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ADVANCED REVIEW

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Climate ethics and population policy: A review of recent philosophical work

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Abstract

It is well-established that human population growth is a leading cause of increased greenhouse gas emissions and accelerating global climate change. After decades of neglect, philosophical ethicists have, over the past decade, taken up the issue of climate change and population policy and there are now numerous articles and books which explore the subject. Both rights-based and consequentialist approaches seek to balance reproductive rights against other human rights and interests threatened by overpopulation and ecological degradation. While biocentric ethicists have additional reasons to advocate for smaller human populations, even anthropocentrists affirm the need to balance reproductive rights against reproductive responsibilities in order to promote the well-being of future generations. There is a particularly strong consensus on the value of choice-enhancing population policies that reduce fertility voluntarily, such as securing universal access to modern contraception and promoting equal rights and opportunities for women. There is strong support for government policies that incentivize smaller families, some support for policies that disincentivize larger ones, and little to no support for punitive policies. Many ethicists warn that failure to enact reasonable population policies now may necessitate harsher policies in the future, a common theme in climate ethics generally.

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climate change, consumption, growth, limits, population

1 | INTRODUCTION

We have now had 30 years of extensive political debate and ethical reflection on global climate change (GCC) and throughout this time, participants have largely ignored the role that limiting population growth could play in dealing with it. On its face this might seem strange, since our scientific models have long identified population growth as one of the two primary drivers of humanity's increasing greenhouse gas (GG) emissions (IPCC, 2013), while studies have repeatedly shown that limiting population growth is among the cheapest, most effective means to mitigate (O'Neill et al., 2010, 2012, 2015) and adapt (Barrett et al., 2020; Dodson et al., 2020) to GCC's impacts. On reflection the oddity vanishes, since GCC policy discussions have been tightly constrained by conventional economic thinking, which

regards limits to growth as anathema (Broome, 2019). Until recently, neither the scientific nor the philosophical communities have shown much interest in challenging this taboo, while among policymakers, proposals, and actions to limit GCC have focused on technological fixes or efficiency improvements within the context of continued demographic and economic growth.

This approach, however, has proven itself a failure. GG emissions have continued to increase and GCC has advanced more quickly than expected (IPCC, 2018). Some impacts that scientists once predicted might show up in the second half of this century are happening now; worries about how our grandchildren's lives might be constrained have been replaced by worries about our children's lives, or our own. In the face of grave and imminent danger and an unraveling global ecosystem, more people are starting to question once-sacred cows, such as the possibility of endless economic growth at the expense of nature, or humanity's ability to safely manage unimaginably complex systems.

One example of this new open-mindedness (or panic) has been a surge in scientific and ethical discussions of population in relation to climate change. Ten years ago, when I wrote a literature review on "Climate ethics and population policy" (Cafaro, 2012) for this journal, it mostly noted the absence of such discussions in the philosophical literature. Thankfully ethicists have taken up the topic of population and there are now numerous articles and books on which to report. This review focuses on substantial philosophical contributions from the past decade, after first briefly reviewing the science regarding our topic.

1.1 | The science

It is well-established that human population growth is a leading cause of GCC. According to the IPCC's *5th Assessment Report*, "Globally, economic and population growth continue to be the most important drivers of increases in CO_2 emissions from fossil fuel combustion" (IPCC, 2014a). Between 1970 and 2000, these two drivers contributed roughly equally to driving up GG emissions. Since 2000, economic growth has contributed more than demographic growth, but population growth's contribution remains substantial and atmospheric carbon pollution continues to increase, far outstripping all efficiency improvements. Total emissions, which need to trend sharply down to limit climate disruption, instead continue to grow. According to the IPCC (2014a): "Without additional efforts to reduce GG emissions beyond those in place today, emissions growth is expected to persist driven by growth in global population and economic activities. Baseline scenarios, those without additional mitigation, result in global mean surface temperature increases in 2100 from 3.7°C to 4.8°C compared with pre-industrial levels." In plain language, continued growth in human numbers and wealth is set to cause a worldwide climate disaster within the lifetimes of many people alive today.

When the *5th Assessment Report* turns from explaining the causes of climate disruption to analyzing policies to mitigate or adapt to it, the IPCC ignores direct efforts to limit its main drivers and instead focuses on technological changes and efficiency improvements (Bongaarts & O'Neill, 2018). Nevertheless, over the past decade, numerous scientific publications have found significant potential for population policies to contribute to climate change mitigation and adaptation.

Regarding mitigation, analyses show that limiting human numbers can contribute substantially to limiting GCC (Cafaro & Götmark, 2019; Ripple et al., 2019; van Vuuren et al., 2018; Walsh et al., 2017). Comparing low, medium, and high population projections from the UN under one plausible economic development scenario, one study found: "if the world population were to follow a low rather than a medium growth path, world-wide emissions would be reduced by 1.4 GtC/year in 2050 and 5.1 GtC/year in 2100, or by about 15% and 40%, respectively" (O'Neill et al., 2012). Conversely, underfunding family planning and taking a high rather than a medium growth path was estimated to lead to 17% and 60% higher emissions in 2050 and 2100. The fact that improved contraceptive availability takes time to provide significant mitigation benefits has led some to note that "human population reduction is not a quick fix for environmental problems" (Bradshaw & Brook, 2014). But neither is reducing average consumption or deploying new technologies. There are no quick or easy solutions for GCC. It seems strange to question policies whose environmental benefits cumulate over time as insufficient or too slow, when there are no faster or more effective solutions being pursued, and when limiting GCC is motivated in part by a desire to make life easier for our descendants in the future.

Limiting population growth is also important for climate adaptation, since higher population paths could expose hundreds of millions more people to climate risks such as flooding (Hinkel et al., 2014), water stress (Satoh et al., 2017), and drought (Ahmadalipour et al., 2019) during this century. Studies show that family planning policies that reduce desired family size and increase contraceptive prevalence rates could increase global per capita water availability (Gunasekara et al., 2013) and compensate for the likely effects of climate disruption on national food security

(Moreland & Smith, 2012). Indeed, several studies have found that future food and water security problems will be driven primarily by population increase raising demand, and only secondarily by GCC reducing supply (Hall et al., 2017; Smirnov et al., 2016).

Many of the studies cited above have been published since the IPCC's *5th Assessment Report* came out. It will be interesting to see whether the *6th Assessment Report* in 2022 takes this literature seriously: for example, by commissioning full chapters on population policy from the working groups devoted to mitigation and adaptation. A pro-growth economic ideology remains politically dominant, yet signs of ecological decline are leading more people to question it (Götmark et al., 2018). A recent "Warning of a Climate Emergency," signed by over 11,000 scientists, forthrightly describes continued increases in human population and the world gross domestic product as "profoundly troubling signs" of ecological decline, and states: "The world population must be stabilized—and, ideally, gradually reduced—within a framework that ensures social integrity" (Ripple et al., 2019). These scientists say that addressing population must be part of humanity's response to GCC. Ethicists have also begun to acknowledge this.

1.2 | Philosophers recognize an issue

In a searching series of articles, Elizabeth Cripps illustrates how widely held commitments to cosmopolitan justice, combined with realization of GCC's potential harms, support policies to limit the size of the global human population (Cripps, 2015, 2016, 2017a, 2017b). Cripps (2015) stipulates support for "minimal understandings" of global and intergenerational justice: the former "requiring that no one in current generations is unavoidably unable to live a [materially] decent human life: one with a secure opportunity to satisfy central human interests;" the latter requiring the same for members of future human generations. GCC creates a danger that "within a few generations, basic global justice and intergenerational justice could become incompatible if the human population grows fast enough." In fact, this situation may already exist.

The confluence of GCC, continued population growth and a commitment to basic justice, means that humanity must make hard moral choices now, to avoid the need for tragic moral choices in the near future (Cripps, 2015, 2016). Cripps sympathizes with those who find it morally suspect to focus on limiting population to deal with GCC, given that most population growth in coming decades is projected to occur among poor people in the developing world, who have done little to cause GCC. But the reality is that poor people do not want to stay poor and improving their basic living conditions will increase GG emissions, at least in the short-term, ratcheting up already excessive human demands on the biosphere.

Cripps (2017a) argues that assuming human population will stabilize or decrease on its own, without enacting policies designed to achieve this, is naïve and dangerous. Recent demographic studies that project a quicker end to global population growth than the standard UN (2019) projections depend on substantial policy changes to improve access to family planning and girls' educational opportunities, not continuation of the status quo (Lutz et al., 2018; Vollset et al., 2020). Hoping new technologies will allow humanity to keep growing indefinitely while simultaneously reducing our ecological impacts is even more naïve. As recent history shows, new technologies are just as likely to increase GG emissions (greater computing power and new fracking methods) as they are to help decrease them (wind turbines and solar panels).

These considerations justify proactive population policies designed to stabilize, and if necessary humanely decrease, the global human population. (Here as throughout this review, "population policies" are defined broadly to include most government policies that influence fertility rates, including reproductive rights, contraceptive availability, and tax, benefits and educational policies.) Like most ethicists writing on this topic, Cripps advocates for "choice-providing policies" and "soft-incentive changing policies," such as "the education of women and the reduction of gender inequality, as well as the wide provision of contraception," while rejecting coercive or punitive policies of any sort (Cripps, 2017b). Such policies, which have reliably reduced fertility rates in many parts of the world, are not just morally permissible and environmentally prudent—they also benefit recipients directly. Given the urgent need to limit population, Cripps also supports educating people about the connections between population and the environment, and enacting policies that incentivize couples to have fewer children, provided they can be implemented without harming those affected (Cripps, 2017b).

A similar approach is taken by Colin Hickey and colleagues in their article, "Population Engineering and the Fight against Climate Change." Like Cripps, Hickey et al. (2016) believe that "climate change is among the most significant moral problems contemporary societies face, in terms of its urgency, global expanse, and the magnitude of its attending

harms," and that "population plays an important role in determining just how bad climate change will be." As they note, it is possible to put forward plans for mitigating GCC that do not address population; in fact, that is the consensus approach currently taken by the world's governments under the United Nations Framework Convention on Climate Change. They find such an approach morally irresponsible, since it "falls short of offering a clear and reasonably certain pathway to avoiding dangerous climate change." While population policy may take us into morally fraught territory, ignoring population policy may be even more problematic, given the high costs of failure to limit GCC.

Hickey et al. (2016) provide a helpful analysis of possible "population engineering policies," which they locate on a "coercion spectrum," from policies with a low risk of coercion up through policies with a high risk. "Straightforwardly coercive interventions to reduce human population growth are almost always wrong," they write, unacceptable violations of the human rights to autonomy and bodily integrity, while "choice-enhancing interventions are not only permissible, but obligatory, as they are means of ensuring equal access to basic goods" (Hickey et al., 2016). Policies in the mid-range, which seek to adjust people's preferences or actively incentivize choices, may seem intrusive. Yet in practice, all cultures influence their members' procreation choices and all governments have policies which influence their citizens' fertility rates, even if they do not label them "population policies." Autonomy should be protected in procreation decisions, Hickey et al. believe, yet upholding individuals' choices cannot mean shielding them from all influence.

Responding to Hickey et al. (2016), Quill Kukla (2016) asks "Whose Job is it to Fight Climate Change?" Kukla agrees that climate change is a serious threat and that providing incentives for smaller families can help address it. Yet Kukla worries that such efforts could put the burden on those who have done the least to create the problem, especially poor women in the developing world. Kukla also worries that public advocacy for small families will wind up stigmatizing children from large families. Such concerns are widely shared (e.g., Heyward, 2012) and ethicists attempt to address them in various ways, from arguing that efforts to reduce fertility should focus on the developed world (Hedberg, 2020) to proscribing positive arguments for smaller families and limiting policies to improving access to contraception and girl's educational opportunities. These debates are ongoing.

Hickey et al.'s (2016) most valuable contribution may be coining the phrase "population engineering" for "the intentional manipulation of the size and structure of human populations." Dangerous proposals to engage in high-tech geoengineering have proliferated in recent years, as the magnitude of the threat posed by GCC has become clearer. "Population engineering" reminds us that there are more responsible alternatives focused on changing human behavior and limiting our environmental demands.

2 | RIGHTS-BASED APPROACHES

Human rights concerns loom large in debates about population policy. On the one hand, opponents of population stabilization efforts often point to past human rights abuses, such as forced abortions under China's one child policy, to justify their opposition (Angus & Butler, 2011; Fletcher et al., 2014). On the other hand, family planning proponents note that most social pressure and government coercion, now as in the past, involves forcing women to have more children than they want to have, not fewer (Cottingham et al., 2012; Echegaray & Saperstein, 2010). GCC brings further rights concerns to the table since it directly threatens a number of human rights, particularly the rights to basic physical security and sufficient food, water, and shelter (Caney, 2010, 2018). GCC indirectly threatens all human rights, since securing rights depends on a functioning social order, which in turn rests on essential ecosystem services that GCC is degrading. Beyond *human* rights concerns, other species arguably have a right to continued existence free from untimely anthropogenic extinction (Donaldson & Kymlicka, 2011; Staples & Cafaro, 2012). This right, too, is clearly threatened by GCC and the full suite of environmental impacts caused by human overpopulation.

2.1 | Conly's rights-based approach

The most rigorous recent treatment of population ethics from an environmentally informed, rights-based perspective is Sarah Conly's *One Child: Do We Have a Right to More?* (Conly, 2016). Conly begins by noting that humanity's current, unprecedented numbers have led to great environmental damage, including GCC and massive biodiversity loss, with the promise of worse to come, including potential shortages of food and water. In response to the oft-repeated refrain that it is consumption, not population size, that is driving environmental harms, she responds, reasonably, that it is both: the growing per capita consumption of ever more people. Her central conclusion is that under current

circumstances, people do not have a moral right to have more than one biological child. Her argument hinges on the claim that the harms of environmental degradation are significant enough to justify limiting the human freedom to procreate.

Not that Conly denies such freedom. A chapter titled "The Right to a Family" argues for a right to procreate based on basic human interests and the fact that in most societies, "our standard model of a good life typically involves having some children" (p. 39). Another chapter, titled "The Right to Control Your Body," argues for such a right based on personal autonomy and integrity, grounded in the respect we owe one another as persons. Conly's arguments for a right to procreate thus incorporate the two main approaches in contemporary rights theory, interest-based and status-based. However, she goes on to argue that while these moral concerns provide "reasonable grounds" for a right to procreate, they do not "entail a right to have more than one child."

Regarding interests, while many and perhaps most adults have strong interests in procreation, these interests can be met fairly well by having one child. The kinds of interpersonal and intergenerational bonds cultivated in family life do not require large families. While people may desire more children, this must be balanced by a consideration of potential harms.

Similarly, respect for autonomy generally supports non-interference in individuals' reproductive lives. Again though, this right to be left alone may be limited when our behavior threatens to harm others—including potential harms to future generations. The dangers of overpopulation may be serious and pressing enough to outweigh claims to a right to have more than one child. If they do not now outweigh such claims, Conly argues, they may do so in the future, as humanity stumbles toward ecological catastrophe (see also Spears, 2015).

What then are reasonable and just population policies? Conly reminds readers that "when it comes to stopping an undesirable behavior, punishment should not be the first thing we think of." Education regarding the connections between overpopulation and environmental problems can change behavior. Financial incentives have proven effective in convincing people to have fewer children, although Conly discusses how such incentives have sometimes passed over into coercion. Increasing contraceptive availability is a non-coercive, win/win approach, and "regardless of our worries about population, it seems the humane thing to do" to further women's safety and health.

Most ethicists stop here, with an admonition against coercion and a plea for win/win solutions. But Conly notes that it is an empirical question whether non-coercive means will be sufficient to keep human populations within sustainable bounds and that when it comes to protecting the environment, we do not typically rely solely on education and voluntary action. For these reasons, she affirms that coercive laws regarding how many children people have may be justified. However, she points out that any punishments for breaking such laws must themselves be morally justified. Sanctions such as forced abortions or sterilizations are morally repugnant and never permissible, she argues, while substantial fines may be acceptable—particularly if implemented on a sliding scale that impacts the wealthy equally with the poor. That is her preferred approach, should coercion become necessary. In any case, "we can discover the best approach, once we stop refusing to look at the issue." Like Elizabeth Cripps, Conly argues that mild population regulation now might spare our children and grandchildren more intrusive regulation in the future.

2.2 | Caney's alternative approach

An interesting critique of Conly's analysis comes from Simon Caney, a leading proponent of a rights-based approach to climate policy. According to Caney (2010, 2018, 2020a), essential human rights to life, health, and basic subsistence oblige the current human generation (particularly its richer members) to support robust climate mitigation policies, as a matter of justice. Because population size is an important driver of GCC, such mitigation may and perhaps ought to include population policies and like Conly, Caney's preference is rights-enhancing policies that improve women's lives and increase freedom (Caney, 2020b). Still, Caney recognizes that voluntary approaches to limiting population size may prove insufficient to avoid catastrophic GCC. Uncomfortable with "restrictivist" approaches like Conly's or Christine Overall's (2012) that deny "a human right to unlimited procreation," Caney (2020b) crafts an "ecologically liberal" approach which cushions possible demands to limit procreation by allowing trade-offs between more procreation or more consumption, and by holding space open for techno-fixes which could alleviate the need for discipline in either area.

Invoking Ehrlich and Holdren's (1971) $I = PAT$ equation, Caney points out that "population is just one of the three crucial variables" driving increased GG emissions. "One thus cannot make any inference at all about how many children persons are entitled to have without knowing the levels of consumption that people (including those to be born)

would or could enjoy (the A variable). Similarly, one cannot reach any conclusion about how many children persons are entitled to have without knowing the levels of access to clean technology (the T variable) that people would, or could, enjoy" (Caney, 2020b). Caney's approach formally recognizes the importance of all three $I = PAT$ factors, recognizes that I must be reduced, and seeks to maximize people's freedom to choose their own fair contributions to environmental sustainability.

Some policies demanded independently by justice will themselves help humanity address GCC and should be pursued. Such policies include securing women's rights to education and reproductive autonomy, which will drive down fertility rates (addressing P); taxing the GG emissions of the world's wealthiest inhabitants (A); and eliminating subsidies to the fossil fuel industry, accelerating the shift to less harmful technologies (T). Beyond that, "those who wish to have children can do so, but they must pay for the privilege, and they must ensure that there is sufficient reduction in consumption and use of clean technology to ensure that humanity lives within the Sustainability Frontier. By the same logic, others can choose to consume more, but they too must pay for the privilege and ensure that their population size and technology policy are such that they too live within the Sustainability Frontier." If reducing A or P will both help keep environmental impacts within bounds, we have no reason to mandate one or the other approach. Furthermore, Caney (2020b) claims, "by providing flexibility in how people discharge their responsibilities it makes it much more likely [to compel assent] than one which calls for everyone to engage in a specific course of action."

This is an ingenious approach, but it seems unworkable and overly optimistic about managerial solutions to GCC. To be effective, there would have to be cases where people could have a second or third child, for example, if they foreswore buying a car or a bigger house. Conversely, those who chose to remain childless might be free to take more overseas vacations or eat more meat. How would that work? Who would keep track? Caney seeks to make the bitter pill of constraint more acceptable, but the same societies that have balked at limiting overconsumption or harmful technologies are unlikely to become more public-spirited by adding limits to procreation.

Caney's approach would internalize the cost of having children, an approach anticipated by Casals and Williams (1995). It relies on the principle that individuals' discretionary consumption and discretionary procreation are morally equivalent, a position argued for explicitly by Young (2001). This position is also tacitly assumed in several studies comparing the GG emissions caused by having children and various personal consumption decisions (Murtaugh & Schlax, 2009; Wynes & Nicholas, 2017). This view is questioned by Robeyns (2021) and denied by Pinkert and Sticker (2021), who see greater moral seriousness in creating life than in buying a new Audi. However, these authors stop short of advocating an unlimited right to procreate, and Burket (2021) argues contrarily that procreation's emissions impacts are so harmful that most people have no right to any children. This debate is ongoing and is likely to grow in importance as environmental constraints hit societies harder.

Building on Caney's valuable reminder that all three IPAT factors are important, societies that took GCC seriously might work to shift the impact of all three factors downwards simultaneously, as quickly and humanely as possible. Bourban (2019) notes that the validation of IPAT within climate science has allowed policy analysts to focus on whichever one of the three factors they chose, often to argue against action regarding the others. He believes this is a mistake, writing: "The IPAT equation should not be used to emphasize any one of its three main factors over the others: it should be used to fully consider each of them. Without an institutional framework to promote technological innovations, consumption changes, and reduced population growth through education, regulation and incentives, we risk creating a far more dangerous world." Bourban adds that the need to avoid rushing past any of nine planetary boundaries for safe use of the biosphere, not just the single one of atmospheric carbon load, reinforces the imperative to attend to population and consumption, since curbing them helps ratchet down human impacts in all nine areas (for similar arguments see Mitchell, 2012; Ganivet, 2019).

2.3 | Meijers' rights-based approach

In "Climate Change and the Right to One Child," Meijers (2016a) asks the question: "To what extent is it fair to require people to refrain from procreating as part of a strategy to make the world more sustainable?" He rejects the idea that the right to reproduce can be unlimited, since this would not be universalizable: "in a world in which everybody had many children, extreme scarcity would arise and stable institutions could prove unsustainable. This would lead to violation of (rather uncontroversial) rights such as the right to life and to health and subsistence." In the actual world today, excessive procreation could also undermine our descendants' right to have children, since people are likely to refrain (and perhaps should refrain) from bringing children into an insecure and dangerous world (Gheaus, 2016).

Nevertheless, many adults have a fundamental interest in founding a family, as recognized in the UN's foundational human rights charters. Meijers argues that this justifies, at a minimum, a non-defeasible moral right to have one child.

People may have a moral right to have more than one child; however, in a crowded world with limited resources, they may not. Focusing on climate change, Meijers (2016a) writes: "The right kind of balance between limiting fertility and per capita emissions will probably depend on how much value people attach to having large families as opposed to being able to have high per capita emissions on which reduction can be enforced in a morally permissible way." In seeking to create sustainable societies, governments can legitimately consider limiting both per capita consumption and per capita procreation, although any measures undertaken to remain within such limits should respect human rights.

Like Caney, Meijers argues that poor individuals in the developing world do not have the same moral responsibility to limit their procreation, given lower consumption levels and the fact that having large numbers of children may be rational in traditional social milieux. Nevertheless, he believes that "a decline in fertility rates is [generally] in the interests of the global poor," since high fertility perpetuates poverty and can lead to environmental degradation, which harms poor people disproportionately. He concludes:

> When striking a balance between lowering per capita emissions and limiting procreation, a priority should be placed on limiting superfluous emissions that do not contribute to goals as important as parenting. This is in order to protect the interest people have in there being sufficient births for continuity and to allow people to become parents. Importantly, in an unequal world like ours, limiting fertility levels will have to go hand in hand with addressing global poverty; this will decrease fertility as well as open up the possibility for further fertility reduction because procreation becomes a choice rather than a necessity. (Meijers, 2016a)

An intriguing follow-up article (Meijers, 2017) considers some of these ideas within a Rawlsian framework of justice (see also Meijers, 2016b).

Meijers' position that poor people in the developing world do not bear responsibility for climate change is widely shared. Applied to consumption, it supports the view that wealthy people should limit "luxury emissions" to preserve ecological room for increased consumption and emissions by the global poor (Shue, 1993); it also undergirds "contract and converge" goals under the UN Framework Convention on Climate Change. Many ethicists apply this view to population matters, arguing that it is unfair to ask poor people to limit procreation to deal with a problem they did not create and their children are unlikely to make worse (Okyere-Manu, 2016). Since most future population growth is projected for the developing world and much attention focuses on reducing rapid growth in poorer countries, some maintain that population stabilization is largely irrelevant to dealing with GCC (Gaard, 2015). Others go further, arguing that attention to population is a diversion by wealthy neo-colonialists who do not want to limit their own consumption (Angus & Butler, 2011), or a racist plot to limit the numbers of brown-skinned people (Dyett & Thomas, 2019; Sasser, 2014).

In response, many population advocates join Meijers and argue that efforts to limit population growth should emphasize reducing births in the developed world (Crist, 2019; Hedberg, 2020). Others, however, contend that people everywhere have a responsibility to limit their procreation, given the potential harms of overpopulation, which fall disproportionately on the poor (Cafaro & O'Sullivan, 2019; Hines, 2018). It is true, for example, that Africans have contributed little to GCC to date. Yet according to recent UN (2019) median projections, Nigeria is poised to grow from 206 million today to 733 million by 2100, Ethiopia from 115 million to 294 million, Congo from 90 million to 362 million, and Tanzania from 60 million to 286 million. Because people in Africa understandably want to improve their standards of living, their per capita environmental impacts are likely to grow. This makes their reproductive decisions and population policies significant both for their descendants' well-being and for future efforts to limit and adapt to GCC.

2.4 | Feminist concerns

Some of the strongest arguments against tackling population growth to address GCC come from feminist scholars (Hartmann, 2016; Hendrixson, 2016). In part, this is justified by reference to past human rights violations in population control programs. But critics also argue that any talk of limiting women's reproductive rights is disrespectful and dangerous (Ojeda et al., 2019). For example, Hendrixson (2018) criticizes the "120 by 2020" initiative to improve family planning options in the developing world, because it set specific targets for increasing contraceptive use and because it justified these, in part, by reference to the environmental benefits of smaller populations. Proponents saw increased

contraceptive availability as necessary to secure poor women's reproductive rights, and the initiative explicitly disavowed any form of coercion (Hardee et al., 2013). But skeptics believe that when governments promote smaller families or populations, this itself represents a kind of coercion, and starts a process that is likely to cumulate. It also obscures the real causes of the problems mistakenly blamed by "populationists" on overpopulation: excessive consumption by wealthy westerners in the case of GCC (Hendrixson et al., 2019); distribution problems and unjust poverty in the case of famines (Gaard, 2015); and an unfair and unsustainable capitalist economic system generally.

There are two issues here. The first is the relative importance of human numbers in generating environmental problems, and the role curbing our numbers might play in solving them. Feminist philosophers such as Cripps and Conly tend to follow the science on this, while feminists from other disciplines often stipulate population's unimportance. "I certainly do not dispute that population has grown enormously in the last hundred years or that anthropogenic climate change is threatening our very existence on Earth," writes Emily Merchant (2021), "but research has shown that the former is not the cause of the latter" (for a similar statement see Hendrixson & Hartmann, 2019). Such blanket dismissals are implausible, given the scientific consensus on population's environmental importance described in Section 1.1 and elsewhere (IPBES, 2019; Reid et al, 2005).

The second issue is how to fairly balance rights and responsibilities in the realm of procreation. As we have seen, ethicists have begun to grapple with this difficult question. Critics outside philosophy, however, sometimes take the view that any discussion of limits to procreation is disrespectful and unfair to women (Bhatia et al., 2019). But from an ethical standpoint, this cannot be correct, since rights are claims on limited resources and always involve correlative responsibilities (Conly, 2016; Cafaro, 2021). Successive UN population conferences in Bucharest (1974), Mexico City (1984), and Cairo (1994) each declared couples had "a right to responsibly choose" when to procreate. Whatever balance societies wind up striking, their members, male and female, will have to live with the results of those choices (Clarke & Haraway, 2018).

2.5 | Rights and responsibilities

We can take some provisional results from the work reviewed in this section. First, that the question of procreative rights is an important one for climate ethics and policymaking, deserving further discussion. Second, that such discussions should seek to balance reproductive rights against other rights, and rights with responsibilities. Some ethicists add the need to fairly balance human and nonhuman interests (Cafaro & Crist, 2012; McShane, 2016). With the proviso that preserving robust populations of other species is a moral imperative, affirming a proper balance between reproductive rights and responsibilities becomes part of sustaining the flourishing of life in all its forms (Rieder, 2016). On this view, the proper context for "striking the balance" is the effort to create just and sustainable societies.

3 | CONSEQUENTIALIST APPROACHES

3.1 | Dasgupta's utilitarian approach

While Sarah Conly's book has set the agenda for debate among rights-based approaches to population ethics, Partha Dasgupta's *Time and the Generations: Population Ethics for a Diminishing Planet* (Dasgupta, 2019), seems likely to do so for many utilitarians. Dasgupta takes humanity's environmental predicament seriously, writing that "the enormous economic success we have enjoyed in recent decades may be a down payment for future failure" as we spend down natural capital and threaten essential ecosystem services. He believes it is a mistake to reduce these environmental threats to GCC, writing: "Global climate change attracts attention among intellectuals and the reading public not only because it is a grave problem, but also because it is possible to imagine meeting it by using the familiar economics of commodity taxation, regulation, and resource pricing without having to forego growth in living standards in rich countries." Focusing narrowly on GCC also leads analysts to concentrate on technological solutions, rather than reducing consumption or limiting human numbers. But while developing and deploying new technologies can play a role in reducing environmental impacts, Dasgupta believes it is unlikely to lead to real sustainability in a world where the goal is more growth.

All this suggests a need to attend to P and A as well as T. Dasgupta (2019) does so by working out estimates for a sustainable global population at various average income levels, with income standing in as a proxy for consumption. In an article titled "Socially Embedded Preferences, Environmental Externalities, and Reproductive Rights," written in

2017 with Aisha Dasgupta and included in *Time and the Generations*, they calculate a maximum sustainable population of 3.5 billion, based on sustainability criteria borrowed from the Global Footprint Network and stipulation of an average annual global income of $20,000. The higher a desired or acceptable average income is set, the lower the number of people who can be sustained globally. We can ignore this trade-off temporarily by decreasing Earth's long-term carrying capacity, but that, according to the Dasguptas, represents a failure of stewardship and disregard for the rights of future people. Reproductive rights are important, they believe, but "to insist that the rights of individuals and couples to decide freely the number of children they produce trump all competing interests is to minimize the rights of all those (most especially, perhaps, future people) who suffer from the environmental externalities that accompany additions to the population."

Having children is an inherently social act involving claims on limited resources, which may need to be managed for the common good (see also MacIver, 2015). Best to face this with an understanding of real limits and ethical goals. *Time and the Generations* seeks to do that in a long technical essay written at the intersection of philosophy and economics titled "Birth and Death." This lies in a long line of utilitarian attempts to specify an optimal human population, going back through Parfit (1984) and forward through Broome (2004, 2012, 2016) and Greaves (2017, 2018, 2019). An intriguing part of this effort involves arguing for Generation-Relative Utilitarianism, Dasgupta's attempt to specify an ethically plausible compromise between Average Utilitarianism (in which average human well-being is held all important) and Total Utilitarianism (which takes aggregate human well-being as its central value), both of which generate ethically counterintuitive implications regarding population policies (see Greaves, 2017 for an overview and Section 3.4 below). The basic idea is to discount the well-being of future generations, to facilitate practical planning and preserve a focus on human flourishing rather than maximizing mere numbers, while not discounting it too much, to preserve a strong moral commitment to our descendants' well-being.

Dasgupta develops a formal theory that relates population, per capita consumption and biospheric capacity, suggesting, as in his earlier article, that we work out optima for the first two while respecting the third, keeping in mind future generations who will bear the costs of diminished biospheric capacity. Calculating hard numbers under such a framework necessarily involves considerable uncertainty: regarding total biospheric capacity, a proper discount rate for future people's well-being, and how best to balance average consumption against number of consumers. Within a spectrum of plausible answers to these questions, Dasgupta delivers a range of optimal global populations between 0.5 and 5 billion. Like his earlier article, this more rigorous effort suggests that humanity is already grossly overpopulated, as does a recent revision of the earlier article that defines per capita impact in terms of average production, rather than average consumption, giving an optimal sustainable global population of 1.8 billion (Dasgupta & Dasgupta, 2020; see also Tucker, 2019).

Dasgupta's central argument is strictly anthropocentric, in line with ongoing utilitarian debates about optimal population (Broome, 2016; Greaves, 2018). The biosphere is essentially a resource (or source of all resources) for human use; carrying capacity and optimal population are simply functions of what is possible or best for humans. Yet Dasgupta himself rejects anthropocentrism; as he wrote in kind response to a query, he deliberately made "minimalist assumptions" in developing his moral arguments, the better to show that even if all people care about is ourselves, we need to limit our population. "In examining our values and thus our lives," he writes at the conclusion of Dasgupta (2019), people need to ask whether needlessly extinguishing other species "is something we can live with comfortably." If not, we should grant some portion of biospheric capacity to other species and thus accept a smaller optimal human population.

3.2 | Coole's circumspect consequentialist approach

In "Too many bodies? The return and disavowal of the population question," Coole (2013) provides a clear explanation of the shift from the "population control" discourse of the 1960s and 1970s to the "Cairo consensus" of the 1990s and beyond. The UN Population Fund has described this as "a shift ... away from a focus on human numbers to a focus on human lives." Under the new approach, Coole explains, "policies based on perceptions of a 'race between numbers and resources' are eschewed as synonymous with a 'numbers game' presented as antithetical to human rights," while "reproduction is recast as a self-regarding act," justifying rights but not enjoining responsibilities. But the distinction between attending to numbers and attending to lives was always questionable. Pre-Cairo, many countries saw limiting future numbers as essential to improving their citizens' lives, and in recent decades developing countries that succeeded in reducing birth rates have been more economically successful than countries that did not (Sinding, 2009). GCC and

other global environmental problems call the Cairo consensus further into question, suggesting that attending to human numbers could be a prerequisite for protecting human rights going forward.

In a concise follow-up, *Should We Control World Population*? Coole (2018) answers her book title's question in the affirmative, on broadly utilitarian grounds. "Contrary to some popular misconceptions," she writes, "population control does not mean culling superfluous people. The aim is to reduce current birth rates in order that smaller future generations might live better." An initial chapter summarizes the case that limiting human numbers is important in dealing successfully with humanity's environmental problems, with a focus on GCC. Coole also flags potential social costs of increased population density, even when it is ecologically possible. Referencing John Stuart Mill's classic statements about the disutility of a wholly managed world with little opportunity for solitude, she notes that such concerns have been largely ignored in sustainable development debates.

Subsequent chapters explore the ethics of population control. Coole argues that from a consequentialist perspective, it is reasonable for citizens of modern democracies to support "mildly coercive fiscal and legislative measures" to decrease birth rates. Such measures could "avoid more harmful outcomes, including more stringent coercion, later" (Coole, 2018). Once we accept the reality of ecological limits, unlimited procreation becomes a threat to human freedom, rather than a reasonable expression of it. But, aware of the potential dangers of overzealous government efforts, Coole propounds a three-part account of reproductive rights, in line with her "circumscribed consequentialist" approach.

Rights to life, liberty, and security are absolute: they can "never be legitimately violated on consequentialist grounds." Prohibiting violence and securing basic bodily integrity, in Coole's view these rights include the right to abortion on demand and the right against forced abortion. In a second category, rights to full reproductive health services, including contraception, are very strong, although actualizing them depends on general social and economic development. Securing these rights will limit population growth and further women's agency and happiness, in complementary ways. Finally, in a third category, comes the right to choose family size—an important right which is nevertheless context dependent and balanced by an imperative need to choose responsibly. Serious environmentalists will want to limit this right, Coole (2018) suggests, and though she refrains from explicitly joining them, she presents the central issue clearly when she writes: "The relative importance of rights and responsibilities remains vague here. Is there a right to choose irresponsibly, regardless of the consequences for others?" Many utilitarians, following Mill, would answer "no": responsible parents should consider the impacts of such choices on their existing children, their society, perhaps the biosphere as a whole. Even (or especially) if they do not support governments restricting individual procreation decisions, sensible utilitarians must make a place for government actions to incentivize smaller families, since reproductive choices have clear implications for the well-being of other people.

Coole concludes that there are *prima facie* just means to pursue population stabilization or reduction, in light of current liberal practices within reasonably just societies. She highlights the benefits of her approach for women, poor people, and non-human beings—the ones who will be most harmed if societies fail to achieve ecological sustainability. She argues, too, that since contemporary societies continue to pursue economic growth and increased per capita consumption, it makes even less sense to ignore continued population growth. At various points, Coole defines her approach in contrast with Sarah Conly's, but she comes to fairly similar practical conclusions.

3.3 | Hedberg's broadly consequentialist approach

Like many recent treatments, Trevor Hedberg's *The Environmental Impact of Overpopulation: The Ethics of Procreation* (Hedberg, 2020) strikes a note of urgency. "We are now more than 25 years past the United Nations International Conference on Population and Development," he writes:

> the venue where explicit discussion of population policy became a political taboo. Evading the problem has not helped us. Population growth has continued and made it more difficult to mitigate climate change, slow down the rate of species extinctions, and adequately distribute the world's finite resources. Minimizing the harm that befalls present and future people requires confronting this reality and abandoning the fiction that procreative choices are too private or intimate to be subjected to moral scrutiny.

Hedberg's approach does not rely on a particular ethical theory; instead, he appeals to general moral principles that he believes most theorists and laypeople will accept. These include that current people have a duty to avoid causing

massive and unnecessary harm to future people, and that we have a duty to create sustainable societies. The central role harm plays in his argument justifies treating it as consequentialist, broadly speaking.

Hedberg stipulates that environmental degradation is the product of human population size and the average rate of environmental degradation per person. That means we must address either population size or average consumption, or both. Given humanity's current population momentum (we are adding roughly a billion people every dozen years) and the evidence that we are already overpopulated relative to what Earth can sustain, there is no way we can humanely reduce the global population fast enough to avoid having to cut back on per person consumption. Hedberg thus rejects population reduction as an environmental panacea. But the obstacles to cutting average consumption fast and deep enough to avoid catastrophe are perhaps even more daunting; most nations have decreased their fertility rates significantly over the past half century, while literally no country has a lower per capita consumption rate than it did 50 years ago, or desires one. Thus there appears to be no feasible way to cut average consumption enough to sustain a global population of 8–12 billion people indefinitely.

Hedberg concludes that humanity must reduce both per person environmental demands and population size, subject to moral and practical limits. He develops this central argument with clarity and ingenuity in the first half of his book (see also Hedberg, 2019, 2021). Its second half explores the practical implications regarding personal procreation decisions and government population policies, and responds to likely objections. Like Caney (2020b), Hedberg is centrally concerned to avoid making unjustified moral demands on people in developing nations, and this leads to some policy differences with Sarah Conly. Most consequentially, while Conly (2016) argues for a right to only one child for everyone, Hedberg believes people in the developing world with low personal consumption have a right to more. Similarly, Hedberg would avoid incentives for smaller families in the developing world, only supporting them in developed countries. These positions may be rhetorically effective, but they seem unrealistic about the grave dangers growing populations in Africa, the Middle East, and South Asia pose to the people who live there and their descendants. Hedberg's main argument is anthropocentric, but a short chapter titled "What about the nonhuman community?" notes that if we extend moral consideration to other species, the incentives to reduce our numbers increase significantly.

3.4 | Greaves, Broome, and population axiology

By taking limits seriously and emphasizing the need to act under conditions of uncertainty, Dasgupta (2019) makes a compelling case for government policies to limit or reverse population growth. Other writers on population axiology instead emphasize its ethical and empirical uncertainties, leaving us with admonitions for further study rather than political action. A good example is Hilary Greaves, who provides a clear introduction to the topic. Greaves (2017) defines population axiology as "a betterness ordering of states of affairs, where the states of affairs include ones in which different numbers of persons are ever born." The two most basic population axiologies are averagism (a state A is better than a state B if and only if people's average well-being is higher in A) and totalism (a state A is better than a state B if and only if the summed well-being of all people is higher in A). While averagism and totalism each have appeal, both also generate negative or counterintuitive consequences for population policy, as do other possible approaches such as variable value and critical level theories, and Greaves (2017) concludes that further study is needed.

Greaves (2018) applies a totalist population axiology to determine the optimum size of the global human population. This effort founders on two problems; first, the implausibility of totalists' inclination to maximize human numbers at the expense of life quality; second, uncertainty regarding the biosphere's human carrying capacity (Greaves assumes without argument that human beings have no moral responsibility to share that capacity with other species). Despite numerous signs of environmental decline, including melting glaciers, immense dead zones at the mouths of the world's major rivers, the expanding Great Pacific Garbage Gyre, and so on, Greaves insists we do not know whether biospheric carrying capacity is in danger of being breached. Again, further study is needed.

In "Climate Change and Human Population," Greaves (2019) applies her general framework to the question of whether humanity should limit population growth to deal with GCC. In addition to uncertainties already mentioned, she explores further ones regarding the practical details of successfully limiting GCC. She concludes, tentatively, that "population reduction probably would, in the end, help with climate change." In addition, she notes that larger populations might accelerate other aspects of environmental degradation and undermine the planet's future life-support capacity. As is usually the case, widening the scope of environmental concern beyond GCC lends greater urgency to limiting human numbers. Widening the scope even further, however, again deflates that urgency, as Greaves concludes

that theoretical uncertainties about the optimal "timeless population size"—the total number of people who will ever live—undermine all her previous conclusions.

John Broome, another population axiologist, has been influential in climate ethics through his own writings (Broome, 2012, 2016, 2019) and as one of the few ethicists contributing to the IPCC's *Fifth Synthesis Report* (as a lead author of a chapter in IPCC, 2014b). In the latter role, he brought a short discussion on population ethics into an IPCC publication for the first time. Tellingly, though, this discussion did not treat any actual or proposed population policies, focusing instead on the probably unanswerable question of how many human beings we should seek to sustain over humanity's entire career. After providing a short summary of population axiology under the title "Valuing Population," it concluded:

> Each of the existing ethical theories about the value of population has intuitively unattractive implications. ... So far, no consensus has emerged about the value of population. Yet climate change policies are expected to affect the size of the world's population, and different theories of value imply very different conclusions about the value of these policies. This is a serious difficulty for evaluating policies aimed at mitigating climate change, which has largely been ignored in the literature. (IPCC, 2014b)

In other words, as humanity hurtles toward catastrophic GCC, further study is needed. Given the chance to discuss the pros and cons of actual population policies, which substantially influence one of the two main drivers of GCC, Broome and his co-authors passed. Summarizing the uncertainties of population axiology was easier than forthrightly addressing the ethics of growth on a finite planet—the inescapable problem at the root of GCC. This suggests that population axiology, the approach pioneered by Parfit (1984) and developed at length by Greaves, Broome, and others (Fleurbaey et al., 2019; Méjean et al., 2020; Scovronick et al., 2017), may be a dead end, at least as regards climate ethics.

Population axiologists call for greater rigor in thinking about the value of human numbers (Greaves, 2019). But their inability to speak to actual policy choices renders their approach questionable, as does their over-reliance on mainstream economic approaches to value. Consequentialism has done some of its best work when it questioned previously unchallenged economic views and practices; that may be the sort of rigor needed now. Some economists take GCC to show the need to radically rethink mainstream economics' emphasis on "more" in favor of "enough" (Daly & Farley, 2010; Stuart et al., 2020). Perhaps ethicists also should replace optimizing and maximizing with satisficing and gratitude in considering how best to respond to GCC.

3.5 | Looming consequences

Given the world's complexity, consequentialism is always vulnerable to paralysis by analysis. Yet when it focuses on the likely consequences in the real world of actual policy choices, it is a powerful ethical approach providing useful practical guidance. Within climate ethics, more grounded consequentialist approaches tend to support robust efforts to limit human population growth to deal with GCC (Coole, 2018; Dasgupta, 2019; Hedberg, 2020; see also Gesang, 2013). Their conclusions mirror the conclusions of most rights-based treatments (Conly, 2016; Meijers, 2016a; Rieder, 2016), suggesting that the overall ethical case for such efforts is strong.

4 | RADICAL APPROACHES

4.1 | Broadening the issue

GCC is often treated as a synonym for all of humanity's environmental challenges. Yet it only represents part of our global environmental damage, as documented by the *Millennium Ecosystem Assessment* (Reid, 2005), the *Global Assessment Report on Biodiversity and Ecosystem Services* (IPBES, 2019) and various scientists' warnings that have proliferated in recent years (Bradshaw et al., 2021; Ripple et al., 2017, 2019). The planetary boundaries approach developed by the Stockholm Resilience Centre identifies nine global ecological thresholds that humanity needs to avoid crossing to preserve essential ecosystem services, several of which have already been breached (Higgs, 2017; Steffen et al., 2015, 2018). Seeing GCC as part of a larger suite of environmental threats tempers hopes that technological or managerial fixes alone might solve these problems, encouraging us to consider reductions in consumption, production, and human numbers as well (Bourban, 2019; Cafaro, 2014).

Another frequent yet questionable assumption in climate policy debates is that stabilizing population will be sufficient to deal with GCC, or that stabilization is all that is possible or desirable. As Kuhlemann (2018) observes, "that a population's size is stable in no way entails sustainability. It may be sustainable, or it may be far too large." Three recent studies argue that two to three billion people might be sustainable globally if societies made heroic environmental improvements in existing modes of consumption and production (Dasgupta, 2019; Lianos & Pseiridis, 2016; Tucker, 2019). At the national level, too, many populations in both the developing and developed worlds may need to shrink to achieve sustainability: Lianos and Pseiridis (2016) found that 44 of the world's 52 most populous countries are currently overpopulated, based on plausible stipulations regarding per capita consumption and sustainability requirements. This puts recent demographic studies that project global populations may peak sooner than expected in proper perspective (Lutz et al., 2018; Vollset et al., 2020). Even if true, most nations and Earth as a whole will still be grossly overpopulated for the foreseeable future, given likely human demands on the biosphere (see also Bravo & Tamburino, 2021).

A third necessary broadening of concern involves GCC's impact on other species (Lo & Brennan, 2018; Nolt, 2011). As we have seen, anthropocentric analyses of climate policy can justify limiting human numbers, along with other mitigation and adaptation efforts. Yet many ethicists see anthropocentrism itself as a significant cause of humanity's harmful environmental behavior (Kortetmäki, 2017; Rolston, 2020): a selfish and unjust approach to ethics that must be transcended to successfully meet environmental challenges like GCC. Committing to generously sharing habitat and resources with other species would have significant implications for the full suite of climate ethics issues, from geoengineering to population policy (Cafaro, 2010; McShane, 2016). Arguably, climate ethicists and policymakers should broaden their discussions to take other species into account.

4.2 | Questioning growth and redefining success

Perhaps the most radical approaches to dealing with GCC are those that directly explore modern societies' obsession with growth and try to frame alternatives. In *Abundant Earth: Toward an Ecological Civilization* (2019), Eileen Crist argues that a false conception of the good is at the root of humanity's environmental destructiveness. She details the many ways people have come to redefine the Earth as a storehouse of resources for our use, where wild species and wild places have no integrity we feel compelled to respect. Along with this anthropocentrism goes a shallow, misplaced conception of freedom built around high levels of irresponsible consumption. The only realistic solutions to GCC, massive biodiversity loss and other environmental problems, she believes, involve scaling back human numbers and economic demands. Yet "sociocultural conditioning into the precepts of human distinction and prerogative renders the very notion of substantially scaling down and pulling back humanity's sprawl almost unthinkable from a mainstream perspective" (Crist, 2019). To date this unwillingness has been widespread among climate policymakers.

Reformist attempts to square continued growth with environmental protection are bound to fail, Crist argues. She presents an alternative vision of social progress in which people accept and even welcome limits to growth, as an expression of caring relationships with the biosphere and concern for future generations. A growing chorus of critics makes similar arguments (Mills, 2003; Urry, 2010; Vieira, 2016). If they are right, we must choose between demographic and economic degrowth, or an ecologically devastated world. Thirty years ago, such claims found little hearing, yet research by climate scientists and conservation biologists appears to bear them out. In a recent "Warning to Humanity," more than 15,000 scientists assert: "We are jeopardizing our future by not reining in our intense but geographically and demographically uneven material consumption and by not perceiving continued rapid population growth as a primary driver behind many ecological and even societal threats" (Ripple et al., 2017). Their suggestions for creating sustainable societies include "estimating a scientifically defensible, sustainable human population size for the long term while rallying nations and leaders to support that vital goal," with no hint that merely stabilizing human numbers will be sufficient (see also O'Sullivan, 2018).

5 | CONCLUSION

Faced with the reality of GCC and its devastating impacts, climate ethicists have begun to address the role of population and the need for limits to growth. Across all ethical approaches, there is a strong consensus on the value of choice-enhancing policies that reduce fertility, such as securing universal access to modern contraception and providing equal rights and opportunities for women. There is also strong support for government policies that incentivize smaller

families, considerable support for policies that disincentivize larger ones, and little to no support for punitive policies. It appears that ethicists who ask what justice demands regarding population policy in a warming world may find reasonably clear answers. Whether our societies can discipline themselves to apply those answers is a further question.

CONFLICT OF INTEREST

The author has declared no conflicts of interest for this article.

DATA AVAILABILITY STATEMENT

Data derived from public domain resources.

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