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EDITORIAL

Population growth, climate policy and sustainable futures

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The silence at the core of contemporary climate policy

A perplexing tension exists at the heart of contemporary climate policy. While scientific evidence identifies population growth as a primary driver of greenhouse gas emissions, international climate negotiations rarely address it directly. This gap reflects complex political and cultural considerations about discussing population – considerations that may affect our collective capacity to address the climate crisis comprehensively.

The most recent full report (AR6) from the Intergovernmental Panel on Climate Change is clear on the role of population growth where it comes to carbon emissions:

> Globally, gross domestic product (GDP) per capita and population growth remained the strongest drivers of CO_2 emissions from fossil fuel combustion in the last decade (robust evidence, high agreement). (IPCC, 2023a: 217)

However, this emphasis diminishes in policy documents. The 64-page *Summary for Policy Makers*, the document that shapes international negotiations, does not explicitly mention population growth as an indirect driver and acknowledges only obliquely that 'slow technological change, high levels of global population growth, and high fragmentation as in the Shared Socio-economic Pathway SSP3, may render modelled pathways that limit warming to 2°C (>67 per cent) or lower

infeasible (medium confidence)' (IPCC, 2023b: 21). The absence of discussion regarding mitigation and adaptation policies aimed at addressing population growth in AR6 significantly contrasts the approach taken in the IPCC's Fifth Assessment Report (AR5).

From recognition to retreat: The IPCC's evolving position

While the AR5 *Summary for Policy Makers* flagged population growth as a vulnerability risk, the full report dealt with the issue at some length, acknowledging it as an indirect driver of climate altering pollutant (CAP) emissions and explicitly discussing family planning policies:

> Providing access to family planning saves women's lives by reducing the total number of births and, in particular, through the reduction of births in high-risk groups... while simultaneously reducing total fertility and subsequent CAP emissions. (IPCC, 2015: 741)

The AR5 report emphasised that meeting unmet need for contraception in high-fertility, high-vulnerability regions such as the Sahel could help reduce human suffering in the face of climate change. It noted the importance of reproductive health services not only in developing countries but also in wealthy nations like the United States with high per capita emissions and unmet reproductive health needs. The report connected population policy to improved maternal and child health through increased birth spacing and fewer births among very young and older mothers.

What might explain this pivot from AR5's comprehensive approach to AR6's more limited treatment? Political sensitivities around population likely play a role, since the topic still carries historical associations with coercion, racism and victim-blaming that make policymakers understandably cautious. The IPCC's emphasis on behavioural and technological change may also reflect the temporal urgency of emission reductions. As Bradshaw and Brook (2014) demonstrate, demographic momentum means that even optimistic fertility reductions would take generations to significantly reduce total population size, with environmental benefits only realised by 'our great-great-great-great grandchildren' (16614). In the face of targets for 45 per cent emission reductions by 2030 and net-zero by 2050 (IPCC, 2023a), population policy may appear to offer limited near-term impact.

Defining and addressing overpopulation

Yet this temporal constraint may be diverting attention from crucial questions about human numbers and planetary boundaries. In this issue, Philip Cafaro addresses these directly, arguing that the Earth is currently overpopulated and that acknowledging this could strengthen sustainability efforts. Notably, he rejects framing this as choosing between addressing population versus consumption or technology.

Cafaro observes that global population grew from two to over eight billion in a century while cascading environmental crises such as climate disruption, biodiversity collapse and ocean acidification suggest the Earth cannot sustainably support current human numbers at present consumption levels and technologies. Using the IPAT formula (Impact = Population × Affluence × Technology), he argues that, while all three factors matter, population reduction may actually be most achievable. Fertility rates have fallen dramatically worldwide when modern contraception and education are provided, and reducing population is relatively popular and inexpensive compared to significantly cutting per capita consumption or radically transforming technologies.

Cafaro's central contribution is a formal definition of 'overpopulation': populations are too large if they degrade essential ecosystem services threatening future human wellbeing, or displace species enough to cause mass extinction, when these harms stem partly from unprecedented population size and would decrease significantly with smaller populations. This focuses on observable outcomes rather than speculative future transformations.

Applying this definition, Cafaro suggests that current evidence on climate change and biodiversity loss meet all his criteria for overpopulation. IPCC data confirms population growth remains a primary emission driver and conservation science indicates human displacement of wildlife due to population growth threatens mass extinction. Moreover, he argues that European population decline has enabled wildlife recovery. Cafaro's conclusion that sustainable societies benefit from addressing all three IPAT factors simultaneously through universal family planning access and policies encouraging smaller families via democratic decision-making offers an alternative to binary policy discourses.

Reproductive rights and population sustainability

This framing connects population sustainability to human rights rather than opposing them. While fertility reduction may not deliver emission reductions quickly enough to meet 2030 or even 2050 targets, the IPCC AR5's observations about welfare benefits of reproductive autonomy remain relevant. As Bradshaw and Brook (2014) conclude, the limited effectiveness of population policy for tackling immediate environmental crisis 'should not be an excuse for neglecting ethical measures for fertility reduction now; it could avoid millions of deaths by midcentury and possibly keep the planet more habitable for *Homo sapiens* in the next' (16615).

Richard Grossman's contribution examines this connection through the lens of abortion access. Despite modern contraception, over 120 million unintended pregnancies occur annually worldwide. Grossman identifies 134 countries with total fertility rates at or below replacement level, of which 28 maintain severely restrictive abortion laws. While this appears to suggest that replacement-level fertility is possible without abortion access, his analysis reveals that low fertility in these contexts operates through mechanisms that impose costs on women: cross-border access (available only to those with resources), de facto tolerance creating legal uncertainty, or workarounds like Bangladesh's 'Menstrual Regulation'.

Drawing on 43 years as an abortion provider, Grossman emphasises that, while replacement-level fertility may be technically achievable without legal abortion, this comes through unsafe illegal procedures resulting in medical complications, infertility and death. His conclusion resonates with the IPCC AR5's emphasis on reproductive health services as integral to climate adaptation and mitigation: achieving sustainable population without safe, legal abortion access may be technically possible but raises ethical concerns and practical inefficiencies, imposing unnecessary suffering while achieving demographic goals more slowly and incompletely.

The energy transition and population growth in developing countries

The relationship between population growth and emissions is further complicated by rapid technological and economic changes in developing regions. Previous projections assumed that developing countries would follow the Global North's fossil fuel energy pathway and this shaped calculations suggesting that population

growth in these regions would drive significant emission increases (Bongaarts and O'Neill, 2018). However, the precipitous fall in costs of solar PV, other renewables and battery storage has fundamentally altered this calculus. Many analysts now consider it possible that developing regions, particularly those with limited existing energy infrastructure such as most of Africa, might largely leapfrog fossil fuels in their development (Arndt et al., 2019; Jones, 2025; *The Economist*, 2025).

This potential transformation, while suggesting that the emissions impact of population growth in developing countries may be substantially lower than previously projected, does not eliminate the relevance of population dynamics. Although the largest, energy supply is only one source of carbon emissions. Growth in emissions from industry, agriculture, forestry and land use, as well as transport and buildings, are all indirectly driven by growth in GDP per capita and population. While decarbonisation is essential to tackling climate change, the IPCC's own data shows that, between 1990 and 2019, emissions due to economic growth and population growth eclipsed reductions from technical improvements (IPCC, 2023a). Analysis published in this journal showed that population growth alone cancelled out more than three quarters of these emissions reductions (Chaurasia, 2020). Thus, despite promising technical change, limited policy attention to population is clearly unwarranted.

COP30: Silence on indirect drivers

This pattern was evident at COP30, held in Belém, Brazil in November 2025. The final communique, known as the *Global Mutirão Decision* (UNFCC, 2025), has been criticised for failing to reference, much less commit to, phasing out the direct driver of the climate crisis – fossil fuels. Yet COP30 also failed to address the indirect drivers – growth in per capita GDP and population growth. The *Belém Declaration on Hunger, Poverty, and Human-Centred Climate Action* (COP30, 2025) focused on climate change's unequal impacts, emphasising food security and social protection systems as foundations of resilience. The declaration pledged to:

> [l]ink social protection to nutrition, school feeding, livelihoods, health, agricultural extension and education services, and other interventions to promote long term resilience and adaptation in the face of adverse climate impacts. (COP30, 2025: 2)

It also committed support for small-scale food producers, smallholder farmers, fisherfolk, Indigenous Peoples, as key agents of resilience, and renewed commitments to sustainable energy transition in developing countries.

These commitments are valuable but represent only part of a comprehensive approach. While developing regions' energy footprint may pose less of a challenge than previously thought, food security presents increasingly complex constraints. Over 800 million people currently suffer from chronic hunger, while billions more lack access to adequate, safe, nutritious food (FAO et al., 2024). The Food and Agriculture Organisation and World Bank estimate that agricultural production must double or more from 2009 levels by mid-century (Alexandratos and Bruinsma, 2012; Fukase and Martin, 2017).

This production increase is driven not only by population growth but also by changing consumption patterns. Bennett's law captures shifts toward more resource-intensive foods, particularly meat and dairy (Godfray, 2011), which require 50–100 times more land than plant-based alternatives (Ritchie, 2021). One recent study concluded that meeting the needs of 10.4 billion people within planetary boundaries would require a largely plant-based diet (Schlesier et al., 2024). Achieving such dietary transformation involves addressing deeply ingrained dispositions linked to individual and cultural identity – a challenge that may be at least as difficult as fertility reduction, yet one that receives more attention in policy discussions, perhaps because it appears less politically sensitive.

The educational gap: Preparing future leaders

The capacity to address interconnected challenges, climate change, population dynamics, food security, sustainable development, depends on whether future leaders understand their relationships. Céline Delacroix, Paige Passano, Matt Matusiewicz and Ndola Prata's contribution reveals a concerning gap in this preparation. Their mixed-methods study of 125 University of California faculty investigates how they perceive population dynamics and whether they integrate it into undergraduate teaching.

The findings reveal notable disconnect. While 83 per cent consider population dynamics essential for students' understanding, particularly regarding climate resilience, poverty alleviation, and gender equity, only sixty per cent actually

discuss it in courses. Among those who do, coverage is typically minimal rather than substantial. The gap stems from systematic barriers: 54 per cent cite lack of demography training as a key obstacle, while others point to political sensitivity, time constraints, interdisciplinary complexity and concerns about classroom divisiveness around migration, reproductive rights, and historical associations with Malthusian debates and eugenics.

Population dynamics teaching lacks systematic coordination within UC. Its inclusion depends largely on individual faculty preferences rather than institutional support, resulting in fragmented coverage. Students may encounter the topic in one course but not others, with varying depth and framing. Some faculty avoid it, fearing controversy; others include it without adequate background to navigate sensitive dimensions.

This educational gap has policy implications. Students passing through UC and similar institutions will become policymakers, scientists, business leaders and informed citizens shaping future decisions. If they graduate without fundamental demographic knowledge, without understanding population momentum, age structure transitions, relationships between fertility and female education, or demographic dimensions of climate vulnerability, they may be less equipped to engage with issues international bodies currently address. Limited attention in policy discourse may thus be self-reinforcing: policymakers who never studied population dynamics may be less likely to incorporate them into climate and development frameworks.

Historical perspectives: Steady-state economics and population limits

The limited engagement with population dynamics in education and policy is interesting given the long intellectual history of thinking about sustainable population size. Theodore Lianos's contribution examines Thomas More's 1516 *Utopia* as an early conceptualisation of steady-state economics. The modern interest in steady-state economics (SSE) stems from recognition that Earth's limited resources cannot support indefinite growth and Lianos begins by outlining the characteristics of modern SSE theory: constant population at a sufficient level, constant production at a sufficient level and institutions ensuring this stability.

More's island nation maintains constant population through regulation. Households maintain ten to sixteen adults and marriage age restrictions help control reproduction. Any population growth that does occur is accommodated by migration to mainland colonies. Lianos argues that what makes Utopia a steady-state economy is this combination of limited land and population stability. Given that resources are limited, the 'grow or die' imperative of modern capitalism cannot apply; a different system of social values therefore develops. In Utopia, production exceeds consumption due to a value disposition towards sufficiency rather than luxury and the regulation of population size. The citizens of Utopia accept numerous restrictions in their private lives because they understand these as necessary for a just society. Their attitude toward luxuries and wealth is consistent with the value framework that contemporary SSE theorists consider necessary for sustainable economics.

The significance of this historical perspective is not that More's specific prescriptions remain directly applicable, but that the fundamental question remains relevant. For over 500 years, political philosophers have recognised that finite land requires stable population for sustainable wellbeing. Yet contemporary policy discourse often treats indefinite growth as natural and inevitable, with population stabilisation mentioned only occasionally if at all. The contrast between the explicitness with which More, Plato and Aristotle centred population limits in their thinking about just societies and contemporary climate negotiations is noteworthy.

Conclusion: Toward integrated climate and demographic policy

The contributions to this issue, while addressing a diverse range of topics, can be seen to underline a notable gap between scientific findings and policy attention regarding population dynamics and climate change. While the IPCC identifies population growth as a primary driver of emissions alongside growing GDP per capita, this recognition receives limited attention in international climate negotiations, and the climate policy community. The AR6's reduced emphasis compared to AR5 and COP30's silence on indirect drivers suggest systematic barriers to incorporating population considerations into climate frameworks.

Several factors may explain this pattern. Historical associations with coercion and eugenics create understandable political sensitivities. The temporal dynamics of

demographic change – the long lag between fertility reduction and substantial population decline – almost certainly discourages policymakers concerned with near-term emission targets. Moreover, institutional gaps in demographic training, as Delacroix and colleagues document, mean that many universities lack the ability to integrate the topic effectively across curricula relevant to future environmental policymakers. Limited educational exposure may partly explain the apparent lack of confidence of current policymakers to integrate demographic analysis into climate and sustainability frameworks.

While at one level quite reasonable, the argument about the temporal dynamics of demographic change is wanting. If demographic momentum means fertility reductions require many decades to substantially affect total population, this would seem to make earlier action more consequential rather than less relevant. Indeed, Bradshaw and Brook (2014) observe that, if fertility had been addressed immediately after WWII, enormous demographic momentum could have been attenuated and reducing future impacts would have been easier to achieve. The contributions by Cafaro and Grossman suggest that it is not too late to address population growth through rights-based approaches (i.e., universal access to family planning and comprehensive reproductive healthcare) with the benefits beyond long-term emission reductions including improved maternal and child health, enhanced educational and economic opportunities, and greater climate resilience.

The question facing policymakers may not be whether population dynamics matter for climate change – the evidence clearly suggests they do – but rather how to integrate demographic considerations into comprehensive climate policy alongside consumption patterns and technological change. As Lianos's historical analysis indicates, questions about the relationship between human numbers and planetary capacity have occupied political philosophers for centuries. Whether contemporary policy can develop frameworks that address these questions explicitly, ethically and effectively remains an open challenge for climate governance and sustainable development. In a political climate where scientific evidence is routinely dismissed, it is even more important that policymakers are faithful to the evidence from both research and best practice and push back against ideological narratives which can be shown to have damaging consequences.

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