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Sufficientarianism and the economics of climate change

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Abstract

Can economics reflect climate justice? Although the scenario forecasts of climate economists are key inputs to IPCC assessments, their ethical assumptions fail to reflect important considerations of justice. This is clearest regarding sufficientarian justice, which requires that no person falls below a minimum level of well-being. This view is reflected in an important strand of climate diplomacy and activism that highlights the plight of those most vulnerable to climate harms. However, I show that sufficientarian justice is largely incompatible with predominant approaches to climate economic modelling. I then examine the prospects for a sufficientarian climate economics, considering dual discounting approaches, well-being 'guardrails' approaches and basic needs modelling. I find that the latter two are closest to sufficientarianism, although they reflect different interpretations of its core claims. Finally, I consider whether climate sufficientarianism requires economic 'degrowth', as some have claimed. I argue that sufficientarianism is compatible with periods of economic growth, but is likely to be incompatible with the indefinite pursuit of growth due to the ecological impacts this would entail. Since growth is a standard assumption in climate economics, this reiterates the need for new economic approaches in the pursuit of a just and sustainable future.

Keywords

sufficientarianism, climate justice, climate ethics, climate economics, degrowth

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Introduction

Can economics reflect climate justice? This may seem to be a strange question, but it is an important one. The scenario forecasts of climate economists have been key inputs to IPCC assessment reports. To provide them, economic modellers utilize ethical assumptions. These are evident in the social welfare function contained in such models, which determine what constitutes human well-being and the distribution of resources across generations. However, the ethical assumptions in much of climate economics poorly reflect those found in literature on climate ethics and in societal discourse about the climate crisis.

In climate ethics, leading theorists have argued that climate policies ought to protect the human rights, basic needs or capabilities of current and future people (Caney, 2010; Cripps, 2013; Meyer and Roser, 2009; Rendall, 2011; Shue, 1993, 2019). Such views are *sufficientarian:* they hold that justice requires ensuring that no person falls below a minimum moral threshold. Attention to how climate change affects basic needs or human rights accords with an important strand of international climate diplomacy and with climate activist movements that draw attention to the plight of those most vulnerable to climate impacts. Similarly, scholarly and activist proposals for economic 'degrowth' (D'Alisa et al., 2015) highlight the importance of protecting human needs above economic interests. Yet if one went looking for information concerning human rights or basic needs in climate economic models, one would likely be disappointed. This point has now been highlighted by the IPCC, whose Sixth Assessment Report on Mitigation states that climate economic models may not capture important implications of climate change for well-being (Creutzig et al., 2022). This raises the question whether there are any approaches in climate economics that more adequately reflect sufficientarian justice.

While climate economics need not provide a complete picture of justice, the concern is that it reflects a moral perspective that departs too radically, and without justification, from some of the most pressing concerns of justice raised by climate change. This is especially problematic due to the influence of economics upon climate policy. Climate economics has been predominant within the IPCC's Working Group III, which is tasked with producing a research synthesis aimed at policymakers. By virtue of this role, the models and assumptions utilized within climate economics shape much of the ensuing policy debate, as well as wider perceptions of feasible or desirable responses to climate change. Thus, it is important to single out climate economics for normative critique with the aim of improving its convergence with core concerns of justice. This paper will explore contemporary economic approaches that might more adequately reflect sufficientarian justice. This will broaden the consideration of economics within climate ethics, which has mostly been limited to the topic of intertemporal discounting; a topic which, as I explain below, is largely irrelevant for sufficientarian justice. In addition to this normative goal, the paper may also benefit climate economists interested in translating conceptions of justice into their models (Zimm et al., 2024).

The paper proceeds as follows. In the second section, I introduce sufficientarianism in the context of debates about distributive justice. The third section then examines the normative shortcomings of existing work in climate economics. The fourth section considers

Kyllönen and Basso's (2017) proposal for a sufficientarian-inspired social welfare function. Although this moves closer to sufficientarianism, I argue that more radical departures from conventional economic analysis are required. The fifth and sixth sections examine two approaches in recent economics and climate mitigation research as more adequate expressions of sufficientarianism. The first is a set of approaches that aim to build well-being 'guardrails' into their analyses by moving away from a unitary measure of consumption in favour of disaggregated measures of well-being. The second set of approaches models the requirements of preserving basic human needs in the pursuit of climate stabilization, where such needs are conceptualized in opposition to non-basic 'wants'. The seventh section finds that both guardrails approaches and basic needs approaches are compatible with sufficientarianism. Finally, I consider whether sufficientarianism provides reasons to favour a climate policy-based economic growth or one based upon degrowth and whether this answer requires us to favour either the guardrails or basic needs approach.

Sufficientarianism: Core features

First, it is important to clarify how we will understand sufficientarianism in this paper. In debates about distributive justice, sufficientarianism emerged in light of challenges faced by utilitarianism and egalitarianism. Utilitarianism, by requiring policies that maximize (total or average) utility, can require shifting welfare from the worst off to the better off. Egalitarianism is vulnerable to the 'levelling down' objection (Parfit, 1997), since if equality is all that matters, then a world where everybody is very poorly off would be better (because more equal) than a world where some people fared very well but others fared moderately well. An alternative is prioritarianism, which holds that benefits are of greater moral value to the extent that someone is worse off (Parfit, 1997). In contrast to these views, sufficientarianism holds that having 'enough' of what is necessary for individuals to live a decent life is more morally important than benefits above this threshold. While this characterization is accurate as far as it goes, we require a clearer picture of sufficientarianism in order to distinguish it from rival views of justice.

In a recent treatment, Timmer (2022) contrasts two interpretations of sufficientarianism, both of which render it in terms of three core theses. On the one hand, many have characterized sufficientarianism in terms of the *positive thesis*, which holds that it is morally valuable to have an adequate supply of goods, and the *shift thesis*, which holds that our moral reasons for benefitting people change once this adequate supply has been reached. The significance of this change is reflected in the third claim, i.e. the *negative thesis*, which holds that once individuals possess an adequate supply of such goods, justice does not require any further distributions. Implicit in each of these theses is the notion of a *threshold*, which marks the distinction between an adequate and an inadequate supply of the goods required by justice. There is disagreement about whether both the positive and negative theses are necessary for any view to count as sufficientarian. Frankfurt (1987) defends the negative thesis, suggesting that not having enough to live a decent life is what really motivates those concerned about inequality, rather than the mere fact that some have more than others. However, recognizing the moral urgency of having enough to live a decent life does not imply the

negative thesis. Casals (2007) distinguishes between a 'pure sufficiency view' that rejects distributive principles above the sufficientarian threshold and mixed sufficientarian views that endorse further distributive principles.

On the other hand, Timmer's (2022) interpretation recognizes any view as sufficientarian if it endorses an alternative set of three claims. These are the *priority claim*, which holds that there are non-instrumental reasons to prioritize benefits in certain ranges of goods above benefits in other ranges of goods; the *continuum claim* that at least two of those ranges of goods are on a single continuum; and the *deficiency claim* that greater priority is given to benefits in the lower range on this continuum (2022: 299). These three claims substantially overlap with the traditional three theses of sufficientarianism (2022: 304). Take wealth as an example. The traditional positive thesis entails the continuum claim since what is at issue is the supply of the same good, wealth, both above and below the threshold. The traditional positive thesis entails Timmer's priority claim, since the moral value of having an adequate supply of wealth requires that a greater priority be given to providing wealth to those that have an inadequate supply. Further, the deficiency claim explains why benefits below the threshold are especially morally urgent, namely that failing to possess enough wealth would leave a person in a state of morally unacceptable deprivation. Further, the traditional shift thesis holds that there is a moral difference between the provision of wealth below and above the threshold, which seems again to reflect the priority, deficiency and continuum claims for the reasons just stated. Finally, like the positive thesis, the traditional negative thesis also presupposes the continuum claim because the idea that justice does not require redistributions of wealth above the threshold assumes that what we are opposing is further redistribution of wealth, and not some other good.

Given the extent of overlap between these two ways to characterize sufficientarianism, it would be possible to examine approaches to climate economics in terms of either one. Indeed, in what follows, I will sometimes refer to both characterizations. However, I will generally favour Timmer's characterization for the heuristic reason that it helps us to more clearly distinguish sufficientarianism from rival distributive principles. This is important given our aim of exploring economic approaches that might adequately reflect sufficientarianism.

To see what makes Timmer's characterization especially clear in this regard, consider his application of the priority, deficiency and continuum claims to other distributive principles (2022: 301–3). While egalitarianism and prioritarianism both endorse the continuum claim by recognizing a common metric of justice as their *distribuendum*, unlike sufficientarianism, both of these views reject the priority claim. Egalitarianism does this because it judges the moral significance of changes in the distribution of goods according to whether these changes affect distributive equality. Despite appearances, prioritarianism also rejects this priority claim because it judges the moral significance of benefits to an individual to be greater the lower their current level and the greater the size of the benefit, and *not* because there are non-instrumental reasons to provide benefits when someone is below the threshold.[1] This may suggest that sufficientarianism is distinguished by its commitment to the priority claim, but this is not the case. For instance, Rawls also endorses it by assigning lexical priority to basic liberties over equality of opportunity and over the equality of resources (Timmer, 2022: 302). The deficiency

claim is also necessary to distinguish sufficientarianism from other views, because this explains why it is especially important to provide benefits that are further from the threshold. Thus, it is the combination of these three claims that makes a view sufficientarian, rather than merely one of them (2022: 302). In what follows, we will require all three claims to be satisfied for an approach to be considered sufficientarian.

A further benefit of this characterization of sufficientarianism is that it allows us to consider both views that do not require redistribution past the threshold and views that allow for this. Climate ethics tends to reflect versions of sufficientarianism that require protecting the basic needs or human rights of people, but which also require redistribution beyond this (cf. Caney, 2014a; Meyer and Roser, 2009).[2] Nonetheless, I will remain open to sufficientarian approaches that endorse the negative thesis. I will also attempt as much as possible to leave open the question of which threshold should be favoured. Climate ethics features several possible alternatives including Caney's (2010) human rights–based approach which targets the protection of rights to health, life and subsistence and Cripps' (2013) more demanding capabilities-based thresholds. As we will see, the economic approaches considered in this paper offer both direct and indirect proposals to measure sufficientarian thresholds. To do so, I will follow Kyllönen and Basso's terminology of *fundamental interests*, which is meant to include a range of plausible but variously demanding candidates such as capabilities, basic needs or human rights.

Normative shortcomings of climate economics

This section reviews some normative shortcomings of climate economics. I draw upon some more general critiques of welfare economics, as well as recent discussions of economics within climate ethics. While these critiques may be advanced from several conceptions of justice, I will highlight the particular ways in which economic analysis may be problematic.

I will focus primarily upon Integrated Assessment Models (IAMs), which are the premier modelling methods in climate economics. Many IAMs utilize a social welfare function to compare the costs of mitigation now with the damages avoided at some point in the future, as well as with the benefits of consumption which would have to be foregone to fund mitigation. To make such comparisons, it is conventional to calculate a 'social discount rate' via a version of the Ramsay equation:

$$p = \delta + \eta g$$

where δ is the pure rate of time preference for welfare, i.e. the rate at which present benefits are preferred to future benefits; η is the marginal utility of consumption (also known as the rate of aversion to inequality in consumption); and g is the expected rate of economic growth.

Large differences in the social discount rate among IAMs reflect differences in the value of δ (Dasgupta, 2007 2021; Davidson, 2017; Fleurbaey et al., 2019). Prominently, Stern (2006) set the value of δ to 0.1%, while Nordhaus (2007) set δ at 1.5% in line with capital market rates of return on investment. While this looks like a small difference, it produces vastly different estimations of the social discount rate

applied to climate policy. Stern's approach results in carbon prices of $350 per ton (in 2005 prices), ten times larger than Nordhaus' figure of $35 per ton. This result is produced by the time preference introduced in δ, since both Stern and Nordhaus set the value of η at 1 within the Ramsay equation.

Questions of distributive justice arise here because a higher value for δ implies giving a lower weight to the economic welfare of future generations, while a lower value implies the opposite. A sharp disagreement ensued between 'descriptivists' like Nordhaus (2007: 691–692), who claim that their discount rate is separate from ethics and merely describes the preferences of people in current market exchanges (see also Weitzman, 2009), and 'prescriptivists' like Stern who explicitly defend their discount rate in terms of ethics.[3] Observers of this debate have tended to side with the prescriptivists, concluding that the discount rate inevitably reflects a judgement about intergenerational justice (Broome, 2012; Caney, 2014b; Fleurbaey et al., 2019; Walsh, 2017). In addition, serious normative and empirical objections have been levelled against descriptivism. On the normative side, the descriptivists rely upon the premise that it is ethically appropriate to use a discounted utilitarian welfare function in the first place and that the time preferences of investors in markets are ethically appropriate guides for policymaking (Fleurbaey et al., 2019: 93; Walsh, 2017). On the empirical side, it is not clear which of the many actual market rates available we should look to, or what would motivate choosing one over another. There is also a methodological problem with inferring a rate of time preference applicable to climate change from *any* observed market rate, because such rates do not appropriately reflect the impacts of climate change. Partha Dasgupta (2021: 268) notes, '[i]t is a fundamental mistake to infer δ by estimating it from consumer behavior in a world where much of the biosphere remains free to all'.[4]

While the debate about discounting is certainly relevant for climate ethics, it is largely orthogonal to the sufficientarian concerns of this paper. We can see why by means of the well-known distinction between justice as *burden sharing* and as *harm avoidance* (Caney, 2014a: 125–126; Shue, 1996: 164–166). Burden sharing climate justice concerns the fair distribution of burdens among agents responsible for mitigating climate change (Caney, 2014a: 125). Aspects of burden sharing climate justice are reflected in the Ramsay equation utilized by many IAMs, since this takes a position on how much the current generation ought to prioritize their own economic welfare over that of future generations.

The same cannot be said about climate justice as harm avoidance. Harm avoidance begins with the aim of avoiding extremely severe climate harms that would undermine human rights and then asks who ought to do what to ensure this (Caney, 2014a). For sufficientarians, harm avoidance is of greater moral significance than fair burden sharing, since the impacts of climate change threaten to undermine the fundamental interests of many people across generations.[5] As we saw in the second section, sufficientarianism is distinct from most views in prioritizing goods below a certain threshold (the priority claim) and in doing so for the reason that failure to possess such goods counts as morally unacceptable deprivation (the deprivation claim).[6] This implies that such concerns take priority over any non-basic effects upon welfare or economic activity.

The problem is particularly glaring in relation to climate economic models based upon a single aggregative social welfare function. What is being discounted here is *aggregate*

economic consumption, based on the assumption that consumption is a relevant proxy for human well-being. Within the Ramsay equation in IAMs, consumption enters via the variable η, which tracks the diminishing marginal benefits of consumption. Setting η at 1, which as we saw both Stern and Nordhaus do, means that the same $1.00 enjoyed by a wealthy person would provide 10 times as much welfare if given to a person earning only one tenth as much.[7] Within climate economic models, consumption is understood to be shared among individuals within a single generation equally on a per capita basis. Instead, diminishing marginal utility applies intergenerationally, with current and future generations representing agents with different shares of income.[8] Due to the constant rate of economic growth in such models (reflected in the Ramsay variable g), future generations are always assumed to be wealthier than people now.[9]

This approach to welfare is fundamentally at odds with sufficientarianism. The issue is not what the appropriate value of the marginal utility of consumption ought to be, but whether consumption can be meaningfully utilized to understand the effects of policy upon the fundamental interests of individuals.[10] To see why, it is helpful to recall what consumption actually measures. Per capita consumption based upon gross domestic product (GDP) measures the market value of goods and services produced by a national economy. While GDP was originally a way to compare country performance, it became a convenient proxy for social welfare because rising GDP growth seemed to coincide with rising living standards and improved quality of life (Walsh, 2017). We now know that this was not because GDP is correlated with well-being at all times and in all societies, but due to a special combination of historical conditions in the postwar era. Outside of these historical conditions, GDP does not reliably track changes in well-being, or many other ethically important dimensions of the economy that might be plausibly related to sufficientarian thresholds. As Fleurbaey (2009: 1029) notes, GDP is blind to inequality and

> many determinants of well-being such as the quality of social relations, economic security and personal safety, health, and longevity. Even worse, GDP increases when convivial reciprocity is replaced by anonymous market relations and when rising crime, pollution, catastrophes, or health hazards trigger defensive or repair expenditures.

Consumption-based analysis based upon GDP does not capture the depletion of natural resources, nor the degradation of the natural environment, since these effects typically fall outside markets and thus lack meaningful price information (Fleurbaey, 2009: 1041).[11] Morally relevant changes in society can be invisible, as rising wealth inequality has coincided with sustained GDP growth in many developed nations (Piketty, 2014). These critiques of GDP-based consumption modelling have led to a broadening of economic thinking beyond the pursuit of indefinite growth (Raworth, 2017), and towards broader conceptions of well-being and sustainability, as is evident in the pursuit of the Sustainable Development Goals (Fioramonti et al., 2019).

Notwithstanding such critiques in the wider economic literature, climate economics has overwhelmingly continued to model the effects of policy in terms of GDP. Now, I do not wish to imply that such work does not provide useful information. For one thing, global emissions and GDP have been tightly correlated over the past century,

and there is presumably some relationship between GDP and the rate of climate mitigation.[12] Further, significant falls in GDP tend to create or exacerbate patterns of unemployment and poverty. As such, GDP bears some relation to human development outcomes of the sort at issue in many discussions of justice.

For sufficientarianism, the problem is how indirect such relations are. As noted, GDP does not reliably track some of the most urgent forms of climate injustice, such as whether climate change will undermine the human rights or basic needs of people now and into the future. This sort of information cannot be straightforwardly extrapolated from consumption-based analysis. It is thus particularly concerning that consumption-based climate modelling has been the predominant economic input provided to policymakers and the wider public.

Utilizing consumption as a proxy for well-being also assumes that people are relevantly alike in terms of how consumption benefits them. However, as Sen (1980) showed, a disabled person would require far more resources to achieve similar well-being outcomes compared to an able-bodied person. Given this, utilizing consumption to measure the welfare of diverse individuals risks overlooking serious shortfalls in fundamental interests. Even an equal per capita distribution of consumption within the current generation can be incompatible with sufficientarianism's deficiency claim, as individuals who require more resources to achieve tolerable levels of welfare may languish in a state of deprivation (Kyllönen and Basso, 2017). This issue also arises due to the incommensurability among the determinants of well-being, some of which may simply be unavailable notwithstanding one's share of consumption or the efficiency with which one can make use of it. For instance, a person able to purchase a greater quantity of consumer goods may still lack adequate healthcare or access to unpolluted air (O'Neill, 2017).

Importantly, the IPCC has recently recognized the limitations of consumption-based economic modelling, noting how consumption can fail to track the relationship between climate policy and basic needs (Creutzig et al., 2022). This limitation is highly significant for climate sufficientarians, who are interested in precisely such information. Because many IAMs assess the costs of climate change and the costs and benefits of climate mitigation *solely* in terms of GDP, any effects that do not affect GDP are not visible in the resulting analyses, while mitigation policies that harm economic growth look undesirable (Creutzig et al., 2022). However, well-being can be improved without increasing consumption, for instance through redistribution (Fleurbaey, 2009: 1032). Emissions can also be reduced through policies encouraging a shift towards healthy diets, which in turn can improve well-being outcomes (Creutzig et al., 2022).

Consumption-based analyses are inadequate because the relationships between consumption and the protection of fundamental interests are unclear in crucial respects. This means that we cannot learn much from them about whether a given climate policy pathway would protect or undermine the fundamental interests of people across generations. To be sure, these critiques have not gone unnoticed by the climate modelling community. In a recent review of the IAM literature, Zimm et al. (2024) note that some modellers have begun examining alternative distributive principles, including sufficientarianism.[13] Nonetheless, they also note that such work remains a very small part of the IAM literature, which still tends to reflect utilitarian assumptions and to use consumption to assess

the social impacts of climate policy. In the next three sections, I will examine several alternative economic approaches which move beyond this focus upon aggregate consumption, before considering the extent to which these might reflect a sufficientarian view of climate policy.

Dual discounting and sufficientarianism

One alternative is Kyllönen and Basso's (2017) proposal for a sufficientarian-inspired social welfare function based upon a dual-discount rate, specifically in relation to the η variable in the Ramsay formula. This is a rare attempt to bridge the normative gap between climate economics and sufficientarianism. Kyllönen and Basso argue that sufficientarians should favour a welfare function which disaggregates the effects of climate policy upon average generational welfare along two dimensions, namely (i) effects upon individuals within each generation and (ii) the resources needed to satisfy fundamental interests across generations (2017: 76). We saw above why it might be necessary to disaggregate welfare effects in line with (i). On (ii), Kyllönen and Basso explain that the contribution of ecological resources to human well-being can come apart from consumption in important respects. This is based upon dual discounting approaches in environmental economics (e.g. Baumgärtner et al., 2015; Gollier, 2010; Polasky and Dampha, 2021; Traeger, 2011). These approaches distinguish sharply between environmental goods that have little or no substitutability, such as critical ecological functions, and consumption which is assumed to be substitutable without loss.

Kyllönen and Basso's proposal features two distinct discount rates, one applied to resources that are easily substitutable for consumption and another for ecological resources that are difficult or impossible to substitute. Thus, climate policy would aim to ensure that 'the available resources should be distributed so as to (maximally) satisfy people's fundamental interests in any generation' (2017: 77). Kyllönen and Basso note that this runs into a potential trade-off between sustainability and intergenerational justice. While many natural resources are used unsustainably, there are current people whose fundamental interests could be met by using these resources. The intertemporal distribution required by sufficientarianism will depend upon our expectations about the changing efficiency with which resources support fundamental interests. Thus,

> if the current generation's use of resources is expected to decrease the satisfaction of fundamental interests in the future, sufficientarianism requires us to relocate resources from current consumption to investments aimed at ensuring the satisfaction of future people's fundamental interests. (2017: 77)

This would give greater priority to preserving the natural resource base required to satisfy future people's fundamental interests, in contrast to discounted utility approaches in which future consumption is valued lower than present consumption. On the other hand, if we expect that the availability of some resources will increase in future (e.g. due to economic growth), there would be reason to apply a higher discount rate to these resources while giving priority in their distribution to the fundamental interests

of the present generation. This would be justified because growth would make it easier to satisfy some of the fundamental interests of future people.

Based upon the distinction between easily substitutable consumption and difficult to substitute ecological resources, we can apply a discount rate upon the former so long as we have a justified expectation of future economic growth. A different approach to discounting is necessary for ecological resources that are difficult or impossible to substitute, such as the climate system. For such goods, we should discount at a much lower or even negative discount rate (2017: 78). Kyllönen and Basso here rely upon the plausible assumptions that there is close to zero substitutability between a threshold level of ecological resources and consumption resources and that many ecological resources are currently declining below the threshold necessary to satisfy people's fundamental interests (2017: 80). This proposal is reflected in a dual-η social discount rate where different growth rates are applied respectively to consumption and to ecological resources (2017: 78). The social discount rate for ecological resources is thus generally lower than it is for consumption, due to the inelasticity of substitution and the respective growth rates of ecological resources and consumption.

Kyllönen and Basso claim that such a dual-η social welfare function would

> be in line with the sufficientarian aims. Discounting the necessary resources at a lower rate means that the present value of effects on future satisfaction of fundamental interests will be relatively higher than the present value of the effects on future consumption of other resources. The greater the difference between their respective discount rates, the more the model prioritizes the effects on the necessary threshold resources. (2017: 80)

There are reasons to agree with this assessment, insofar as critical ecological resources such as a stable climate system are treated as non-substitutable and essential supports for fundamental interests. Put in terms of the claims of sufficientarianism outlined in the second section, the use of a dual-η discount rate seems to satisfy the priority claim. This is because, to the extent that climate change affects the fundamental interests of people, priority is given to climate mitigation over the pursuit of additional consumption (Kyllönen and Basso, 2017: 79). This also seems to imply that such consumption levels are themselves already at a sufficient level, since otherwise no such priority would be motivated. If a decline in critical ecological resources is predicted that would undermine people's fundamental interests, then ecological resources would be discounted negatively, again taking lexical priority over consumption. A climate policy based upon this dual-η discount rate would therefore 'assign greater weight to the effects of climate policies on future generations' fundamental interests than to our own well-being' (2017: 79).

Nonetheless, this proposal's continued reliance upon consumption as a proxy for well-being seems to undercut its compatibility with sufficientarianism. This is for reasons we encountered in the previous section. Consumption-based approaches do not seem to be compatible with the priority and deficiency claims that characterize sufficientarianism. The deficiency claim is particularly illustrative here, since this explains why we would assign greater priority to a lower level of benefits, namely that being at such a low level of well-being constitutes a morally unacceptable state of deprivation. As we saw

above, there is no such recognition of deficiency in aggregate consumption, notwithstanding its distribution. Indeed, as we also saw, Kyllönen and Basso themselves recognize that a consumption-based approach is problematic because even having an equal share of consumption may not prevent some individuals from being unjustly deprived. Given this, it is thus unclear why their approach retains consumption as a proxy for well-being, rather than further disaggregating those goods that support fundamental interests. As we will explore in the next two sections, recent work in climate economics has moved further from utilizing consumption as a proxy for well-being, exploring the multidimensional nature of human well-being and how this is affected by climate policies.

Well-being 'guardrails'

The first is a set of approaches that aim to build well-being 'guardrails' into their analyses (Dasgupta, 2021; Edenhofer et al., 2014; Jakob and Edenhofer, 2014; Stern et al., 2022).[14] Despite considerable heterogeneity, one key element in this literature is the recognition that well-being is determined by many factors, at least some of which may be incommensurable. Beyond the immediate context of climate change, this reflects developments within welfare economics recognizing the shortcomings of using consumption as a proxy to measure well-being. For instance, Stiglitz et al. (2009: 14–15) found that no single indicator adequately captured the multidimensionality of well-being. They recommended the following list of eight dimensions: material living standards; health; education; personal activities including work; political voice and governance; social connections and relationships; present and future environmental conditions; and economic and physical insecurity. Unlike the approach to social welfare discussed in the third section, guardrail approaches such as this do not utilize a uniform welfare function, nor do they rely upon GDP to show how society is faring. Instead, the dimensions of welfare that are measured are disaggregated and may be incommensurable.

In climate economics, early statements of the guardrail approach include Roemer's (2011) Rawlsian 'maximin' approach, which reconstitutes its social welfare function to reflect four independent variables, namely consumption, the quality of leisure time, biospheric integrity, and the stock of human knowledge (2011: 379), and Edenhofer et al.'s (2014: 480) 'corrected GDP' approach, which utilizes the sum of consumption and investments into capital, but which is further decomposed into a welfare function including the state of the global climate and investments into climate policy, the state of health from pollution and investments into health, and natural capital flows. Subsequent iterations have disaggregated well-being into further components. For instance, Michael Jakob and Ottmar Edenhofer outline an approach called 'welfare diagnostics' that identifies 'factors that are essential for human well-being – i.e. basic needs – and correcting deficiencies in their supply' (2014: 459). These are specified as 'minimum thresholds for capital stocks essential to welfare' (2014: 447) which are then provided or undermined by the ways in which natural resource rents are appropriated. This approach identifies a portfolio of capital stocks including physical capital, natural capital and human capital. These capital goods can be either of direct ethical value, as in the case of education, which is good in its own right, or indirectly as means to societal well-being, including the production of goods and services from physical capital, which raise material living standards.

Building upon these, a recent study based upon both the REMIND and MAgPIE IAM models (Soergel et al., 2021) has explored six climate policy interventions in terms of their effects upon 56 indicators or proxy variables for all 17 Sustainable Development Goals. Another approach based upon a total view of capital stocks is the concept of 'inclusive wealth' recently explored by Dasgupta (2021: 324ff.), which measures the societal value of the total stock of capital goods, comprising produced, human and natural capital, based upon improved estimations of the value of biodiversity.

An important feature of some guardrail approaches is the role of economic redistribution. For instance, Jakob et al. (2016) show that redistributing the domestic revenues from carbon pricing schemes could provide vital access to water, sanitation or electricity by 2030 for all world regions, with the exception of sub-Saharan Africa, which has the most significant access shortfalls but also the lowest emissions. A more demanding international redistribution of carbon pricing from wealthy to poorer nations would allow universal access to water, sanitation or electricity.[15] Similar redistribution could also finance universal access to critical infrastructure (Fuss et al., 2016). This openness to redistribution distinguishes guardrail approaches from much of the climate economic literature, which intentionally blocks redistribution.[16] While the decision to prevent redistribution is not explicitly justified, it may reflect the desire of modellers not to be perceived as criticizing current inequalities.[17] Such a choice obviously raises normative concerns.[18] In considering current inequalities in the context of climate policy, it seems highly relevant that wealthy and poor nations have produced highly unequal shares of emissions and that poorer nations have much higher vulnerabilities to climate harms (e.g. Caney, 2005).

Guardrails approaches also take a precautionary attitude towards the risks of imposing extreme climate harms upon future generations.[19] This seems to be in line with climate justice as harm avoidance. Capital stock approaches build in the non-substitutability of certain kinds or quantities of natural resources due to the potential for catastrophic risk. This has the same aim as Kyllönen and Basso's dual discounting proposal, namely to ensure the conservation of a certain critical 'level of environmental quality necessary for society's life-support systems' (Jakob and Edenhofer, 2014: 460), which are 'considered so precious that they should not be driven down at any price' (2014: 478). This results in a very different approach to social welfare than that evident in many climate economic models. Indeed, Stern et al. (2022: 183) actually equate the guardrail approach with limiting global warming to 'well below 2 °C' in line with the Paris Agreement, which they argue was not motivated by economic analyses but by increasing scientific evidence about the potentially catastrophic risks of exceeding this target. They contrast this with elements of the economics community, and particularly the IAM approach developed by Nordhaus, which is predominantly interested in the non-linearity between the very high costs of climate mitigation to limit warming to 2 °C and the unclear economic benefits of doing so (Stern et al., 2022: 183).[20]

Basic needs modelling

The second set of approaches departs more fundamentally from the assumptions of IAMs to model how climate policies affect basic needs. These approaches emerge out of ecological economics, a field that is highly interdisciplinary and is often positioned in

opposition to more traditional neoclassical economics. This includes some of the guardrail approaches introduced above. Among several long-standing disputes between these paradigms are the substitutability of natural resources and the possibility or desirability of long-term economic growth.

The normative foundation of these approaches is the theory of human needs developed by Doyal and Gough (1991). This theory postulates two universal basic needs, namely physical health and autonomy. These two universal needs require a variety of intermediate needs 'satisfiers' (cf. Max-Neef, 1991), which are socially mediated and cannot be secured by economic or natural resources alone. The full list includes nutritional food and clean water, protective housing, a non-hazardous work environment, a non-hazardous physical environment, safe birth control and child bearing, appropriate healthcare, a secure childhood, significant primary relationships, physical security, economic security and appropriate education (Doyal and Gough, 1991: 155–59).[21] While this account claims that human needs are universal, the ways in which needs are satisfied can be culturally specific. This theory distinguishes sharply between needs, which are morally urgent, and wants, which are not, and seeks to prioritize policies that support the former.

While the theory of human need is meant as a general alternative to preference-based welfare economics, Gough (2015: 1195–1196, 2017) has applied it to climate economics to distinguish a climate policy based upon universal human needs from one based upon culture-sensitive and variable wants. Gough argues that the only justifiable approach to intergenerational well-being in climate economics is one based upon a universal account of human need, because climate change is already imposing some serious harms upon current people, which will only become more severe in future. As Gough (2015: 1203–1204) explains, this means that analyses of climate policy must consider the needs of current people globally, as well as the needs of future generations. And because this conception of need is based upon an objective account of human development, it can be applied intergenerationally as the basic needs of future generations will not change. The contrast here is again with preference-based economic approaches, which simply assume that the preferences of future generations will be the same as people currently alive.

On this basis, basic threshold indicators of human need have been proposed in the context of sustainable development (Rao and Min, 2018). A series of recent climate and energy modelling studies have also operationalized the theory of basic needs (Brand-Correa and Steinberger, 2017; Lamb and Steinberger, 2017; Millward-Hopkins et al., 2020; O'Neill et al., 2018; Steinberger et al., 2020; Steinberger and Roberts, 2010; Vogel et al., 2021). A key move in many of these studies is the distinction between energy use that is needs-targeting and energy use that does not support needs and is instead classified as 'luxury' wants associated with industrial forms of consumption.

A focus upon basic needs allows for potentially more radical decarbonization scenarios to be explored. For instance, O'Neill et al. (2018) estimate the energy needs of the global population, finding that it is possible to provide all 7 billion people currently alive with nutrition, sanitation, electricity access and the eradication of extreme poverty, while radically reducing greenhouse gas emissions. However, they find that universal

achievement of high life satisfaction outcomes would require two to six times the energy than what is sustainably available. According to O'Neill et al. (2018: 95)

> If all people are to lead a good life within planetary boundaries, then our results suggest that provisioning systems must be fundamentally restructured to enable basic needs to be met at a much lower level of resource use. These findings represent a substantial challenge to current development trajectories.

The distinction between needs and wants is used to reduce the moral significance given to non-basic wants and to therefore justify 'drastic changes in demand to bring energy (and material) consumption as low as possible, while providing decent material conditions and basic services for all' (Millward-Hopkins et al., 2020: 2). Complementary studies also seek to decouple energy and carbon from human needs (Steinberger et al., 2020; Steinberger and Roberts, 2010). Steinberger et al. (2020) found that historical improvements in human well-being are only weakly correlated with energy and emission increases. An important implication of this is that even if rapid decarbonization may threaten economic growth prospects, this does not mean it would threaten human well-being. Basic needs approaches recommend radical reductions in resource use, beyond a focus on greenhouse gas emissions.

Towards a sufficientarian economics of climate change

We can now examine whether either the guardrail approaches or basic needs approaches are a better reflection of sufficientarianism. Given that basic needs approaches are critical of the compatibility between the pursuit of climate policy and further global economic growth, this question is of wider policy significance. It is important to ask whether sufficientarianism provides reasons to favour economic approaches premised upon growth or degrowth.

Guardrails, basic needs and the demands of sufficientarianism

Recall the three claims that can be taken to characterize sufficientarianism: the priority claim, which holds that we should prioritize benefits in certain ranges of goods above benefits in other ranges of goods; the continuum claim, which holds that at least two of those ranges of goods are on a continuum; and the deficiency claim, which holds that greater priority is given to benefits in the lower range on this continuum. I will concentrate on the priority and deficiency claims, since the continuum claim appears to be easily satisfied by both approaches.[22]

Let us take the priority claim first. Basic need approaches contain a direct formulation of need, where thresholds leading to their provision and the means to satisfy them are understood following Doyal and Gough's (1991) theory of human need. As Gough (2015: 1202) explains, 'need is a threshold concept', and the 'distributive principle entailed by the needs approach is to minimise… the shortfall of actual achievement from the optimum average'. As we saw in the sixth section, the thresholds associated

with this theory have been utilized to assess the connections between climate mitigation, nutrition and energy use. This formulation of need is premised upon a distinction between needs and non-basic, luxury preferences. Some such distinction is an important feature of many climate sufficientarian accounts.[23] Here, the provision of needs takes lexical priority over luxury preferences. Given that these views call for bringing consumption as low as possible in order to reduce global emissions while providing for basic needs, they reflect a particular version of the priority claim that denies the moral significance of benefits above the threshold. As Gough (2015: 1202) recognizes, basic needs explicitly reflects a sufficientarian conception which aims 'to bring all individuals up to such a threshold. It says nothing at this stage about inequalities above this level'. This reflects the traditional characterization of sufficientarianism, specifically the 'negative thesis' which does not require further redistribution once everyone has reached the threshold. As Gough (2015: 1203) says, 'climate change and a diminishing environmental space impose a further aggregate constraint. If this closes down the opportunity to permit high standards of sustainable need satisfaction across peoples now and in the future, so be it'. Thus, basic needs approaches endorse a view of sufficientarianism where justice is silent about benefits beyond the threshold.

Guardrail approaches also reflect the priority claim, although they do not understand it as denying the significance of benefits above the threshold. Recall that guardrail approaches seek to provide 'minimum thresholds for capital stocks essential to welfare' (Jakob and Edenhofer, 2014: 447). The redistribution of emissions pricing revenues is a key means by which to do this, leading to decreasing emissions and revenues to support human development outcomes. Recall that such redistribution can be limited to the domestic level, or could involve international transfers between wealthy and poorer nations. Now, domestic redistribution would be incompatible with the priority claim due to the serious global inequalities that persist globally. This is because limiting redistribution to domestic contexts would mean that the well-being of those living in societies further below the threshold would not be given priority. In contrast, international redistribution of emission pricing revenues would be compatible with the priority claim, because here benefits for people in poorer countries would indeed take priority over benefits for people in wealthier countries. Such an approach could be combined with domestic redistribution within wealthy countries, so that human development outcomes are generally prioritized wherever they are insufficiently supplied now. Again, this would take priority over benefits to people above a certain range, i.e. above the minimum threshold for capital stocks to be sustainably supplied. Yet unlike basic needs approaches, guardrail approaches do not favour the negative thesis. Instead, they aim to maximize societal welfare above the threshold, aiming at a social welfare *maximum* (e.g. Jakob and Edenhofer, 2014: 458). This is also reflected in the global asset optimization perspective of Dasgupta's (2021) capital stock approach. As we saw in the second section, sufficientarianism is open to such a combination of redistributive principles, where sufficiency applies below the threshold and other principles may apply above it.

Consider instead the deficiency claim. Both approaches again look to be compatible with this, although basic needs approaches seem to possess an advantage due to their clearer distinction between needs and wants. According to Gough (2017), we must be

able to distinguish between needs and wants in order to distinguish between morally urgent and morally frivolous aims. This distinction clearly reflects the deficiency claim, since it explains why the provision of needs is morally urgent, namely that failures to satisfy human needs count as deprivations from the perspective of human development (i.e. Doyal and Gough, 1991). As such, the satisfaction of basic needs is morally urgent, and their lack of satisfaction is considered a serious moral harm, involving the 'fundamental disablement in the pursuit of one's vision of the good, whatever that vision is' (Doyal and Gough, 1991: 50). With the most basic needs of health and autonomy, the theory aims to avoid shortfalls so that 'non-disabled social participation can take place' (Gough, 2015: 1202).

Guardrail approaches seem to less clearly reflect the deficiency claim, since they focus on providing an adequate supply of goods that societies require to support the fundamental interests of people, but without directly distinguishing those fundamental interests from non-basic economic preferences. However, the significance of this difference may be overstated. For instance, Jakob and Edenhofer's (2014) account follows Sen's (2009) capability approach in leaving a substantial role for public deliberation in the determination of thresholds of need or capability. The result is a view of 'society's life support systems' that are supposed to be compatible with all reasonable conceptions of needs or capabilities, without closing down public debate about where exactly the line should be between a person having enough or being unacceptably deprived (2014: 460).[24] In a similar spirit, recent guardrail approaches capture a wider set of internationally recognized sustainable development and equity criteria, including health, education and gender outcomes (e.g. Soergel et al., 2021). These provide further insight into how climate policies might avoid leaving some people in a state of morally unacceptable deprivation.

In conclusion, the guardrails and basic needs approaches both plausibly reflect the core claims of sufficientarianism, although they represent different interpretations of these claims. As such, these approaches provide the outlines for a future sufficientarian climate economics.

The limitations of both approaches are also important to understand for sufficientarian theorists. Guardrail approaches provide important information about the societal and ecological determinants of people's fundamental interests, although future work seems to be needed to clarify these thresholds in terms of individual need or capability provisioning. Instead, the basic needs approaches provide more fine-grained analyses of individual need satisfaction, but provide less insight into the social determinants of need provisioning systems or the role of economic redistribution. This is again likely a subject for future work, rather than a hard methodological limitation.[25] Basic needs approaches might also be expanded in future to include a wider range of goods, as existing modelling has focused on a very small subset of the determinants of need, namely the energy and nutritional requirements for individuals to avoid deprivation. While essential, such entitlements would obviously fall well short of both Doyal and Gough's full theory of human need, as well as sufficientarian accounts of justice which require the provision of a set of capabilities.[26] Future basic needs modelling should be expanded to include a wider range of goods that are essential for individuals to lead a morally decent life.

Does sufficientarianism require degrowth?

We have now seen that both basic needs modelling and guardrail approaches are more adequate reflections of sufficientarianism than previous work on the economics of climate change. Nonetheless, a further division emerges over the presence of economic growth as part of climate stabilisation. As we saw above, proponents of basic needs approaches cast doubt upon the possibility of 'decoupling' emissions from economic growth and recommend more radical reductions in resource use, including but beyond reducing greenhouse gas emissions. Political theorists also appear to be divided on this question. For instance, McKinnon (2022) suggests that the protection of basic needs does not require accepting and may even be incompatible with the pursuit of indefinite economic growth. Instead, Moellendorf (2022) argues that economic growth is essential to satisfy the morally urgent claims of those currently living in extreme poverty, and that growth is indispensable for rapid climate mitigation policies.

The debate between proponents and opponents of degrowth turns on the prospect of 'decoupling' emissions from environmental harm. But this is not all that is at issue. The desirability of economic growth also requires consideration of whether it would provide morally relevant benefits to current and future people. These questions are interrelated. For if it turned out that growth over the long term were impossible or clearly morally unacceptable, then its indefinite pursuit would raise morally relevant risks. Sufficientarianism does provide an initial answer to the question of whether growth is desirable, namely: growth ought to be prioritized where it actually supports fundamental human interests. Since this will in turn depend upon further features, such as institutional structures, we should add that growth should be pursued where, *ceteris paribus*, this would support fundamental interests. Depending upon one's view of the moral significance of benefits above the threshold, we might regard growth which does not support fundamental interests as of no moral significance (i.e. the negative thesis of sufficientarianism), or we might grant that the additional benefits of growth have *some* moral significance but that needs-targeting benefits take priority over them (i.e. the positive thesis). Depending upon the state of deprivation and the benefits involved in growth, there may be compelling reasons to support growth. As Moellendorf (2022) has powerfully argued, the role of economic growth in poverty alleviation is significant enough to justify a human right to sustainable development. Yet the empirical dimensions of such an argument cannot be merely assumed, as even in the context of poverty growth can fail to advance the fundamental interests of all (Drèze and Sen, 2013). Growth-promoting policies have also significantly harmed vulnerable groups in developing countries, especially indigenous peoples (Martinez-Alier, 2002, 2014).

Nonetheless, this initial answer does not get us very far concerning whether we have reasons to believe that growth over the long term is possible.[27] Mintz-Woo (2021: 93) suggests that we might resolve this question by means of 'sufficient empirical (macro) economic data'. The trouble is that existing macroeconomic data poorly reflect sustainability impacts. As such, more of the data available today might remain an inadequate epistemic basis to assess the prospects of long-term growth. Indeed, if we take a broader look at the data currently available, we would likely conclude that it will be impossible to break the link between economic growth and emissions. As proponents

of 'degrowth' have pointed out, there is currently no evidence of global absolute (rather than relative) decoupling of growth and emissions (Brand-Correa and Steinberger, 2017; Hickel and Kallis, 2020; Steinberger et al., 2020; Steinberger and Roberts, 2010).

However, this would be too fast: notwithstanding the historical data, proponents of green growth believe that decoupling through technological innovation will be possible and that growth will spur the needed innovations for a decarbonized global economy (Moellendorf, 2022: 149–150). This epistemic disagreement is difficult to resolve since it turns on judgements about what will be possible *in future.* Such judgements involve implicit considerations of political feasibility, which bring together epistemic and normative assumptions about the future conditions we should take seriously when conducting policy-oriented research. These aspects are notoriously open to dispute, but they are central to understanding the economic modelling of climate change. This is because models take positions on political, as well as technical feasibility (Lenzi and Kowarsch, 2021).

Even seemingly epistemic issues concerning what is likely to be possible in future are importantly connected to moral values. As is familiar from the problem of 'inductive risk' in the philosophy of science, the attitude that researchers take towards the possibility of their predictions being incorrect must inevitably appeal to ethical values.[28] If the consequences of being wrong are very serious, researchers must take extra precaution beyond what would be unnecessary when the consequences of being wrong are harmless. The reason that extra precaution is required (and indeed, the degree of precaution called for) is ethical: the researcher wants to prevent serious harm from occurring should their results turn out to be wrong. Due to inductive risk, economic research premised upon the assumption of indefinite growth seems to call for a robust application of the precautionary principle. As such, sufficientarianism would seem to require the application of robust precautionary standards, since the results of being wrong about being able to decouple economic growth and emissions could be catastrophic, potentially wiping out previous gains in human development.

However, the problem of inductive risk cuts both ways.[29] While those on different sides of the growth debate agree that sufficientarianism requires taking a very robust precautionary stance (cf. McKinnon, 2022; Moellendorf, 2022), they disagree about which course of action is likely to be riskier. Appeals to inductive risk coupled with scepticism about decoupling growth from emissions imply a rejection of climate mitigation policies premised upon indefinite economic growth, given the risks of being wrong (i.e. runaway climate change). On the other hand, proponents of green growth may worry about the potential implications of abandoning growth for the most vulnerable. Moellendorf (2022: 148) makes this explicit, claiming that degrowth 'would foreseeably result in tens, perhaps hundreds of millions of people in low- and medium-income countries being caught in poverty', which would be 'a disastrous violation of the right to sustainable development'. If so, inductive risk could be used to justify climate policies based on economic growth.

The very long timescales and planetary scope of impacts at stake here suggest an answer to this controversy. Consider that climate economic IAMs currently produce long-term scenarios of climate policy from now until the year 2100. This is already a long time horizon against which to model policy, but it is merely chosen for convenience. There is

no computational reason that models could not run over several centuries. IAMs typically model global economic growth continuing indefinitely as part of their Ramsay equation (via the variable *g*).

Seen in this light, indefinite growth now looks to be morally problematic on any sufficientarian conception of justice. This is because even if it proves to be possible to decouple growth and emissions, the indefinite pursuit of growth would still impose serious injustices upon the most vulnerable. This is due to the wider ecological impacts of growth. Biodiversity impacts in particular seem to be even harder to decouple from economic activity than greenhouse gas emissions. In an important recent report on the economics of biodiversity, Dasgupta (2021) found that indefinite economic growth is likely to be *impossible* due to the running down of biodiversity and natural capital. Like climate change, there is currently no evidence of decoupling of biodiversity impacts at high levels of material welfare (Otero et al., 2020). But with biodiversity, the problem appears even more severe and there does not seem to be a credible argument for decoupling of biodiversity impacts from economic growth. As Otero et al. (2020) note, the previous economic wisdom that growth actually leads to better environmental outcomes (known as the 'Kuznets curve') has been shown to be false at the global level, notwithstanding local biodiversity gains within nations following periods of industrialization. Instead, there is a severe biodiversity crisis that has been brought about by the global economy's systemic undervaluing of ecosystem services (Dasgupta, 2021). Biodiversity provides ecosystem services that are essential for human well-being (IPBES, 2019). As such, there are very serious risks of injustice from further undermining biodiversity (Armstrong, 2024). Because growth harms biodiversity and because there seems to be even less prospect of decoupling such harms from growth than there is for emissions, the assumption of indefinite growth is incompatible with sufficientarianism (and with most plausible views of justice) due to the serious ecological effects of growth.

Such wider ecological impacts have often been ignored in climate economic models. The assumption of indefinite growth is thus a serious shortcoming of many IAMs used in climate economics. As Dasgupta (2021: 32) notes, because IAMs simply presume indefinite growth to be possible, they reflect a Promethean vision in which human beings break free of the biosphere by investing in science and technology, a vision that betrays a limited grasp of the dependence of human beings upon a stable Earth system (2021: 27). Following a course of indefinite growth is therefore likely to result in very serious wider ecological impacts, even if growth were compatible with a complete decarbonization of the global economy. As such, analysis premised upon indefinite economic growth raises significant risks of undermining sufficientarian justice. Even if we are worried about the effects of abandoning growth upon the development aspirations of current people, this consideration is time-bound. Over a longer timescale, severe conflicts are likely to emerge between economic growth and wider ecological impacts, and these conflicts would undermine previous gains from growth such as the alleviation of poverty.

This conclusion has important implications for any sufficientarian approach to climate economics. While sufficientarian concern with the fundamental interests of people does not require adopting degrowth or rejecting economic growth entirely, the assumption of indefinite economic growth is unacceptable due to the wider ecological harms of growth. This is significant because, as noted in the third section, the vast majority of economic

modelling on climate change is premised upon indefinite economic growth. Such work is therefore highly problematic from a sufficientarian perspective and will remain so unless plausible evidence emerges of a decoupling of ecological harms from economic activity.

This does not affect the usefulness of guardrail approaches as inputs for sufficientarian analysis. This is because prominent guardrail accounts actually endorse a 'growth agnostic' position that allows for sustained periods of negative growth as well as periods of growth (Jakob and Edenhofer, 2014; Kyllönen and Basso, 2017; van den Bergh, 2011). As such, the controversy about degrowth in climate economics does not necessitate favouring basic needs approaches over guardrail approaches, notwithstanding the greater hostility of the former to growth. At the same time, the burden of proof is on guardrail approaches, as with other economic approaches, to demonstrate how further periods of growth are compatible with protecting the interests of current and future generations, especially given the ecological effects of such growth. There is a corresponding burden of proof upon defenders of degrowth to demonstrate how their policies will avoid harming the most vulnerable. As Raworth (2017: 245) put this dilemma, 'No country has ever ended human deprivation without a growing economy. And no country has ever ended ecological degradation with one'. Sufficientarian justice requires urgently finding ways to do both, without betting indefinitely on economic growth.

Conclusion

I have argued that sufficientarian climate justice requires approaches that depart fundamentally from the discounted utilitarianism that shapes much of climate economics. Instead, economic approaches are required that disaggregate dimensions of well-being from growth, while ensuring that wider sustainability criteria reflect the ecological effects of economic activity. I have argued that contemporary guardrails and basic needs approaches are promising reflections representatives of sufficientarianism, although both face normative shortcomings that should be addressed in future work. Finally, although proponents of these approaches are divided on the desirability of economic growth, I have argued that sufficientarianism does not rule out periods of growth, but is incompatible with any approach that requires economic growth to continue indefinitely due to the wider ecological impacts of growth. These impacts may be as harmful as climate change and seem inextricably linked to growth. Because much of the economic modelling on climate change assumes indefinite growth, it is incompatible with a sufficientarian conception of justice.

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Notes

1. Prioritarianism reflects a different priority claim in which being worse off continues to have greater moral importance in any distribution, including in a situation where everyone is already well off. This is because being worse off is always relative to how others are faring.
2. For instance, Meyer and Roser (2009) argue that in a domestic political context, political cooperation and shared institutions provide reasons to correct domestic inequalities beyond sufficientarian the threshold.
3. This terminology is from Arrow et al. (1996). See Walsh (2017) for discussion of this debate and its connection to wider debates within economics.
4. Discounting has also been defended to resolve the problem of infinite time horizons, because discounting renders utilities calculable (Fleurbaey et al., 2019: 90). However, this does not justify a positive time preference.
5. A fair distribution of duties to avoid climate harm can come apart from a fair distribution of duties under burden sharing climate justice (Caney, 2014a: 126).
6. Recall that sufficientarianism is only fully distinctive with the addition of the continuum claim.
7. The value given to η also reflects an ethical judgement, since it stipulates the relative worth of an extra unit of consumption for rich and poor alike. As Mintz-Woo (2021: 107) notes, the ethical significance of η has been far less obvious to philosophers compared to the value of δ.
8. Within models, there is only a single, infinitely lived individual that maximizes utility into the future (often referred to as a 'representative agent' or 'social planner'). This has important implications for the ethics of discounting. As Roemer (2011) points out, because human beings are obviously not immortal, the fiction of a single, infinitely lived individual that maximizes utility across time reflects an unjust bias towards the present at the expense of future people.
9. We will return to this assumption in the final part of the paper when considering arguments for degrowth.

10. A useful contrast here is prioritarianism. Prioritarian approaches to climate economics adopt the standard marginal utility approach to consumption, where consumption is assumed to be a useful measure of well-being (Adler et al., 2017; Adler and Treich, 2015).
11. Corrected GDP accounts may attempt to provide substitute 'shadow' prices for the depletion of natural capital, although such markets are purely hypothetical.
12. As we will see in the seventh section, this depends upon assumptions about technological innovation and the prospect of 'decoupling' emissions from economic growth.
13. The examples cited by Zimm et al. (2024) include some of the 'basic needs' approaches presented in the sixth section.
14. While the dual discounting approach discussed above is also a guardrail approach, this section explores approaches that disaggregate indicators of well-being from consumption, which dual discounting does not attempt.
15. This second scenario takes an average between the domestic redistribution scenario and an equal per capita allocation of emissions rights globally.
16. Within IAMs, this is achieved using a technical feature known as 'Negishi weights' (Kowarsch, 2016: Ch. 8).
17. My thanks to an anonymous reviewer for this point.
18. It also raises questions about the appropriate scientific advice for policymakers. Given the role of climate economic models in policy discourses, there is a risk that the assumptions in such models exert a 'performative' effect upon climate policy (Beck and Mahony, 2018), narrowing the set of options to those that modellers consider likely or plausible. This is why modelling climate futures that reproduce current inequalities can make it even more challenging to address them.
19. Recent work has aimed to even more directly capture a precautionary attitude towards climate risk in less idealized circumstances, moving away from modelling the risk assessment of hypothetical agents in perfectly functioning markets (e.g. Edenhofer et al., 2021).
20. As Stern, Stiglitz and Taylor note (2022: 181), Nordhaus' optimization model found that a temperature increase of 3.5–4°C would be socially optimal. The IPCC Special Report on 1.5°C (IPCC, 2018) found that such an increase would be catastrophic.
21. The theory of human need proposed by Doyal and Gough overlaps to some extent with Nussbaum's capability approach. However, these theories have important differences. Gough (2014) explains that the theory of basic needs rests on a Kantian conception of agency, which differs from Nussbaum's Aristotelian conception. Gough also claims that the theory of human need is better validated in empirical evidence, while Nussbaum's account relies to a greater extent upon philosophical reasoning.
22. For basic needs approaches, the material and energy requirements to support basic needs remain the same below and above the threshold. For guardrail approaches, capital stocks and funds from natural resource rents are relevant above and below the threshold.
23. Shue (2014: 46) puts the thought memorably: 'Even in an emergency one pawns the jewellery before selling the blankets'.
24. Timmer defends a 'political' conception of sufficientarianism where the nature and justification of thresholds are not natural facts about persons which we could learn through empirical investigation, but require justification through normative reasoning or public deliberation.
25. Gough (2015, 2017) has been explicit about the role for redistribution in supporting a needs-targeting climate policy.

26. See note 21 above.
27. Kyllönen and Basso's approach can account for this possibility, as they apply a discount rate upon consumption when there was a reasonable (epistemic) expectation of future growth.
28. A classical statement of the problem of inductive risk is Rudner (1953).
29. My thanks to Michiru Nagatsu for this point.
30. Please delete Dasgupta 2021 from this sentence, and keep Dasgupta 2007; Davidson 2017; Fleurbaey et al., 2019).

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