Dimensions of climate disadvantage

Dimensions of climate disadvantage.[1]

Climate change will result in an increased frequency and intensity of extreme weather events such as droughts, heatwaves and floods. These events cause death, ill-health, hunger, displacement and social dislocation. Lives and livelihoods are put at risk and lost. These impacts on life and well-being will be unevenly distributed. Drought, heatwave and floods are not new. Neither are the questions of justice raised by the uneven impacts of these events (Blaikie et al., 1994; Klinenberg, 2002). Floods, heatwaves and droughts have a long history quite independent of human induced climate change. However, with climate change their frequency and intensity will increase. This chapter will address questions concerned with the identification of those individuals and communities who will be most disadvantaged by climate change. Doing so matters for climate adaptation policy since it has implications for how responses can be best focused on those who need them most. Identification of climate disadvantage also matters for the framing of climate justice. It turns out that those most disadvantaged by climate impacts are also those who are least responsible for the emissions of greenhouse gases (GHGs), have the least voice and power in responding to them and are often are most adversely affected by policy responses to climate change. These different dimensions of inequality produce compounded injustices.

In this chapter I defend a particular multi-dimensional approach to climate disadvantage. Both the dimensions of well-being that are put at risk by climate change and the personal, environmental and social factors that determine how badly different groups are affected by climate change are plural. One important consequence of looking at climate disadvantage in this multi-dimensional way is to refocus considerations of justice and climate change to include questions of class, inequality, gender and ethnicity that are lost in much of the standard academic and policy discussion on climate change that focus only or primarily on maldistributions across nations and generations.

Dimensions of climate injustice

The focus of much academic and policy debate on climate change has been on the international and intergenerational dimensions of responsibility for and the impacts of climate change. There are good reasons for this. Intergenerationally, the contrast between

those who are responsible for and benefit from emissions of greenhouse gases and those who will be adversely affected by them is stark. The adverse effects of current emissions will fall most heavily on future generations. Those generations will bear no responsibility for those emissions. Globally there is similarly a divergence of responsibility, benefits and harms. Both historical and current responsibility for the emissions of greenhouse gases lies with the richer industrialised countries. The 2014 IPCC report notes: 'median per capita GHG emissions (1.4 tCO2eq / cap / yr) for the group of low-income countries are around nine times lower than median per capita GHG emissions (13 tCO2eq / cap / yr) of high-income Countries' (IPCC, 2014a, p.46). At the same time, the negative impacts will fall disproportionately on people in low-income countries. The global and intergenerational dimensions of climate change are important.

However, while the international and intergenerational dimensions of climate change are important, the use of generations and nations as the foci of analysis can hide the significance of other dimensions of inequality across class, income, gender and ethnicity. For example, while international negotiations tend to use national emissions as the unit of analysis, this can disguise the fact that differences across income and class within countries matter to emissions through consumption. Differences in median per capita emissions between countries are consistent with large differences of emissions within countries according to income and wealth. The IPCC notes: 'There are substantial variations in per capita GHG emissions within country income groups with emissions at the 90th percentile level more than double those at the 10^{th} percentile level' (IPCC, 2014a, p.46). In the UK, for example, those in the highest income decile are responsible for well over twice as many emissions through consumption as those in the lowest income decile. The differences are particularly marked for transport where those in the highest decile have 4.5 times the emissions of those in the lowest decile, and in consumables and services where they have over 3.5 times the emissions (Gough et al. 2011; Gough, 2013). The differences are less marked for food and domestic energy where the ratio of highest to lowest income deciles is 1.8. Responsibilities are then significantly correlated with income, the higher the income, the higher the emissions.

However, when it comes to policy responses to climate change, those with the lowest income who are least responsible for climate change can face the highest policy burdens. This is in part due to the use of market mechanisms that respond to climate change through raising the price of carbon emissions or energy. While total emissions are correlated positively with income, when it comes to emissions per unit of income the relationship is reversed. Those on lower incomes have higher emissions per unit of income. For example, if one considers emissions per £ in the UK, the lowest income decile emits 4 times as much per £ as the highest, where this is greatest for energy and food (6 times greater) and 3 times greater for consumer goods and 2.3 times great transport (Gough 2013, p.205). Policies that rely upon raising the general price of emissions have the heaviest impact on those who contribute least to climate change and the lightest on those who contribute most. Moreover those impacts are worst in the consumption of basic goods such as food and household energy. Both responsibilities for and the impacts of policy responses to emissions of greenhouse gases are unevenly distributed. Finally, as I show in following sections of this chapter, the impacts of climate change on human well-being will tend to fall heaviest on those already least advantaged within any country.

Similar points apply across generations. Consider one standard argument for discounting. Economic models of future impacts of climate change defend discounting on the grounds that growth will mean that average per capita consumption in the future will be greater than that of current generations. Since those in the future will on average be richer, additional units of wealth will be worth less to them. We should discount future consumption accordingly.[2] There are a number of problems with the assumption that future average per capita consumption will be higher. Given that emissions are closely correlated with growth and hence that growth itself in the near term will lead to more serious climate impacts in the longer term, the assumption that continuing growth will mean that average per capita consumption will be higher in the future is open to serious question. Short and medium term growth could well lead to falls in consumption in the longer term. However, even if average per capita consumption is higher it does not follow that all of those in the future will be better off. Average consumption can rise in conditions in which the better off in the future are richer than those in the present and the worse off in the future are poorer. Higher average per capita consumption may entail that some

individuals in the future will be much better off than any individuals in current generations in the sense that they will be wealthier. That wealth may allow them to protect themselves from the worst effects of climate change. However, that will not be true of all individuals. Average per capita consumption is not what matters for determining justice over time but rather what happens to the worst off. Justice requires a disaggregation of impacts within generations, both current and future, and not simply across generations. Given, that climate change will have its largest negative impacts on the lives and livelihoods of the poorest, there are good reasons to think that, unless wide social and economic inequalities are addressed, the disaggregated story will be one in which a large portion of people in the future will be worse off. Hence, a positive discount rate on the basis that future generations on average will be richer is not justified. It is not averages that matter for considerations of justice.

None of this is to argue that the international and intergenerational dimensions of climate change do not matter. They do matter in terms of identifying differential responsibilities for and impacts of climate change. However, any such analysis needs to be wary of simple averaging across those within countries and generations. Disaggregation is required within those populations. In disaggregating other dimensions of climate inequality come to the fore notably across class, wealth and income. Internal inequalities in wealth and income matter. However, these are not all that matter for reasons that Sen gives in developing the capabilities approach to injustice. The same levels of income can have different outcomes for how well people can live their lives depending on personal, environmental and social facts about persons (Sen, 2009, ch.12). Characterising and measuring the adverse impacts of climate change requires further disaggregation beyond wealth and income, important though these are. The points that Sen makes about the conversion of resources into different outcomes for well-being can also be made of the impact of events like flood and heatwave. Personal, environmental and social factors can lead to the same climate related event to have very different outcomes for well-being. Age, health and gender, the physical environments in which individuals lives, social networks and social dislocation, these and other factors will make a difference to how badly affected individuals and communities are by climate related events. In the following I will develop this approach to climate disadvantage and outline briefly its use in the identification of climate disadvantage in the

UK. I then consider both potential problems and benefits associated with the use of multi-dimensional measures of climate disadvantage. In the final section I return briefly to consideration of the implications of the framework for cross generational dimensions of climate change.

Mapping climate disadvantage

Whose lives and well-being will be most adversely affected by climate change related hazards such as floods, heatwaves and droughts? One part of the answer to that question will concern the distribution of exposure to the hazards. There exist both global and local variations in the frequency and intensity of exposure to climate related hazards. For example, globally more frequent and intense drought is likely in West Africa and the Mediterranean and less likely in central North America and northwest Australia (IPCC, 2014c, p.1136). Similarly within countries there exist differential likelihoods of exposure. Those who live in urban areas prone to urban heat island effects are more likely to suffer the effects of heatwaves. Flooding can come in different types – rivers (fluvial), surface water (pluvial) and sea (tidal). Each will have particular patterns of distribution. The distribution of pluvial flooding in cities will depend on patterns of drainage. People whose homes or sources of livelihood are by sea and river are more likely to be badly affected than those whose homes and sources of livelihood are on higher ground.

One significant strand of argument on environmental justice has been concerned with the ways in which exposure to environmental hazards such as toxic waste and pollution reflects wider patterns of injustice associated with race and class (Bullard, 1994, 1996). Is climate change another hazard that is distributed like this? In the case of climate change there is some overlap between prior dimensions of inequality and the distribution of exposure. For example in the England those in lower incomes deciles are much more likely to be exposed to coastal flooding than those in the highest income deciles (Walker et al 2006 pp.58-9; Walker and Burningham, 2011, pp.121-2). However, the relationship between flooding and deprivation is not systematic. For example, with fluvial flooding there is very little variation across different income deciles for England as a whole (Walker et al 2006 pp.56-7; Walker and Burningham, 2011, p.221). Indeed, for fluvial flooding in the South East of England

there is an inverse relationship between exposures to flooding and deprivation with those in the higher income decile more likely to be living in river floodplains. Does this mean that in this region those with higher incomes turn out to be more likely to suffer from river related climate disadvantage? It doesn't. Exposure to flooding is not all that matters to measuring disadvantage. What also matters is the vulnerability of different persons and communities to the hazard.

How disadvantaged a person or community are by climate related hazards is a function not just of the frequency and degree of exposure to the hazard but also their vulnerability to that hazard. Vulnerability refers to how well individuals are able to cope with impacts that events like flood, drought and heatwave will have on their well-being, in particular with their ability to respond to and recover from events and prepare for future events (cf. Kelly and Adger, 2000 p.328) The vulnerability of a person or population to exposure to a hazard is a matter of the degree and likelihood of exposure to a hazard impacts on life, livelihood and well-being. If an individual is more vulnerable to a hazard then she is more likely to suffer a serious loss of well-being or life as a result of exposure to that hazard. Climate disadvantage is a function both of the frequency and intensity of exposure to climate related hazards and the vulnerability of individuals and communities to exposure to the hazard.

Vulnerability is a matter of how exposure to a hazard converts into a loss of well-being. This characterisation of vulnerability raises a number of prior questions that need to be addressed in considering the distribution of climate disadvantage.

First, how is well-being to be characterised and measured? Many studies of vulnerability have focused on losses of life, health and income or livelihood. There are good reasons for this focus. These all matter for well-being. They are also relatively easily to measure. However, climate related events like flood and heatwaves bring much wider losses in well-being. For example they bring social dislocation and the loss of abilities to plan for the future. An adequate characterisation of vulnerability needs to be based on an account of well-being that is able to include the full range of losses in well-being.

Second, what factors are involved in the conversion of exposure to hazards into a loss of well-being? Again an adequate characterisation of vulnerability will include the full range of factors involved in the conversion of exposure to a hazard into a loss of well-being. These will include personal factors - including biophysical features of the person such as age and health. They will include properties of the environment, such as access to green space and cool places in a heatwave. Finally, and not least, they will include social factors. Poverty, social networks, social dislocation, levels of trust and fear in a community, the nature public institutions, distributions of power and voice, and a variety of other social factors all will affect how well a community or individual is able to cope with the impacts of floods and heatwaves.

Third, how far is this vulnerability specific to a particular hazard like flood or heatwave or how far is it an instance of a more general vulnerability to a variety of different events that impact on well-being? Some vulnerabilities are hazard specific. People who live in houses that are designed to withstand floods will be less vulnerable than those who are not. However, many vulnerabilities to climate related hazards are particular instances of more general vulnerabilities. For example, the absence of power and voice, poverty and social isolation will render individuals vulnerable not just to floods and heatwaves but to a much wider array of hazards. Climate disadvantage reflects and reveals wider disadvantage and injustice.

In the following I discuss these questions in more detail.

Characterising and measuring well-being

How should well-being be conceptualised and measured? In the following I consider three answers to that question: resources; subjective well-being; objective states (O'Neill, 2006; 2008; Robeyns and van der Veen, 2007; Stiglitz, 2009).

Resources: One standard metric that is used for measuring well-being is the resources a person has at her disposal. The metric is an indirect measure. Resources are means to well-being. However, the argument goes, how ever well-being is understood by an individual, the more resources she has the better her well-being will be. The proponent of the

resource index sometimes takes this to be an advantage to the index. A resource metric is not paternalistic. Resources are what enable a person to pursue whatever her conception of a good life is. The use of the resource metric in economics tends to be associated with a preference satisfaction account of well-being. Well-being consists in the satisfaction of preferences. Resources allow individuals to satisfy their preferences, whatever they happen to be. A resource index is widely used as an indirect metric of well-being. We have already noted in the debates on discounting an assumption is made that where average per capita consumption is higher people will be better off. A resource metric is also used by economists to identify the negative impacts of events like floods and heatwaves, for example through their impact on incomes and property values. However, because resources are only a means to an end, not ends in themselves, there are good reasons we have already touched upon for rejecting a resource metric. As Sen notes, the same resources can have very different outcomes on how well a person can live (Sen, 2009, ch.12).

Personal, environmental and social factors can mean that the same resources result in very different capabilities to lead a good life. An individual with a physical impairment can, due to the lack of medical care, to the lay out of the physical environment, and to social attitudes and institutional structures and norms have far fewer opportunities to lead a good life than a person without that impairment, even where they have the same initial resources. Correspondingly addressing the disadvantage for that person need to address not just their resources but also those personal, environmental and social conversion factors – through medical interventions, changes to the physical environment and changes to social structures and norms (Wolff, 2002). Similar points about different points of intervention in disadvantage apply as we shall see to climate adaptation policy.

Subjective well-being: Developments in hedonic psychology have seen the revival of subjective state accounts of well-being (Kahnemann et al. 1997, 1999, Frey 2010, Layard, 2005). Subjective state theories take well-being to consist in being in the appropriate psychological state. Hedonic theories of well-being are the paradigmatic example**.** Well-being is identified with happiness and happiness with pleasure and the absence of pain. Resources on this account are means to an end. There can be a departure between

increasing resources and consumption and increasing well-being. While the income a person has relative to others in a society is correlated with reported subjective happiness, beyond a certain point, the absolute growth in income and consumption is not (Easterlin, 1995; Frey and Stutzer, 2002; O'Neill, 2006; 2008). Given that this is the case, even if those in the future had higher average per capita income it would not follow that they would be better off as measured by subjective state metric.

Climate related events like floods do have a clear impact on subjective well-being. They bring increased levels of anxiety and depression and falls in self-reported life-satisfaction. (Ahern et al 2005, Sekulova, 2013, ch.4). Subjective well-being matters and is adversely affected by flood, drought and heatwave. However there are problems with simply using a subjective state metric for measuring inequality and disadvantage. One problem is that of adaptation: mental states adapt to adverse situations: 'The utilitarian calculus based on happiness or desire-fulfilment can be deeply unfair to those who are persistently deprived, since our mental make-up and desires tend to adjust to circumstances, particular making life bearable in adverse situations' (Sen 2009, p.282). A subjective well-being metric is liable to underestimate the well-being losses of the more deprived. The measurement of inequality requires more objective measures of well-being that are not subject to the problems of adaptation.

Second, there is in any case more to well-being than subjective states. As Kahneman, one of the main figures in the development of hedonic psychology, notes in a paper with Sudgen: 'human well-being may be thought to depend, not only on the sum of moment-by-moment affective experiences… but also on other aspects of life, such as autonomy, freedom, achievement, and the development of deep interpersonal relationships, which cannot be decomposed into momentary affective experiences' (Kahneman and Sugden, 2005, p.176). The point is important if the full range of losses in well-being associated with climate related events like floods and heatwaves are to be captured. While events like floods do have a major impact on subjective well-being, losses in subjective well-being are not all that matters. Losses in other dimensions of well-being, for example losses in autonomy or the disruption of social relationships, matter in themselves and not simply as a means to subjective well-being.

Capabilities, functionings and needs. Subjective states matter, but they are not all that matter. What matters for well-being is not just what people feel but what people can be and do in their lives. The two approaches to well-being that attempt to capture what individuals can be and do are those that appeal to needs (Wiggins, 1998, 2006; Doyal and Gough, 1991; Gough, 2015; O'Neill, 2010) and to capabilities (Sen, 1993, 1999, 2009; Nussbaum, 2000). The differences between them can be inflated (Wiggins, 2006, O'Neill, 2010). Here I will use a capabilities approach, but I believe a needs based approach would capture the same dimensions of well-being at stake. According to the capabilities approach well-being is a matter of having capabilities to achieve central human functionings. Functionings are 'the various things a person may value doing or being' (Sen, 1999, p.75). Typical functionings might include being healthy, being well-nourished, being housed, being able to plan and make decisions about one's own life, having good social relations, having self-respect. Capabilities are 'substantive freedoms to achieve alternative functioning combinations' (Sen, 1999, p.75).

A virtue of a focus on capabilities and functionings is that it is able to capture the full range of goods constitutive of well-being that climate related events put at risk. The loss of life, damage to health, the loss of resources and income, psychological states of anxiety and depression are all effects of flooding for example. However, they are only some of the functionings and capabilities that are put at risk by flooding. There are other wider losses that also matter. Consider for example the following observation based on interviews and diaries of people affected by social displacement from floods in Hull in the UK:

> 'The process of recovery is one that carries with it the challenge of adjusting to displacement (caravans, living upstairs, rented accommodation, living with family), managing the process of physical recovery (loss adjustors, insurance companies, builders, retailers), trying to maintain 'normality' in everyday life (work, school, child care, illness, deaths, births, celebrations) and trying to rebuild social life (adjust to a new home, new community relations, build trust in the future).' (Whittle et al., 2010 p. 3)

The observations are fairly typical of functionings lost or put at risk by floods. In addition to the effects on health, a feature of displacement is a loss of support from others and the

normal routines of life, and with this the loss of ability to plan and make further choices. Individuals suffer a 'personal planning blight' (Wolff and De Shalit, 2007, p.69). Life is put on hold.

For Sen and Nussbaum capabilities rather than achieved functionings should be the aim of policy. There are two arguments offered for this priority given to capabilities. The first is freedoms to realise functionings that matter for well-being as such – there is a difference in welfare between a person who is starving and a person who is fasting. The person who is fasting has a choice to eat, whereas the person who is starving does not. The second is a liberal argument that policy should respect individuals' freedom to make their own choices about their lives. However, the impact of disasters like floods on achieved functionings shows that there are good reasons for thinking the simple priority of capabilities over achieved functionings cannot be sustained. Certain achieved functionings are a condition of being able to effectively exercise freedoms and choices at all. These would include for example social networks, secure housing and minimum levels of health. Having the support of others in social networks is both an achieved functioning and a condition of exercising capabilities. The point is of particular importance in considering the impact of floods, droughts and heatwaves, since these events put at risk some of the functionings that are condition of the exercise of capabilities. There is also a second independent reason for a focus on functionings in identifying climate disadvantage. It is much more difficult to identify and measure capabilities than it is measure individuals' functionings. In practice, the capabilities approach typically measures different levels of achieved functionings rather than capabilities.

Vulnerability: from hazards to disadvantage

Just as resources differentially convert into gains in well-being so negative events like floods, heatwaves and droughts will differentially convert into losses in well-being. Personal, environmental and social factors can mean that the same event can lead to very different losses in well-being. What factors are involved in the conversion of exposure to hazards into a loss of well-being?

Consider heatwaves. The impact of heatwaves on life and well-being depends upon a variety of personal, environmental and social conversion factors. The personal conversion factors include age and health – the old and the very young and those with certain prior health conditions will be more sensitive to heat. Environmental factors are also clearly important. For example, those in urban conurbations without green spaces or access to cool buildings will suffer enhanced exposure to heatwaves. However, there are also a variety of social factors involved in the loss of life and well-being. Klinenberg in his classic study of the Chicago heatwave notes that social isolation, fear of crime, neighbourhood decline all had major impacts on death rates. Old people died alone, in rooms with windows closed and doors locked, fearful of crime and without social connections of support and without public cool spaces to which they could move. This unequal pattern of deaths in heatwaves reflected and revealed wider patterns of social deprivation and disadvantage: '[E]xtreme exogenous factors such as the climate have become disastrous partly because the emerging isolation and privatization, the extreme social and economic inequalities, and the concentrated zones of affluence and poverty pervasive in contemporary cities create hazards for vulnerable residents in all seasons… [T]he event expressed and exposed conditions that are always present but difficult to perceive.' (Klinenberg, 2002. p.230)

Similar points apply to floods. Personal factors such as age and health again will affect who is most adversely affected. So also do environmental factors such as the patterns of drainage in cities or the design and elevation of buildings in which people live and work. However, there are also a variety of social factors that affect the degree to which people's well-being is affected. Those on low incomes are less able to make their homes resilient to floods, less able to take up insurance, are more likely to be displaced for long periods in inadequate temporary accommodation that makes it difficult to sustain supporting social networks or to maintain the capabilities to plan and shape their lives. Social networks are central to how well individuals and communities are able to respond and recover from floods (Whittle et al., 2010). As with heatwaves, patterns of vulnerability to floods often reveal and reflect wider patterns of deprivation and disadvantage. Inequality in income and health and the deterioration of social networks of support are sources of vulnerabilities to wider set of negative impacts on life.

A point to note here is that several of the conversion factors are also themselves functionings that are important to well-being. Social networks and health both matter in themselves and are central to maintaining other functionings. They are what Wolff and de Shalit usefully term 'fertile functionings' and their loss 'corrosive disadvantages' (Wolff and de Shalit, 2007, p.121-125). Their loss is a particularly damaging form of vulnerability since their loss brings other vulnerabilities in their wake. A particularly important fertile functioning is voice and power. Those with voice and social power are often better able to call on and mobilise resources in response and in recovery. Those without may be less able to do so even where their actual and potential losses in well-being are greater.

The examples I have used in this section are based primarily on research in the UK on climate disadvantage (Lindley et al, 2011; Lindley and O'Neill, 2013; ClimateJust, 2015). While some of the losses to well-being and some of the conversion factors will be true generally, in different contexts different dimensions of well-being and different conversion factors will be more salient. For example, the seriousness and gravity of drought and flood will be greater in conditions of subsistence agriculture where life itself is dependent upon livelihoods that are put at risk (IPCC, 2014b chs.9 and13). Problems of social dislocation and the loss of ways of life are at stake where the very existence of some island communities is threatened by rising sea levels (IPCC, 2014c, ch. 29). What conversion factors will be salient will also be different in different contexts. As the IPCC note in developing a multi-dimensional approach to vulnerability and inequality, factors involved in vulnerability 'may be context-specific and clustered in diverse ways (e.g., class and ethnicity in one case, gender and age in another)' (IPCC, 2014b, p.50). For example, where patterns of labour and livelihood and access to land and resources are marked by strong gender differences, gender will become more salient (IPCC, 2014b, pp 50, 808-9 and passim.) Difference in both the dimensions of well-being and the factors that will be involved in loss of life and well-being require more detailed specification in different contexts. However, what emerges in all these different contexts is a relationship between many hazard-specific vulnerabilities and wider social and political inequality (IPCC, 2014b, p.15). The virtue of understanding climate disadvantage across distinct dimensions of vulnerability is that it brings to fore this relationship between climate disadvantage and wider patters of inequality.

Multi-dimensional disadvantage

Climate disadvantage is a function both of the frequency and intensity of exposure to climate related events like floods and heatwaves, and of the vulnerability of individuals and communities to those events – to the degree and likelihood that the event will lead to a loss in well-being. Identifying and measuring climate disadvantage is a matter of bringing together exposure and vulnerability.

Is it possible to use this approach to identify geographical and social distributions of climate disadvantage? One way of doing so is to identify measures or proxy measures of the different conversion factors that lead from being affected by flood and heatwave to losses in well-being: personal conversion such as age and health; environmental conversion factors, such as the physical characteristics of housing and neighbourhoods; and social factors that determine how well individuals are able to prepare for, respond to and recover from floods and heatwaves, such as income, community networks, access to public spaces, access to medical services, local knowledge, abilities to plan and exercise autonomy. Mapping the distribution of vulnerability onto mappings of distribution of exposure to flood and heatwaves allows a mapping of the distribution of climate disadvantage (Figure 1).

FIGURE 1 HERE

There are clear limitations to an exercise of mapping like this (Lindley et al, 2011, pp.29-30; ClimateJust, 2015). Some of these are practical. The metrics employed for different dimensions of vulnerability – personal, environmental and social – are imperfect. Some important conversion factors, such as degrees that individuals are able to plan and shape their lives, may have no metrics, direct or proxy. The mapping of vulnerability will be incomplete. While the metrics will be helpful in identifying some dimensions of vulnerability and targeting responses to those in greater need under those dimensions, they are not substitutes for judgement, local and practical knowledge and public deliberation.

In addition to these immediate practical problems, there are problems that might be raised with the use of a multi-dimensional space of disadvantage. Capabilities and functionings are plural. There is no single measure of gains and losses across different dimensions. Neither is there some trade-off schedule which would allow losses in one dimension of

functionings be compensated for by gains in others. Losses that take an individual below a minimal level of functioning in one dimension, for example that of social relationships cannot be compensated for by gains in another, say improved nourishment. There is, as is said in popular parlance, no substitute for good friends.[3] Moreover, losses in functionings can matter in different ways: in their gravity, how seriously a person will be harmed; in their urgency, how rapidly action must be taken to respond to the harms; in their corrosiveness, how far their loss threatens other functionings (Wiggins, 1998; Wolff and De Shalit, 2007). We have then multiple functionings that matter in different ways.

The complexity of the multi-dimensional space of disadvantage is increased further by the existence of the different personal, environmental and social conversation factors that lead from exposure to flood, drought and heatwave to losses in various dimensions of well-being. Low income, social dislocation, age, health, the physical and social characteristics of neighbourhoods, and various other sources of vulnerability all matter. However, they do not all matter equally and judgements about which matter more in what context are difficult to make.

Climate disadvantage on the account developed here will be pluralist in the constituent dimensions of well-being - functionings and capabilities - in the dimensions along which losses in those dimensions matter, and in the factors that lead to the losses in well-being. A serious objection to this multi-dimensional approach to climate disadvantage is that it becomes difficult to identify those who are most disadvantaged. Indeed given this multiplicity in dimensions of functioning and different ways they matter it may not even make sense to talk of a single most disadvantaged group. The question who is most disadvantaged invites the response: in what dimension of well-being and in what respect – gravity, urgency or corrosiveness? The approach developed here to climate disadvantage is not peculiar in this regard. Similar concerns have been raised more generally to capabilities approach, for example with respect to multi-dimensional measures of poverty (Alkire and Foster, 2011a, b). In contrast the argument might run, a virtue of an approach that uses a single metric, for example a resource metric, is that the worst off can be identified.

In this chapter I will confine myself to two observations in response to this line of argument. The first is that, because different sources of vulnerability and well-being loss tend to cluster in the unequal societies in which we live, in practice the problem of identifying those with greater disadvantage is less acute than the theoretical objection might suggest. Groups on low income, in neighbourhoods with high levels of social dislocation and crime, with few green spaces or access to public facilities, with high levels of ill-health will be disadvantaged over a number of different dimensions of vulnerability. One part of the reason for such clustering is that the certain disadvantages - ill-health, social isolation, poverty, reduced voice and power to shape decisions - are corrosive in the ways outlined earlier. The loss of corresponding functionings leads to losses in other functionings. Social vulnerabilities and losses in well-being cluster in ways that make identification of the most disadvantaged less difficult than might be thought.

The second observation is that the use of a single metric of disadvantage is not what is required for consideration of practical responses to disadvantages. They require rather understanding of the sources of vulnerability - the conversion factors - the different dimensions of well-being at risk and in what way their loss matters. If vulnerability in one neighbourhood is due primarily to the particular age profile of a community, it will require different kinds of responses from one in which the vulnerability is due primarily to environmental factors – such as the physical nature of the neighbourhood – or to social factors such as community ties, poverty or the absence of local knowledge of risks within migrant communities. Where these different factors cluster, there is a need for co-ordination between different service agencies to best deliver responses. Moreover what matters in responses will change in different contexts. In preparing and recovering from floods or heatwaves the gravity and corrosiveness of losses will be of greater importance. In contrast, in responding to an emergency the urgency of needs will be a higher focus. Differentiation between the different dimensions of climate disadvantage is what is required to plan responses and preparation.

Addressing disadvantage is a question of addressing the dimensions of well-being under threat and the different personal, social and environmental factors involved in the loss of well-being. The use of a single resource metric, in contrast, since it misses all the

dimensions of well-being and the factors leading to a loss in well-being, makes for poorer responses to the problems of disadvantage. It cannot be used to specify responses that address the sources of disadvantage. For practical responses to disadvantage, a single ordering of disadvantage is rarely required or helpful. Practical reason requires a different kind of information – who needs what kinds of support. In practice the useful upshot of the mapping project was the information that was disaggregated across different dimensions of vulnerability. Multi-dimensional approaches to characterising and measuring climate disadvantage are better suited to the needs of practical reasoning.

Justice within and across generations

This chapter has been primarily concerned with mapping climate disadvantage within generations. In this final section I will consider the implications of the arguments for questions about justice and well-being across generations.

Standard economic approaches to future generations tend to employ a preference based approach to well-being. Well-being is conceptualised in terms of preference satisfaction. The conceptualisation brings the concept of well-being under 'the measuring rod of money'. The strength of a person's preference for a marginal improvement in her goods is measured by her willingness to pay for that good. On the standard account, improving well-being is a matter of improving consumption. Growth in consumption improves human well-being. Consumption here is used in the specific market sense to refer to the acquisition of any goods and services for which a person can express a willingness to pay (Knights and O'Neill, 2015). As we saw earlier a standard assumption in the discounting literature is that, given that average per capita consumption is higher in the future, those in the future will be better off. Sustaining human well-being on this account is a matter of passing on capital that will deliver these consumption opportunities to those in the future. Weak and strong versions of sustainability are typically distinguished on the basis of how far delivering the relevant level of capital will be simply a matter of passing on some total amount of capital – human made or natural – or whether there is some critical level of natural capital that must be passed on and which cannot be substituted for by human made capital. Passing on a level of capital is also typically what is taken to be required to insure that future generations

are able to adapt to and cope with climate change. It will provide the stock of goods required for future generations to generate technological innovations and forms of physical defence that will allow them to live well in a world affected by climate change.

There are two central problems with this approach. The first is that total levels of consumption do not provide a good index for the provision of goods that matter for human well-being.[4] The mix of goods passed on matters, not simply totals. A needs or capabilities based approach to well-being, permits far less substitutability across different dimensions of well-being than a preference satisfaction account. Generally any objective state account of well-being which is pluralist about dimensions of well-being and claims that there exist minimal thresholds in those dimensions will be committed to limits in substitutability across dimensions of well-being. As we noted earlier it will not be possible to trade-off losses in one dimension of needs or functionings against gains in others. Losses that take an individual below a minimal level of functioning in one dimension, for example that of social relations, cannot be compensated for by gains in another, say housing. Losses in any dimension of well-being that take a person below a minimal threshold can only be properly addressed by the provision of goods in that dimension. A person who suffers from malnutrition requires specific objects of nutrition: better housing and education in themselves will not compensate for that loss.

Given the limits of substitutability across different dimensions of human functioning, insofar as intergenerational ethical concern is about maintaining or improving human welfare over generations, then it requires each generation to pass on a bundle of goods that is disaggregated across the different dimensions of human functioning. It requires the maintenance of the specific conditions and bundles of goods required for livelihood and good health, for social affiliation, for the development of capacities for practical reason, for engaging with the wider natural world and so on across other dimensions of functioning. Each dimension will require goods specific to that dimension. The capacities of reason require particular formal and informal institutions and goods for their development. The goods of social affiliation require cultural and physical conditions, including particular environments and physical places that are constitutive of good community. The bundle of

goods to be passed on needs to be disaggregated. The mere aggregate provision of more goods and services as such is not what is important.

Second, what matters to future well-being are not simply the resources available and hazards that face people in the future, but how these will convert into gains and losses in well-being. In particular what matters is the kind of social world that is passed on to future generations. The point matters in particular in considering adaptation to climate change. Adaptation is not simply an apolitical technical problem concerned only with issues such as that of infrastructures required for defence against flood and drought. It has a strong political dimension concerned with the social dimensions of vulnerability. As we have seen many of those vulnerabilities are not hazard specific. Rather they reflect wider patterns of inequality and social dislocation. Measures that address poverty, inequalities in wealth, power and voice, the support of communities and neighbourhoods matter in themselves, but they are also central dimensions of adaptation policy. What matters for the well-being of people in the future is not, above certain threshold levels, primarily the consumption opportunities they have available, but rather the social and political world in which they live.

Climate change will increase the frequency and intensity of extreme weather events such as flood, drought and heatwaves. In this chapter I have argued that the impacts of these events need to be disaggregated across the full range of dimensions of well-being they threaten and the full range of personal, social and environmental factors that render individuals more or less vulnerable to them. What emerges from the process of doing so is that the impacts of climate change will both reflect and reveal wider patterns of injustice across dimensions such as class, gender and ethnicity which tend to be absent from much of the discussion of justice and climate change. Doing so also allows a better understanding of what justice requires between generations that has been, for good reason, central to the debates on climate change. The goods that are to be passed on to future generations need to be disaggregated themselves across different dimensions of well-being. The social, economic and political world in which future people live will matter to how climate disadvantaged they and their communities will be.

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[2] The argument is stated more formally in terms of the standard Ramsey formula for discounting future consumption (Stern, et al. p.46; Beckerman and Hepburn, 2007 p.191):

$\rho = \delta + \eta g$

where ρ is the social discount rate for a project, δ is the pure time discount rate for utility or welfare, η is the elasticity of marginal utility with respect to consumption and g is the expected future growth rate of average per capita consumption. The value of η, eta, is a measure of the relative worth of consumption of some unit of consumption of the less well off in comparison with the better off. The Stern report has $\eta = 1$ which means that £1.00 for one person A is worth 10 times more for poorer person B who has a tenth of the income of A. If η is given a higher value, the value of the same unit of good will be proportionally worth more to a person with lesser wealth. So if $\eta = 2$, £1.00 for one person A is worth 100 times more for another person B who has a tenth of the income of A. The value of η is correspondingly said to measure 'society's aversion to inequality of consumption' (Beckerman and Hepburn, 2007, p.193). Much of the more recent debate on Stern has concerned the value he assumes for eta. Thus for example, Dasgupta, while largely accepting Stern's view about the value to be put on δ, claims that the value he places on $\eta = 1$ is insufficiently egalitarian. The more egalitarian one is, so the argument goes, the higher will be the discount rate on consumption. This is true only the assumption that the rate of growth of consumption, g, is positive and not negative. If growth rates are negative then we should value consumption in the future at a higher rate than it is today. The discount rate should be negative (Dasgupta 2007, p.10). However, if growth is positive so also should be the discount rate – the higher the growth rate, the higher the discount rate. The argument runs that if future average per capita consumption is higher we should discount.

[3] This is not of course to deny that there are not important causal relations between losses in different dimensions of well-being as the existence of fertile functionings and corrosive disadvantages shows.

[4] I develop this point in more detail in O'Neill, 2010, 2014.