured for this generation.

Another way of according the present some priority over the future, on the grounds of indeterminacy, is to appeal to a discount rate. Most commonly associated with economic approaches to intergenerational issues, a discount rate expresses the degree to which an agent at a given time can, when considering what to do, reduce the costs or benefits of the future consequences of a possible

[87] This argument is not always made in terms of interests. Some articulate it in terms of preferences, for example (Passmore, 1974; for a critical response, see Routley & Routley 1978: 155). Whether one takes interests or preferences to ground future generations' claims makes no difference. The point is that the indeterminacy of this foundation means that they do not have just claims against the present.

action. There are a number of different types of discount rates, and confusion over this point has led to disagreements based on mutual misunderstanding (Broome, 1994: 128). With that in mind, note that there are three different *types* of rates – (1) pure time discounting; (2) growth discounting; and (3) opportunity cost discounting – as well as two *values* that can be discounted – (1) individuals' interests (e.g. wellbeing) and (2) commodities (Broome, 1994: 130ff; see also Ponthière, 2004). Not all of these rely for their justification on the indeterminacy of the future. For example, growth discounting aims to offset for future generations' wealth; opportunity cost discounting offsets the potential loss from unchosen actions. In short, if one takes the indeterminacy of the future seriously and wishes to capture it using a discount rate, one will use a version of the pure time discount rate, which simply discounts future events depending on how far they are into the future. For example, one might wish to discount the possible future benefits of a given action at a rate that reflects the possibility of human extinction, that no one will exist in the future to enjoy the benefits in question (Ponthière, 2004: section 4).

The problem with this sort of indeterminacy-based discounting implicitly assumes that time tracks probability. This assumption, however, leads to two objections (Parfit, 1984: 480–6). First, it suggests that probability, not time, is the normatively significant factor (Parfit, 1984: 482). After all, the reason that time is associated with quality of information is that the latter is significant to establishing a given agent's normative duties. That is, when considering what to do, agents should consider the relative probability of possible events. In some cases, an agent is justified in according less significance to a future event on the grounds that it is not particularly likely to occur, especially when compared with ongoing events or events in the very near future that are quite likely to occur. It is the probability of a given event, however, that is of fundamental importance. This leads to a second objection, that time does not always track probability. Importantly, in cases where this is true and time does *not* track probability, dismissing a normative duty because of the temporal location of a relevant fact will produce the wrong conclusion. In short, time is not a good proxy for the relative determinacy of information: it is in fact a distraction that leads to mistaken conclusions, in certain circumstances.

6.3.2. Defining the challenge

None of the arguments considered above show that indeterminacy poses a significant challenge to duties of just mitigation. The problem with those various arguments is that they misunderstand the challenge that this indeterminacy raises for intergenerational duties. I therefore outline an alternative problem, the general challenge of indeterminacy. In my view, this constitutes the main problem that

the indeterminacy of the future raises for intergenerational duties of just mitigation (as well as intergenerational duties more generally).

When a moral agent considers the question, 'what should I do?' in a given circumstance, the obvious answer is: do what is *in fact* morally required. As argued throughout the thesis, with respect to climate change, justice requires the present generation to mitigate climate change, on the grounds of a principle of intergenerational equality of opportunity. On this view, then, when considering whether and how much to mitigate climate change, the present generation should pursue climate change mitigation strategies that will in fact protect the ability for future generations to secure their own interest for themselves. However, the present generation does not possess the information required to know that a given choice will in fact protect this. The problem is that a concept of normative duties that holds agents to do what is in fact morally required has no purchase in indeterminate circumstances. Again, that is not to say that there is no available basis upon which to ground projections about climate change and the adverse impacts it threatens. The problem is that there is a gap between what, at first glance, justice requires agents to do – namely, do what is in fact required – and the empirical basis that is available to the present generation when considering its intergenerational duties of just mitigation. The general challenge of indeterminacy, then, is to develop a concept of normative duties that applies directly to indeterminate circumstances.

The mistake of the objections canvassed above is that they consider indeterminacy to apply directly to intergenerational duties. Implicit to each of them is the view that indeterminacy is relevant to what a given generation owes its successors in principle. This is a mistake. That said, indeterminacy might still undermine intergenerational duties. However, it will result from the gap outlined above: indeterminacy undermines duties of just mitigation by driving a wedge between what justice requires and what agents motivated by reasons of justice can do. If the general challenge is unanswerable, it does not follow that the present generation owes less to future generations because of indeterminacy, but rather that the present generation cannot successfully discharge the duties that it owes to its successors.

In sum, the general challenge of indeterminacy is to bridge the gap between a given intergenerational duty in principle and agents' efforts to discharge that principle. In my view, considering what effect indeterminacy has on intergenerational duties of just mitigation shows that I need to specify a more

precise account of normative duties that can apply to agents' decision-making in the context of indeterminacy.

6.4. The Precautionary Principle

The Precautionary Principle offers one way of resisting the general challenge of indeterminacy, bridging the gap between what justice requires and what agents can do. In this section, I discuss what the principle is and assess its success as a response to this general challenge.

6.4.1. What is the Precautionary Principle

The one feature of the Precautionary Principle about which there is consensus is that there is disagreement about virtually every feature of the Principle, including its origins, its definition, its scope and its utility (Farber, 2015: 1674–5; Sandin, 2004: 461; Steel, 2015: 1). As such, in this subsection, I outline the core features of the Principle that make up a large proportion of the total number of its alternative versions. Before turning to the Principle itself, note that some dispute the term 'Precautionary Principle,' instead arguing that there is really only a precautionary approach that generates context-specific principles (Broome, 2012: 117; Hartzell-Nichols, 2013: 308). Despite these disagreements, I take there to be underlying themes that unify the disparate sense in which precaution – as a Principle or approach – appears when thinking about how to respond to climate change.

As with many other features of the Precautionary Principle, its origins are unclear. One early example of the precautionary approach to public actions – which predates theoretical efforts to outline a particular principle – was the removal of a water pump's handle during a cholera epidemic in 1854, with the aim of limiting the spread of the disease (Harremoës et al., 2002: 5). It began to solidify into an explicitly precautionary approach in the 1970s in German efforts to combat "forest death," the causes of which were not well understood (Harremoës et al., 2002: 4). Precaution has also figured in a variety of international legal instruments including the Montreal Protocol on Substances that Deplete the Ozone Layer and the UNFCCC. The UNFCCC's formulation of the Principle runs as follows:

> [T]he Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures

> to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost." (UNFCCC, 1992: article 3.3)

There are three features that together form the core of most interpretations of the Precautionary Principle, including the UNFCCC's (for similar breakdowns of Precaution, see Ahteensuu and Sandin, 2012: 969; Sandin, 1999). Each feature is necessary and together they are sufficient to generate a Precautionary Principle, regardless of other features that a given version might also include. First, there must be the prospect of harm, which provides the fundamental reason why the preventive action might need to be taken. For example, article 3.3 (outlined above) refers to "threats of serious or irreversible damage" (Kunreuther et al., 2014: 172). Second, there is the notion of preventive action: this is the idea that the principle licenses actions that prevent harm even in the absence of complete understanding of the harms and their causes. With that in mind, the UNFCCC refers to anticipating and preventing harm. Third, and most importantly for our purposes, the principle is invoked in the face of indeterminacy (Gardiner, 2006: 36, 50; Wiener, 2008: 598). According to the UNFCCC, quoted above: "lack of full scientific certainty should not be used as a reason for postponing such measure". This is the feature that distinguishes the Precautionary Principle from more simple, generic harm principles. The idea is that when there is the prospect of possible harm that might be brought about by means that are not fully understood, the Precautionary Principle licenses acting to prevent the harm.

Building on this three-fold foundation, many attempt to further specify the Principle. For example, it is suggested that the Principle should apply when there are "high stakes" and an "effective solution" is known (Page, 2006: 31). Others distinguish between a strong version, where the principle *requires* action and a weak version, where the principle simply *permits* action (e.g. McKinnon, 2012: 54). Others take a different approach that attempts to frame the principle as a 'common sense' principle, aiming, for example, to reflect views about precaution in practical action that are held across cultures and throughout time (Martin, 1997: 264, 276; Trouwborst, 2002: 7). I simply note these possibilities to highlight that the core three components of the Precautionary Principle can be developed to fit further substantive views about what the Principle should require of agents.

6.4.2. Critics of precaution

In this section, I offer a sketch of critiques that have been levelled against the precautionary approach and the Precautionary Principle. I will discuss first two major criticisms: (1) incoherence and (2)

vagueness. On the grounds of those two problems, I then argue that the Principle only offers a partial response to the challenge of indeterminacy. Note that there is often a third charge levelled at the Principle, namely that it is too extreme, either proving too permissive or too restrictive (for a review of these extremes, see Gardiner, 2006: 37ff). I do not examine this third line of critiques in this section as they are attached to particular instantiations of the Principle. In contrast, the two major criticisms I discuss are a problem for a wide range of differently formulated principles.

The first criticism is that the Precautionary Principle, howsoever conceived, generates incoherent requirements of agents. For example, it is "unclear and even internally contradictory when it applies simultaneously to threats of harm to human health and the environment" (Hartzell-Nichols, 2012: 952). Genetically modified organisms (GMOs) and genetically modified crops provide precisely such a problem (Turner and Hartzell, 2004: 454). On the one hand, GMOs might prove effective at combating malnutrition in certain populations; on the other hand, concerns have been raised about the possible, but as-of-yet poorly understood or even unforeseen, effects of consuming GMOs. In this case, what constitutes preventive action? Of course, one might appeal to the relative disvalue of the different harms to prioritise one preventing action over another. However, the problem is that, given that the Precautionary Principle is meant to apply to indeterminate circumstances, there is every possibility that a definitive ranking of possible harms is not possible. With that in mind, the Principle does seem vulnerable to the objection of incoherence: the issue is that indeterminacy remains problematic in circumstances where the Principle generates incoherent requirements.

The second critique of the Precautionary Principle is that it fails to provide the resources necessary to specify a number of important parameters, including what threshold of harm must be crossed to trigger the principle, what number and intensity of precautionary efforts are sufficient, what level of investment (and therefore opportunity costs) is required, and who is responsible for discharging the requirement of the Principle (Farber, 2015: 1674; Hartzell-Nichols, 2012: 952; Sunstein, 2007: 2). Some take this problem as a call to better specify the Precautionary Principle (e.g. Sandin et al., 2002: 290). Of course, some versions will be formulated to be immune to some of the issues just mentioned. But this is not a sufficient answer to the problem. Here again I return to the fact that the Precautionary Principle is always applied to indeterminate circumstances. Therefore, important considerations, such as the magnitude of possible harms, are unclear and the effectiveness of any given response cannot be assured, and so the relationship between the costs incurred and harm prevented is unclear. In other words, what is the significance of the harms prevented through precaution, especially as they compare

to the costs of precaution? Of course, the proponent of the Precautionary Principle might argue that this is precisely the scenario in which agents should appeal to the Principle, since it tells agents not to let indeterminacy prevent them from acting. Beyond this license to act,[88] the Precautionary Principle does not help agents to choose how to act in indeterminate circumstances.

Do these problems apply to precaution in the context of climate change mitigation? Consider first the problem of incoherence. On the one hand, mitigating climate change might seem like the precautious choice. Indeed, insofar as the moderate-to-high mitigation pathway contains the least damaging climate hazards, pursuing this pathway clearly minimises the risks that climate change threatens. On the other hand, given that this mitigation pathway will be at least somewhat costly or burdensome for the present generation, some might argue that the precautionary choice is to mitigate less, if at all, to make sure that costs are not incurred for nothing. Or some might interpret precaution differently, arguing that adaptation and rectification are less indeterminate and so the precautionary approach is to invest in these. In reality, the relevant evidence firmly supports the conclusion that the burdens of unmitigated climate change will far outweigh the burdens of climate change mitigation and so the precautionary approach probably does not generate significant incoherence in this case. It should be noted, however, that the reason for this relative success is a function of the evidence available, not of the precautionary approach itself.

The vagueness of precaution is more troubling when thinking about what it implies with respect to mitigation. Consider the indeterminacies inherent to the climate system discussed above. For example, if one objects to mitigation on the grounds of possible climate feedbacks – that might either render mitigation futile or redundant – precaution appears to ground a decisive response: act despite the indeterminacy. The problem is that this is only part of the issue. There are further, more fine-grained questions about how to go about doing so, including what targets (in terms of timing, temperature or atmospheric GHG concentration) to set or what balance of sink enhancement and emissions reduction to employ.

[88] Or in certain cases, the requirement to act. This depends on whether one endorses a strong Precautionary Principle that requires action in the face of possible harm or a weak Principle that simply permits action in such circumstances (McKinnon, 2012: 54)

In short, precaution appears to be ill-equipped to answer anything more than the binary question of whether or not to mitigate at all. Many argue for adopting a particular point within the range of uncertainty about climate sensitivity.[89] One problem is that proceeding on the grounds of such an assumption adds a significant point of contestation about the policies that are proposed on the grounds of such an assumption, particularly given that such assumptions often lead to costly policy proposals. This state of affairs is "fragile" in the technical sense that both the costs and impacts of mitigating policies are grounded on an assumption about climate sensitivity, which leaves them particularly vulnerable to contestation (Otto et al., 2015: 918). Against this, some adopt an approach to mitigation policies that are indexed to increases in global temperature attributable to human activity (Otto et al., 2015: 918–20). The idea behind this approach is that, rather than setting assumptions in the face of indeterminacy, an index that represents actual warming would rely on empirical observations and increase the stringency of mitigation requirements as time passes. How should the present generation choose between those two approaches to climate change mitigation? In other words, how should it weigh the reasons for and against either approach? Here, the Precautionary Principle is unhelpful because, while it tells us to act, it offers no guidance about the form that action should take, or the costs that we ought to incur in taking it.

With all that in mind, precaution – as a Principle or approach – provides an imperfect justification for mitigating climate change. While it is in one way quite clear about the implications of indeterminacy for climate change mitigation – indeterminacy is not sufficient grounds to justify inaction – precaution is also unclear in other ways, with respect to what it implies for mitigation. In the end, the precautionary approach fails to meet the general challenge of indeterminacy and close the gap that indeterminacy opens between intergenerational duties of justice and agents who are motivated to act according to reasons of justice. For the moment, I set aside precaution as a response to the general challenge of indeterminacy to develop another response, which I call *the pluralist view*.

6.5. An alternative to the Precautionary Principle: the pluralist view

In this section, I outline the pluralist view of normative duties, a view which aims to close the apparent gap between what a duty requires of a given agent and the indeterminate grounds on which this agent has to act. This in turn produces important improvements for the conception of intergenerational

[89] E.g. Moellendorf argues for a "middle-range consensus of 3ºC" (2014: 76).

duties of just mitigation based on the proportional view. Before outlining the pluralist view, I consider three alternatives, namely, fact-relative duties, belief-relative duties and evidence-relative duties. My aim is not to settle which of those is correct. Instead, I take them to express different ways in which we might conceive of normative duties. In other words, they capture different properties of an action that can make it either wrongful or required.[90] Given that the overall concern in this thesis is with whether the present generation is required to mitigate climate change of the sake of future generations, I aim to establish a conception of normative duties can justifiably hold the present generation to mitigate climate change for the sake of future generations.[91] This explains my choice of label: the view I suggest is pluralist because it is immune to the challenge of indeterminacy *without* endorsing one of the three views discussed below over the others. Indeed, the pluralist view is coherent with whichever view one takes to be required for a given agent to have a normative duty.

6.5.1. Fact-relative duties

I consider first the fact-relative view of duties, which takes duties to require agents to do what is *in fact* required. Consider the following:

> *The Fact-Relative View:* an agent has a normative duty to perform an act only when that act is in fact the morally required option, based on what matters morally (Parfit, 2011: 150; Zimmerman, 2014: 2).[92]

On this view, the present generation has a duty to mitigate climate change, for doing so will in fact protect future generations' opportunities to secure their own interests. Regardless of whether the present generation believes this to be the case, on this view, the duties still exist.

In general terms, the strength of the objective view is that it clearly produces normative duties that conscientious agents should follow when considering how to act. If the present generation aims to

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[90] Parfit applies fact-, belief- and evidence-relativity to wrongness, rather than to normative duties (2011: 151). The difference in his conceptual focus (on wrongness) from the present focus on normative duties is slight. For example, if one has a belief-relative duty to X, then it is also wrong not to X, in the belief-relative sense. Parfit's language has received other, similar extensions, such as to the context of rights (Quong, 2015). Parfit briefly discusses the implications of the concept of wrongness for normative duties (Parfit, 2011: 165).

[91] Note that there are other ways of dividing the territory. For example, some omit the category of evidence relative duties (e.g. Gibbard, 1990: 42) or argue that there is only one type of normative duty (e.g. Thomson, 1990: 173). Those views notwithstanding, it is implicit in the following discussion that I consider there to be three independent (though, of course, related) view of normative duties that each capture distinctive positions.

[92] In defining this view, as well as the next two, I include the phrase 'based on what matters morally' to be clear that these are conceptions of normative duties that can be attached to any different substantive moral view, such as consequentialism, non-consequentialism, etc. For a defence of this approach, see Zimmerman (Zimmerman, 2008: 2–5; 2014: 8).

respect the interests of future generations as classes of individuals, then the fact-relative view generates duties that will hold the present generation to perform actions that will ensure that it actually respects these interests. As such, it expresses the type of normative duties that agents would have, had they all the relevant information. J. J. Thomson, for example, points out that it would be "weird" if normative duties varied according to whether an individual divulges or withholds information that would help another discharge a fact-relative duty (1990: 233).

The fact-relative view of normative duties is clearly subject to the objection that, at first glance, it appears to have no purchase in any situation where an agent must confront indeterminacy. Nowhere is that clearer than with respect to climate change mitigation. If the best that normative principles can provide for the present generation is principles that hold it to act in a way that will in fact bring about the morally best circumstances, then those duties will be effectively impossible to discharge, given that climate change projections, as well as projections about the effect of any given mitigation strategy, are replete with indeterminacies.

6.5.2. Belief-relative duties

The following view of normative duties is a stark contrast from the fact-relative view:

> *The Belief-Relative View:* an agent has a duty to perform an act only when that act is what that agent believes to be the morally required option, based on what matters morally (Parfit, 2011: 150; Zimmerman, 2014: 7).[93]

On this view, the present generation has a duty to mitigate climate change if it believes that doing so will protect future generations' opportunities to secure their own interests. In general terms, the idea here is that the present generation only has a given normative duty if there is the belief that the present generation has that duty. At first glance, this might seem to illustrate the implausibility of the belief-relative view of normative duties. After all, it appears to imply "that all moral agents possess a certain kind of moral infallibility" (Zimmerman, 2008: 13, see also 2014: 27). In other words, on this view, there is no point to changing ones beliefs: one can never do better (or worse). Because it fails to establish any critical distance between agents' beliefs and agents' duties, this conception of normative

[93] For one influential defence of the view that belief-relative duties are the *only* normative duties that agents can have, see (Ross, 1939: 146-58). For a criticism of this argument, see (Zimmerman, 2008: 8-16).

duties cannot alone fulfill their moral purpose. Unlike the fact-relative view, this view cannot hold agents to duties that they believe are in fact wrong (Hems, 1955: 560), which is simply implausible.

This objection notwithstanding, there is a class of cases where belief-relativity matters, such as circumstances where an agent must make a quick decision. Consider the following example (based on Smith, 2010: 64). A multi-storey building is on fire. A concerned citizen alerts the tenants to the fire and directs everyone to take the stairs, despite having no prior relevant experience with evacuations and simply believing that it would be best to take stairwell A, rather than its alternative, stairwell B. As it turns out, fewer people escape the blaze because of the length of time it takes to exit; this would not have occurred if everyone took stairwell B, which would have provides a faster exit. The belief-relative conception of normative duties is useful because it explains blameworthiness: we might consider the concerned citizen to be blameless, since the directive to take the stairs might be based on a reasonable belief.[94] With this in mind, the objection presented above shows that this conception of duties is limited in its application, applying to restricted scenarios such as those where agents must act and has no opportunity to change their beliefs.

Climate change is not one such case. The example of the fire is relevantly disanalogous from the case of climate change. The present generation's choice is not one that is made with restrictions, such as time constraints, which justify acting on beliefs alone. Importantly, an enormous quantity of evidence is available that pertains directly to the present generation's options with respect to responding to climate change. There has been ample time for the evidence to be considered. To act according to belief rather than on this evidence would not, therefore, produce the same result as it did for the concerned citizen. With this in mind, the belief-relative view of duties is not relevant to the present discussion of intergenerational duties of just mitigation insofar as it constitutes a plausible view of (certain) normative duties.

6.5.3. Evidence-relative duties

> *The Evidence-relative View:* an agent has a duty to perform an act only when that act is what the evidence available to that agent holds is the morally required option, based on what matters morally (Parfit, 2011: 151; Zimmerman, 2014: 8)

[94] For related views see Scanlon (2008 especially chapter 4) and Parfit (2011: 151–6).

On this view, the present generation has a duty to mitigate climate change if that is what the available evidence shows will protect future generations' opportunities to secure their own interests. The strength of the evidence-relative view is that it avoids the significant problems that plague each of the other two views. The belief-relative view fails to achieve the critical distance that is one of the central purposes of considering normative duties in the first place; the fact-relative view, as articulated above, seems not to provide guidance in the epistemic situation in which agents so often find themselves. The evidence-relative view has neither of those problems.

Exactly what constitutes 'available evidence' is crucial to this conception of normative duties. Consider first the interpretation of evidence as that which agents *could* have availed themselves, whether or not they have considered it. On this view, evidence refers to all of the evidence that is available to an agent, rather than the evidence that the agent has actually considered. Adopting this view recognizes that agents have responsibilities with respect to gathering the knowledge required to discharge normative duties. An agent who acts wrongly due to a failure to consider some pertinent evidence cannot appeal to ignorance to justify the wrongful action in cases where the agent is culpably ignorant, that is, where the agent bears prior responsibility for the ignorance (Smith, 1983: 548ff). With that in mind, the evidence-relative view holds agents to choose actions according to normative duties that are fixed by the evidence that is available to agents, whether or not it has in fact been considered. Note further that this view of evidence ensures that the evidence-relative view remains distinct from the belief-relative view. If evidence is taken as that which has been considered by the relevant agents, then the view is open to the same objection levelled at the belief-relative view, that it lacks the critical distance from agents' actual beliefs to be held as a normative standard about how people should act.

The interpretation of evidence as available, rather than availed, is not without its own problems. Consider again the epistemic position of the present generation with respect to climate change projections. Computer models are a key tool in generating such projections. The present generation could build better climate models that provide better evidence that is relevant to choosing how to mitigate climate change. Once that better model is built, then there will likely be an even better model that could be constructed and provide superior evidence. In some cases – and, most importantly, in the case of climate change – the boundary of the concept of available evidence continuously expands. The concept of evidence as available to agents, rather than evidence as that of which agents have availed themselves, is thus not entirely clear. One response is to appeal to the concept of justification (Zimmerman, 2014: 73). On this interpretation of evidence, a given agent should act according

evidence that that agent can justify to others as reasonable. Consider the following example (based on Scanlon, 2008: 50). Agents should always ensure that their actions do not harm others. This means that "we are required to be on the lookout for [harm], and to take reasonable steps to find out whether or not it obtains" (Scanlon, 2008: 50). On the evidence-relative view, agents should take reasonable steps to ascertain whether their actions will cause harm, which involves gathering sufficient evidence to be able to justify their assessment of the chance that a given action will cause harm.

6.5.4. The pluralist view of normative duties

Based on the preceding three views that is not vulnerable to the general challenge of indeterminacy, I propose the following:

> *The Pluralist View:* in normal circumstances,[95] an agent has a duty to perform an act only when that act has the greatest prospect, based on the available evidence, of comporting with that agent's moral requirements, based on what matters morally (based on Zimmerman, 2014: 8).

Crucially, when a given agent appeals to duties formulated according to the pluralist view, there is no gap between what justice requires that agent to do and what that agent can do, given the indeterminate circumstances. Of course, while the pluralist view builds on the insights underlying the three alternatives just discussed, it remains importantly different. For one, it seeks to hold a middle ground between facts and evidence: while conscientious agents of course aim to do what is in fact morally required, they pursue this end by seeking to act on the best evidence. This recognises the limitations of the fact-relative view, applied to indeterminate circumstances; it also holds agents to particular standards with respect to evidence, of the sort discussed in the previous section.

Using the pluralist view, I can now reformulate the argument of this thesis as follows: the present generation has a duty to mitigate climate change if doing so has the greatest prospect, based on the available evidence, of comporting with what justice as intergenerational equality of opportunity requires. Recalling the discussion above, I interpret the concept of available evidence as evidence that future people can reasonably expect the present generation to have considered, rather than the more

[95] I add the phrase 'in normal circumstances' to recognize the importance of the belief-relative view to abnormal circumstances, such as emergency situations.

general alternative. Furthermore, based on the argument of chapter 3, I take intergenerational equality of opportunity to express the relevant portion of the present generation's moral requirements.

6.5.5. The pluralist view and precaution

At this point, it is useful to take stock of the argument. The animating problem is the general challenge of indeterminacy. This is the problem that there is a gap between what justice requires of agents and how agents can discharge duties of justice in indeterminate circumstance. I first considered precaution (as a Principle or approach) as a way of filling the gap and justifying intergenerational duties of just mitigation, arguing that it is, at best, a partial solution. In short, the Principle supports the judgement that the present generation should act to mitigate climate change, but does not support any judgement about the more fine-grained questions relevant to climate change mitigation. I therefore turn to a second response to the general challenge of indeterminacy, the pluralist view. After considering three alternatives, I argue that duties of just mitigation, formulated according to the pluralist view, can resist the general challenge of indeterminacy. That is, formulated in this way, there is no gap between what (climate) justice requires and what the present generation can do, given the indeterminacy of climate change projections.

Should we favour the pluralist view over the Precautionary Principle? After considering some criticisms of precaution, I argued above that the latter is, at best, imperfect as a justification for intergenerational duties of just mitigation, since it answers the binary question of whether or not to mitigate climate change without helping answer scalar issues of how much to mitigate. The pluralist view is thus in one way superior because it is comprehensive as an answer to the general challenge of indeterminacy. The pluralist view also has the advantage of fitting continuously with what justice requires in circumstances that are not indeterminate. To see this point, consider first that one final worry with precaution is that it is ad hoc, being used to respond solely to indeterminacy (Majone, 2002). I prefer to put the worry as follows: precaution is a suitable response to the (mistaken) indeterminacy-based objections canvassed above. That is, precaution matches the relative superficiality of these objections. On the one hand, proponents of one (or some) of these objections take indeterminacy to have great normative significance without reflecting on where exactly the concept challenges intergenerational duties. On the other hand, precaution simply denies this normative significance, again without actually meeting the challenge that indeterminacy raises.

In contrast, the pluralist view represents a direct response to what I take to be the actual challenge that follows from indeterminacy. In my view, the concept of indeterminacy forces us to refine the concept of a duty (including duties of justice) to ensure that there is no gap between what a duty requires and what an agent can do, given any relevant indeterminacies. In general terms, then, the pluralist view holds that conscientious agents should seek to do what is morally required (for example, what justice requires) according to the evidence that they can reasonably be expected to have considered. More specifically, indeterminacy does not threaten the proportional view of intergenerational justice, and the duties of just mitigation that it implies, once we adopt the pluralist view. The reason is that the emphasis on the importance of evidence to doing what is right – sustaining a range of opportunities available for future generations and improving it where improvements are costless or aid in the pursuit of justice – forecloses any line of reasoning that seeks to release the present generation from its duties of just mitigation on the grounds of indeterminacy, howsoever conceived. Moreover, the pluralist view has two further virtues that the precautionary approach lacks. First, it connects intergenerational duties of just mitigation directly with normative theory more generally, rather than appealing to precaution due to some extraordinary circumstance. Second, it supports the precise judgements about what the present should do for the sake of future generations, a precision that the precautionary approach lacks.

6.6. The problems of risk, uncertainty and ignorance

Armed with the pluralist view, I now turn to the specific problems that are associated with each sub-type of indeterminacy. To recap: after explaining the key concepts of the chapter, I outlined the general challenge of indeterminacy and provided an answer to the challenge, in the form of the pluralist view. With the answer in hand, I now turn to a second set of three problems, each associated individually with risk, uncertainty and ignorance. I argue that none of these neither undermine the claim that the present generation should mitigate climate change for the sake of future generations nor do they diminish the amount of mitigation that justice requires. That said, as we shall see, the answers I provide to the problems do not necessarily apply to further problems of intergenerational justice.

6.6.1. The problem of risk

Even on the best available evidence, climate change projections identify the *risk* of threats to future generations' interests. Considering available evidence, then, does not yield a determinate picture of harms to be prevented, for example, but rather outlines the possible threats to human interests. This

is not a particular problem for duties of just mitigation, formulated according to the pluralist view, since that view directs agents to examine available evidence. Crucially, as discussed above, there is plenty of evidence to consider, for what distinguishes risk from uncertainty and ignorance is the presence of evidence that allows for possible outcomes to be well-defined, including with a numerical probability. While I note that intergenerational risk presents difficult philosophical problems, I argue that those do not undermine intergenerational duties of just mitigation.

Does the fact that climate change imposes risks on future generations – rather than guaranteed harms – free the present generation from duties of just mitigation? The answer is clearly no. Take, for example, possible threats to human health. Climate change stands to: (1) expose a wide range of human populations to the risk of disease by increasing the range of existing disease vectors; (2) destabilise food production, leading to greater risks of food deficits and malnutrition, which are particularly harmful to childhood development and (3) increase the prevalence, frequency and intensity of extreme weather events (i.e. increasing their risk), which lead to direct injuries, as well as indirect harms, such as the ill-health and morbidity related to infrastructure disruption (Field et al., 2014: 47–51; Hare, 2006: 179; McMichael, 2013: 1337–9; McMichael et al., 2006: 859–60). Emphasizing the significance of those projections is the disproportionate burden that they will place on populations that are already disadvantaged, such as the global poor (Adger, 2010: 276; IPCC, 2014b: 69). On this evidence, moderate-to-high mitigation certainly appears to be morally required, out of respect for future generations' opportunities to secure their own interest in health.

There are further substantive questions about the ethics of risks. At first glance, in general terms, one agent imposing a risk on another, purely for personal benefit, is impermissible (Routley and Routley, 1978: 151). There are, however, certain cases where the difference between imposing risks, rather than certainties, is normatively significant. For example, driving a car involves generating risks for others for one's own benefit, yet it is generally permitted. One might think that there are some analogous intergenerational cases. The question here is, is this true of climate change? Are there some conditions in which the present generation could permissibly impose risks on future generations?

One way of explaining the general permission to drive is that it allows all drivers to subject one another to roughly similar risks and benefits. On the system of "reciprocal risk imposition," the individual decision to drive, and thereby impose risks on others, is permitted because it is part of a general system of mutual risk imposition (Hansson, 2013: 101–4). The system must, of course, be beneficial: it would

be unreasonable for there to be a general license to engage in a risky activity when it is better for no one (Hansson, 2004; see also Hayenhjelm and Wolff, 2012: 37ff). With all that in mind, then, there are some conditions in which the imposition of a risk by one agent on another is permissible.

At first glance, the system of reciprocal risk imposition does not seem to extend to cases of intergenerational risk imposition, since generations cannot simultaneously experience the risks and benefits of such a system. One might, however, seek to amend reciprocal risk imposition to suit intergenerational cases as follows: each generation is permitted to impose risks on future generations, as long as there are accompanying benefits to be enjoyed by those who will experience the risks. This is a plausible extension of reciprocal risk impositions for it produces a system of risk imposition that is generally for the benefit of the involved parties. Everyone benefits from the permission to engage in some risk activities and those who are subject to the risk receive concomitant benefits. It seems to me, however, that this move is too quick. In general terms, doing badly by another, whether by subjecting them to harm or the risk of harm, is not justified, even if one knows that one can compensate (that is, benefit) the individual for the bad.[96] In short, the prospect of compensation does not act as a license for one agent to treat another as she sees fit. However, this leads in a very constricting direction: many, if not most, innovations that a given generation can expect will benefit its successors have some accompanying risks. In general terms, then, there needs to be a system for justifying some degree of intergenerational risk.

The lack of such a system, however, is not an impediment to duties of just mitigation. The reason is that when thinking about such duties, the present generation is in effect considering the extent to which it can justly impose risks alone on future generations. For example, the minimal mitigation pathway contains many risks that threaten more significant interest violations than the moderate-to-high pathway does, without the prospect of greater benefits. Climate change, in other words, does not stand to pass on risks with offsetting benefits. While the question of whether justice permits, or even requires, passing on benefits when they are sufficiently connected to such risks is philosophically challenging, it is not especially problematic when thinking about the justification for intergenerational duties of just mitigation.

[96] For a similar point in a different context, see Goodin (1989: 56).

In sum, the problem of risk, as a subtype of indeterminacy, does not pose a serious threat to the formulation of intergenerational duties of just mitigation. To establish whether the present generation should mitigate climate change for the sake of future generations, we require evidence about what present climate change-inducing acts will do to future generations and their interests. There is ample evidence about the adverse effects and potential catastrophes that climate change is projected to inflict on future generations. By engaging in GHG-emitting activities, the present generation imposes a wide range of risks on future generations. Many of those risks involve severe possible events with a high probability. On balance, climate change will make future generations worse off, predominantly disadvantaging populations that are already vulnerable, and will last far into the future (Broome, 1992; Page, 2006: 37ff). When considering a range of options, including mitigation, that are available to the present generation, it therefore appears that any option that does not include climate change mitigation simply entails unjustly imposing on future generation risks that will make them worse off.

6.6.2. The problem of uncertainty

Climate change projections are also replete with uncertainties. With respect to risk, I appealed to the quality of evidence to argue that the present generation should mitigate climate change as a matter of respecting future generations' shared interests. Uncertainty is different: as noted above, uncertainties are possible outcomes to which no numerical probability can be assigned. Therefore, the question is, does the absence of numerical probability make a difference?

One reason to answer this question positively is that the absence of numerical probability makes the use of an approach that weighs the costs and benefits of an action (i.e. cost-benefit approach or risk-benefit approach) impossible (Moellendorf, 2014: 74). If a given agent acts to prevent a possible wrong about which that agent is uncertain, the act may well turn out to be futile. If, for example, the act entailed great cost, it seems implausible that the agent should be morally required to bear this cost, given the possibility that it will be incurred for nothing. The more general point is that the information available about uncertainties seems insufficient to ground normative duties.

In certain cases, that may prove correct. However, climate change is not one such case. Here, there is ample information with which to assess alternative options such as mitigating or leaving climate change unmitigated. Unmitigated climate change carries the prospect of massive losses, resulting from well-understood mechanism; there is evidence that "the conditions for the functioning of the mechanisms are accumulating;" and the costs of mitigation are not unacceptable (Shue, 2010: 148; see

also Moellendorf, 2014: chap. 3, esp. 85;). Moreover, it may be that the present generation has the last opportunity to avoid future catastrophes through emissions reductions (Shue, 2015: 86–7). Given the facts of this case, uncertainty does not seriously threaten intergenerational duties of just mitigation. For example, not only does uncertainty about climate sensitivity, climate feedbacks, and low change, high impact catastrophes not free the present generation from intergenerational duties of just mitigation, it in fact support such duties. The mechanisms behind each of those are increasingly well-understood. Moreover, the possible harms associated with certain possibility are unacceptable. As explained in the previous section, the risks associated with a given level of warming are well-understood. Therefore the uncertain possibility, of rapid, positive feedbacks that lead to catastrophic, irreversible change in the global climate carries risks to human interests that are well-understood.

One might object that this argument analyzes uncertainty incorrectly. In the context of uncertainty, it is tempting to endorse a principle of *indifference* (Gillies, 2000: chap. 2, esp. 29-42; Mellor, 2005: 28–9). This is the principle that "evidence which gives us no reason to think that any one of a number of mutually exclusive possibilities […] is more probable than any other will give those possibilities equal epistemic probabilities" (Mellor, 2005: 28; see also Keynes, 1921: chap IV, esp. 45). This principle is intuitively compelling: in scenarios where there are a range of possible actions about which one is uncertain, it seems like the cautious thing to do is to consider each action equally likely. Doing so ensures that no possibility is discounted. Consider again climate sensitivity, one of the chief sources of uncertainty in climate change projections (Moellendorf, 2014: 68). On the principle of indifference, we should consider each possibility within the range of uncertainty to be equally probable. This approach has considerable practical implications for mitigation, since the prospect of warming at the lower end entails significantly fewer impacts, when compared with the prospect of warming at the higher end.

There are two responses to this objection. First, the intuitive appeal of the principle of indifference is a problematic illusion. Consider the following example. I have drawn a ball from a jar with 9 green balls and 1 red ball. You know that the jar contains only green and red balls, but not their respective number. On the principle of indifference, you should assign equal probability to drawing green and drawing red. Of course, you would be mistaken, as there is a significantly higher probability that I shall draw a green ball. The basic problem is that the principle of indifference, in practical circumstances, suggests that agents act as if each possibility has equal probability when there is simply no basis to think so. More generally, the point is that uncertainties cannot be assigned numerical probabilities and

that doing so on the basis of the principle of indifference is simply to assign an arbitrary probability. Second, imagine that the principle of indifference *were* true. Even if this were the case, it would not follow that uncertainties about climate change projections should be treated with equal concern. The reason is that some climate change projections raise the significant, but still uncertain, prospect of catastrophic events. Despite not knowing the numerical probability of 4.5ºC of warming, the present generation knows it raises the prospect that future generations will have to cope with serious disasters. Even if this is only one possibility amongst other, less dire projections, the extent to which the future generations would have their interests set back in the pessimistic scenarios generate significant support for the conclusion that the present generation should mitigate climate change for the sake of future generations

In sum, when faced with uncertain climate change projections, the present generation should choose the act that the available evidence shows has the best prospect of comporting with its moral requirements. When confronted with climate change uncertainty, there is sufficient evidence to support the conclusion that the present should mitigate climate change due to the significance disvalue that accompanies some climate change projections. The lack of numerical probabilities does not undermine this conclusion, since it has no bearing on the severity of the projections with which the present generation should be most concerned.

6.6.3. The problem of ignorance

Despite our best efforts in developing and refining climate change projections, there are undoubtedly aspects of the future that would be relevant to present decision-making about mitigation but about which the present generation is entirely ignorant. The problem for the pluralist view of normative duties offered above is that ignorance consists in the lack of evidence. Once an agent considers the fact that there are possibilities about which that agent is ignorant, it appears that indeterminacy may yet undermine that agent's normative duties. It seems to me that ignorance raises two closely related issues: (1) the prospect of unforeseen events might undermine the evidence that a given agent uses to make a normative judgement about what to do[97] and (2) while the evidence available to a given agent supports a course of action, the prospect of unforeseen events might make that course of action

[97] E.g. while I have reason to prefer course of action X, based on evidence A, B and C, it follows from my ignorance that I have insufficient reason to in fact pursue X.

futile.[98] As I argue below, the relevant issue that ignorance raises for climate change mitigation is of the second type. More importantly, it does not follow that the present generation should not mitigate climate change for the sake of future generations.

Before turning to these points, I need to introduce the concept of a "mere possibility" (Hansson, 2013: 88ff), as it helps explain the normative significance of ignorance. A mere possibility is a conceivable future event about which there is little, if any, prospective information. For example, the present generation might be ignorant of some important mechanism within the global climate system that will reverse climate change. Such an event – a complete return to a stable climate within pre-Industrial ranges – is a mere possibility: it is an ill-defined event, since there is no known mechanism that would lead to it and so it is not clear what changes it entails. This concept helps to avoid sliding the present discussion of ignorance back into a discussion of uncertainty. Unlike mere possibilities, uncertainties are relatively well-understood possible events, even if the relevant probabilities are unknown. They are events for which there is evidence that shows what might happen and how.

The concept of mere possibilities helps further distinguish ignorance from both risk and uncertainty in that the former is purely subjective, whereas the latter are not. Ignorance refers to an agent's perspective (e.g. agents A-P are ignorant of X) whereas uncertainty (and risk) is not limited in that way. To put it in the terms with which I began the chapter, ignorance is an epistemological state. It does not make sense to refer to ontological ignorance. An agent is always ignorant about some possibilities; possibilities cannot be ignorant.

This makes ignorance rather difficult to pin down. It still makes sense to say: 'agent A is ignorant of possible event X.' But there are two closely related interpretations of this statement. It contains both the idea 'agent A has not conceived of event X' *and* 'agent A has conceived of event X but has no well-defined knowledge of it.' In other words, ignorance refers to an agent's conception of a mere possibility and also to an agent's total lack of knowledge about something. The problem is that mere possibilities are as numerous as the agent in question is creative (Hansson, 2013: 89). For example, there appears to be as many mere possibilities with respect to climate change as people can imagine.

[98] E.g. I will pursue course of action Y, based on evidence D, E and F, but some unforeseen circumstance might render Y futile or in some way unnecessary.

Why even consider mere possibilities? A critic might press this question, arguing that they are inventions that should not figure in moral deliberation. On that view, ignorance is simply irrelevant. My response is that, unfortunately, the case is not so simple. To be sure, some mere possibilities are ludicrous. For example, I cannot justify smoking by appeal to the mere possibility that eating broccoli has some as-of-yet unknown curative properties (Hansson, 2013: 89). I can conceive of the possibility, but cannot define it further by any means other than my imagination. But when ignorance outweighs, or in some way undermines, available evidence (issue (1) from above) or when it ignorance raises the possibility of futility (issue (2)), it is relevant and requires due consideration.

One way of dealing with ignorance is using the "test of opposite effects," where agents faced with options that may have outcomes about which they are ignorant should disregard a given possibility when there is an opposite, countervailing mere possibility (Hansson, 2013: 89–90). This works in the above broccoli example. Just as I can conceive of broccoli's anti-smoking-damage properties, so can I conceive that it has symmetrically deleterious health effects. I should therefore disregard both mere possibilities, focusing instead on the evidence that exists about the effects of smoking. It also helps in the case of climate change. As mentioned above, it is conceivable that some unforeseen mechanism should counterbalance the effects of anthropogenic GHGs on the global climate. That said, there could also be some dynamics internal to the climate system that will in fact mean that climate change is much worse than anticipated. Through the test of opposite effects, one can disregard both.

The ignorance in the context of climate change mitigation also raises what I have labelled issue (2), that some future events might make mitigation unnecessary. From a moral perspective, this is a problem, since there is the chance that, should the present generation bear the costs of mitigation, it might turn out to have been for nothing, assuming (heroically) that there is this unknown, balancing climate mechanism. With the test of opposite effects in mind, it follows that such a mere possibility can be left behind and so the significance of ignorance to duties of just mitigation diminishes significantly.

There remains one final question: what are the implications of issue (1), that in some circumstances ignorance might somehow outweigh available evidence? While it does not apply to climate change mitigation, it is a theoretically puzzling issue, one that applies to other intergenerational issues, and so I address it briefly here. Ignorance about radical technological innovations, such as nanotechnology, raises this sort of issue. Proponents of these innovations present lines of reasoning in favour of

pursuing them, based on evidence of their potential benefits, from new medical techniques to sustainable industrial practices (e.g. Anderson et al., 2016; Hutchison, 2016). In some cases, however, there will be far more ignorance than evidence: exactly how some technology will function and, perhaps more importantly, how it will disrupt existing industrial and social practices is simply unknown. In such as case, the first step is to be sure to approach the two alternatives symmetrically, as with the test of the opposite effects. For example, some object to the development of nanotechnologies on the grounds that it will exacerbate inequality, creating a "nano-divide" (Beumer, 2016). Assuming that global inequality persists, the alternatives are (A) an inegalitarian future with nanotechnology and (B) an inegalitarian future without it. Some take this as reason to ignore the ignorance, since (A) is in one way better than (B) (Hansson, 2013: 91). While this conclusion is far too quick – it ignores questions about what egalitarian justice requires – the example illustrates the sort of comparison that helps understand decision-making in the context of ignorance.

One final, concluding point is in order. My aim in this section is to avoid being overly permissive or conservative when thinking about decision-making in the context of ignorance. Rather, my aim is to help work out what role it has in practical deliberations, including with respect to just mitigation. The examples considered in this section are importantly different. To object to climate change mitigation on the grounds of ignorance is not to deny what evidence shows has the best prospect of comporting with what justice requires of the present generation, but rather is to conjure a scenario where it is pointless. In contrast, to object to nanotechnological innovation on the grounds of ignorance is, at least in some cases, to argue that the available evidence is somehow outweighed by present ignorance. The former was not especially challenging: the test of opposite effects proved sufficient to set aside the objection to climate change mitigation. In contrast, while the symmetrical treatment of alternative was useful in the latter case, it is not so decisive. In short, it does not provide a principled way of responding to the problem of ignorance and issue (1), as I have been calling it.

While that last point remains puzzling for more general questions about normative significance of ignorance, I have at least shown one way of responding to the problem of ignorance and defending duties of just mitigation. In sum, ignorance provides no reason why the present generation should not pursue the moderate-to-high mitigation pathway. There is ample evidence that policies designed to that end will prevent a range of right-violating burdens for future generations. Appealing to merely possible scenarios to ground reasons against this conclusion is, in the end, an unsuccessful rhetorical strategy.

6.7. Conclusion

Indeterminacy raises significant challenge to the formulation of any intergenerational duties. It is thus important to think through what follows from that concept for duties of just mitigation. In this chapter, I aim to have shown the proper place that indeterminacy should have in our thinking about intergenerational justice and developed a way of formulating normative duties that grounds a response to the general challenge that indeterminacy poses, which I call the pluralist view of normative duties. That in turn allows me to address the particular problems of risk, uncertainty and ignorance. While that might not be true for every intergenerational issue, the evidence available about climate change, particularly with respect to the impacts that it will have on future generations provides a strong foundation for intergenerational duties of justice mitigation. This concludes the third of the three 'problem chapters,' the chapter in which I consider some of the most significant objections to intergenerational duties of just mitigation. In the next chapter, I conclude the thesis by reflecting on the place of reasons of justice – which have been my focus throughout the thesis – within the broad range of reasons why the present generation should mitigate climate change for the sake of future generations.

Conclusion

1. Just mitigation

At the beginning of the thesis, I set out to offer an interest-based defence of the claim that justice requires that the present generation engage in stringent mitigation of climate change, which I later associated with the moderate-to-high mitigation pathway. Less mitigation is unjust because of the burdens that it leaves for future generations to bear; more mitigation is unjust because it constitutes overinvestment, ignoring other responses to climate change (e.g. adaptation, rectification), as well as other pressing injustices.

The principled basis for my argument rests on the view of intergenerational justice as proportionality of opportunities, which I develop by reconstructing and developing Brian Barry's view of intergenerational justice as non-diminishment. I take these views to instantiate best the idea of justice as an impartial adjudicator between individuals' competing claims in the intergenerational context. The proportional view holds that each generation should ensure that it leaves a range of opportunities for its successors that is in proportion with the range of opportunities that it inherited, where proportionality is defined by non-diminishment, plus costless improvements and improvements that contribute to future generations' pursuit of justice (at a reasonable cost to the contributing generation).

That principle has many virtues. For one, it scales according to the circumstances of the generation to which it applies. While it rests on the idea of basic equality of individuals across generations, it requires of each generation a level of concern for its successors that is consonant with each generation's inheritance. The view generates more stringent duties of justice for generations whose inheritance affords them a wide range of opportunities; it is also sufficiently flexible to accommodate challenging scenarios where generations find themselves badly off, imposing less stringent duties in such cases. \

Drawing on Barry's notion of productive potential, the proportional view also illuminates the metric of intergenerational justice. The limited substitution that that concept permits generations leaves a reasonable range of choices for each individually, without permitting the depletion of critical natural capital and of other goods that must be sustained to avoid diminishing the range of opportunities available to future generations. Furthermore, by drawing on the Capability Approach, the proportional view identifies the opportunities that it is reasonable to expect future generations to have, which helps

determine more precisely what justice requires be sustained for the sake of future generations. That in turn also helps establish that justice requires that the present generation pursue the moderate-to-high mitigation pathway, as deviating from it either unjustly restricts future generations' opportunities (should mitigation be insufficient) or entails investing more than justice requires, potentially generating injustices between members of the present generation. In short, it bears repeating: to discharge its duties of intergenerational justice as proportionality of opportunities, the present generation must engage in immediate and extensive climate change mitigation.

One key difference between the proportional view and the non-diminishment view is that the former respects the value of just improvements, that is, the value of contributing to successors' pursuit of justice and the establishment of just institutions. Of course, the non-diminishment view has much to recommend it. It captures the idea of intertemporal impartiality, that justice should not permit any particular generation to advantage itself purely on the basis of its temporal location. By ruling out choices that diminish the range of opportunities for future generations, justice thereby rules out disadvantaging future generations simply because they come later in time. Building on this, the proportional view adds the further requirement that generations improve the range of opportunities available to their successors, when doing so is costless or aids in the pursuit of justice and just institutions. More than simply preventing individuals from making others worse off, justice should also be sensitive to the interests that individuals share in living in a more just world, or even living under just institutions. Out of shared recognition of that interest, the proportional view therefore also requires just improvements, when there are costless or at least reasonably costly to those producing the improvements.

While this difference is theoretically important, there is a further question about what difference, if any, there is between the two views with respect to climate change mitigation. Here, as discussed in chapter 3, both the non-diminishment and the proportional view converge on the relatively general point, that the present generation should pursue moderate-to-high mitigation pathway. However, the proportional view will influence what constitutes a just design of mitigation policies. Where two options differ in that one conceivably helps future generations live in a more just world and the other does not (but they both contribute equally to the mitigation of climate change), the proportional view offers the extra reason why the present generation should choose the former option. This has significant consequences: where mitigation policies can be integrated with efforts to redress other

injustice, for example by alleviating the global disease burden or reducing the scope and extent of global poverty, then the proportional view will require such integration.

As a view on what intergenerational justice requires, the proportional view is subject to a range of objections. I group these according to certain key problems: the problem of non-reciprocity, the problems of non-existence and non-identity, and the problem of indeterminacy. Each of these grounds objections that diminish the force of intergenerational duties of just mitigation or even release the present generation from then altogether.

On the problem of non-reciprocity, the objection is that because relationships of reciprocity do not hold between generations, the neither do duties of justice. I offer a two-part response to this problem. Once we see the possibility of indirect reciprocal exchanges (where agent A benefits B, for which B returns benefits to C), it appears that relationships of *fair* reciprocity can hold between generations. On this model (the stewardship model of intergenerational justice), the present generation should mitigate climate change as part of its effort to steward its inheritance for its successor. This conclusion is, of course, quite similar to the conclusion that the proportional view reaches in the case of climate change. However, I argue that the line of reasoning that the two adopts differs importantly. A key implication of the one based on the stewardship model is that the significance of reciprocity appears to be diminished, with the concept of mutual respect playing a more important role. The more general points about the relationship between reciprocity and justice notwithstanding, the problem of non-reciprocity does not impede the formulation and justification of intergenerational duties of just mitigation.

On the problem of non-existence, the objection is that future people do not exist and therefore cannot bear rights. In response, I argue that the present generation should ensure that it acts in ways that do not inevitably violate the rights of future people, when they come into existence. This leads to a further problem, that of non-identity: this problem leads to the objection that the present generation cannot act 'for the sake of future generations,' that is, the present generation can neither harm nor benefit future generations because whatever it does will be a necessary condition of the particular identities who will occupy future generations. I defend a wide person-affecting response, that the present generation can reasonably expect that future generations will share certain interests, based on certain normatively relevant properties that they will have. It is these interests that the present generation should consider. No matter who in fact comes into existence, future generations will have a just

complaint if the present generation fails to act out of consideration for the identity-independent interests that future generations will have, when they come into existence.

This leads to the final problem, that of indeterminacy. The general thought – that the indeterminate, unsettled and (to some extent) unpredictable nature of the future – leads to a wide variety of objections to intergenerational duties, weakening their demandingness or even ruling them out entirely. I follow my own classification of the problem, distinguishing a general challenge from the specific problems attached to subtypes of indeterminacy, risk, uncertainty and ignorance. The general challenge of indeterminacy is that there is a gap between intergenerational duties and what an agent must do to discharge such duties. For example, duties of just mitigation raise precisely such a challenge because of the many indeterminacies found within climate change projections. In response, I defend a pluralist view of duties, an understanding of normative duties that I argue is immune to the challenge. In proposing this, I obviate the need for the precautionary approach, which I argue is problematic in itself and which I take to respond to misdiagnoses of the problem of indeterminacy. Finally, I argue that none of the problems of risk, ignorance and indeterminacy undermine intergenerational duties of just mitigation, though the problem of ignorance might prove more troublesome in other cases. I argue that those do not apply to the case of intergenerational duties of just mitigation because it is not one where ignorance obscures projections about the effects of present actions.

1.1. Beyond mitigation

I have focused on the specific task of outlining and defending an interest-based foundation for intergenerational duties of just mitigation. There are a range of reasons to focus on this task, some of which I recapitulate below. That said, there are also a range of other important issues of climate change justice, beyond the demands of mitigation alone. By way of conclusion, I offer some remarks about the context of just mitigation, looking beyond both mitigation and justice.

As outlined in chapter 2, I focus on mitigation because it will largely shape the other responses (adaptation and rectification) that human will have to undertake to respond to climate change. The extent to which future generations will have to adapt to climate change and to create schemes of just rectification will depend on the extent to which the present generation mitigates climate change. Moreover, projections show that some of the impacts of climate change that will result from the present generation's choice to pursue the low mitigation, for example, will lie beyond future generations' capacity to successfully adapt.

As a response to climate change, mitigation also has the advantage that it directly targets a fundamental injustice of climate change, that unrestricted GHG emissions tend to benefit advantaged members of past, present and future generations. Insofar as mitigation consists of efforts to restrict these emissions, it requires the already-advantaged to cease unjustly abusing their dominant position and instead respect the claims of those who are comparatively disadvantaged.

Finally, from the perspective of the present generation, mitigation is the primary response to climate change. That is, a significant proportion of the present generation's duties of climate change are duties of just mitigation. For this reason, though I outline some context for these duties in this conclusion, I do not mean to provide excuses to focus on other injustices. I stress that this is from the present generation's perspective; the requirements of justice will likely change depending on the circumstances that future generations face. For example, as the human impacts of climate change become stronger, duties of just adaptation and rectification will increase in importance. For future generations, then, mitigation might diminish in its relative importance within the confines of climate change justice. With that in mind, just mitigation must suit the changing burdens of climate change, as they shift from projected to actual harms and costs. This readily coheres with the proportional view of intergenerational justice: should a generation inherit a range of opportunities diminished by the actions of its predecessors, that generation's duties of intergenerational justice will change accordingly.

Without diminishing the importance of mitigation, then, what other duties of climate change justice does the present generation posses? Beyond the duties of just mitigation, justice must also regulate what those alive today do with respect to adaptation and rectification. Here, many of the duties will be anticipatory and therefore intergenerational: in addition to helping those already affected by climate change to adapt to the new circumstances, as well as rectifying the wrongs that occur where adaptation cannot help, there is significant opportunity for the present generation to enable future adaptation by building adaptive capacity in communities where little exists and by preparing the institutional structures and material wealth needed to help future generations adapt where possible and compensate where necessary.

Climate change is also not the only intergenerational process through which the present generation influences future generations' opportunities. Obvious examples of similar problems include the storage of nuclear waste and, quite differently, national debt. It is, of course, artificial to treat each of these in isolation. As a threat multiplier, climate change exacerbates seemingly detached problems: to

pick one example, "extreme climatic events create a spiral of debt burden on developing countries" (Mirza, 2003: 223). In principle, then, the intergenerational problems of sovereign debt and climate change do not easily come apart. With that in mind, what the present generation should do for the sake of the future involves more than just mitigation, and indeed more than climate justice.

1.2. Beyond justice

Beyond the pressing injustice of climate change, there are a variety of other moral considerations that are relevant to the question of what the present generation should do for the sake of future generations.

Some might argue that those alive in the present should mitigate climate change because doing so reflects widely-held emotional attachments and judgements. For example, mitigating climate change protects future generations, and many people care, generally speaking, about future generations, either as their descendants or, more abstractly, as the future of humanity (or both). It also protects the environment, safeguards ecosystems and preserves species, all things which many profess to care about. To some, climate change is also the product of vicious behaviours, such as overconsumption, profligacy and wastefulness. Or the attitude that nature and the environment exist only to serve human needs might simply be wrong (Barry, 1999: 113–5).

These considerations are, of course, relevant to what justice demands. For one, people have interests in protecting entities to which they are emotionally attached, which returns us to the concept of justice quite directly. But the considerations just listed undoubtedly also involve moral concepts other than justice. For one, some might think that it devalues certain important emotional predispositions, such as those that have to do with caring or loving something or someone, when one holds them (or tries to hold them) out of a sense of duty (Gheaus 2017; 2009).

There is also the distinct possibility that imperfect duties – duties that are *not* owed out of respect for some right(s) (O'Neill, 1996: 137) – should also guide the present generation's choice to mitigate climate change. Environmental degradation and the destruction of ecosystems trigger precisely these sorts of considerations as they constitute, in part, examples of a "free-floating evil", that is, an act that is deemed wronged without reference to the claims of any particular person, such as their interests (Feinberg, 1988: 19). One way of explaining the detached value of the environment is by appeal to the concept of the sacred. This is the idea that some entities are intrinsically valuable, that is, valuable "independent of what people happen to enjoy or want or need or what is good for them" (Dworkin,

1993: 71). With all that in mind, those alive at present may also have duties to mitigate climate change for the sake of nobody.

These considerations have challenging implications for how and why the present generation should mitigate climate change. They raise the intriguing prospect that a complete theory of mitigation will include a range of composite duties that rest on justification that combine many of the considerations canvassed here.

One further question is: should those alive at present mitigate only as much and in the ways that justice requires? It seems to me that there is far more than what justice requires alone:

> People who are scrupulously moral may nonetheless be destined by deficiencies of character of constitution to lead lives that no reasonable person would freely choose. They may have personal defects and inadequacies that have nothing much to do with morality but that make it impossible for them to live well. (Frankfurt, 2004: 6)

My suspicion (assuming that a conclusion is the right place for such suspicions) is that the same sort of ideas applies to reasons of justice. That is, reasons of just mitigation of the sort that I defend in this thesis constitute only one small part of the full set of reasons that is relevant to contemporary reasoning about climate change and its mitigation.

Part of the reason for this suspicion follows from the understanding of practical reasoning that I presented at the outset of the thesis. Following Onora O'Neill, insofar as arguments such as those presented in the thesis aim to contribute to agents' practical reasoning, those arguments should aim to provide reasoned guidance that helps them choose how to act (O'Neill, 1996: 2). While justice is a uniquely compelling source of practical reasons, many (if not most) individuals look to other moral concepts for guidance, trying to act out of kindness, love or compassion. While mitigation must be just, it should also be compassionate.

The sustained argument of the type that I have developed in this thesis inevitably requires omitting a range of related issues. While the brief outline of the wider considerations that are relevant to climate change mitigation offered here is nothing more than a sketch, I aim to have both rearticulated my reasons for focusing on justice and indicated that there are many other moral concepts that must be combined with justice to provide a complete explanation of why the present generation should mitigate climate change.

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