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EDITORIAL

Spatial and temporal abstraction, individual agency and aggregate trends in population dynamics

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The relationship between population growth and environmental impact, whilst complex, is well established in the scientific literature (Samways, 2022) and can be understood at a number of levels of spatial and temporal abstraction – from the global and long-term to the local and short-term. At the most abstract level, the expansion of the human enterprise, of which per capita consumption and the size of our population are major components, is clearly correlated with environmental change at a planetary level. However, at lower levels of abstraction the role of population growth, as Robin Attfield (1983) has noted, may be a sufficient but not a necessary condition in environmental change, with other factors, including the particular values and social practices of a community, being significant drivers. Thus, a combination of population size and the practices and preferences of that population determine anthropogenic environmental change.

Concomitantly, explaining the causal influences on population size itself is also dependent on the level of abstraction at which the argument is pitched. In this issue, Russ Hopfenberg's *Perspective* article, pitched at a global long-term level of abstraction, argues that it is the expansion in food availability that is the underlying determinant of human population growth. Hopfenberg shows that populations of non-human species are determined by the carrying capacity of their environment – that is, the availability of food, water, space and air, and the level of predation and disease. Whilst recognising that humankind has altered

carrying capacity variables to produce greater amounts of food, he extends this argument to our species, arguing that food availability is the critical determinant in human carrying capacity.

Hopfenberg identifies four key points in human history where new modes of living or production methods increased food availability and population expansion followed. The neolithic revolution around 10,000 years ago marks a significant increase in food availability and population expansion[1] as the dominant mode of human subsistence shifted from hunting and gathering to settled agriculture. Incremental improvements in agricultural productivity and associated population growth followed, but Hopfenberg points to significant change around 1500[2] and further dramatic increases as the industrial revolution intensified production. Further expansion followed the so called 'Green Revolution' of the mid-twentieth century. Acknowledging the influence of decreased child mortality on population growth,[3] Hopfenberg observes that, since the third law of thermodynamics cannot be violated, population cannot grow beyond the level of food availability. He argues that, rather than food supply expanding to meet the demand from a larger population, increasing food supply is the root cause of population growth.

Feeding the global population is one of the greatest contributors to climate change; yet the effects of global heating are already feeding back, decreasing yields, increasing pressure on the food system and leading to greater numbers of people experiencing food insecurity (Mbow et al., 2019). Rather than attempting to increase the food supply – which he argues has paradoxically increased the number of malnourished and starving people – Hopfenberg concludes that we must urgently address population growth to ensure sustainable human welfare.

1 Bocquet-Appel (2011) explains this Neolithic demographic transition as beginning with increased female fertility due to shorter birth spacings consequent on improved calorie intake and a sedentary existence. However, the Neolithic baby-boom was eventually checked by a rise in child mortality caused by greater disease amongst denser sedentary populations. It is also interesting to note that changes in hunter gather practices from 'immediate return' on labour (without food storage) to 'delayed return' where foodstuffs were stored and even simple forms of agriculture were practised, has also been associated with population growth (Feeney, 2019).

2 Associated with novel foodstuffs from the New World (Nunn and Qian, 2010).

3 Eductions in child mortality are themselves associated with improved nutrition (Pozzi and Fariñas, 2015).

While, as Russ Hopfenberg argues, it is clear that food availability must have been a limiting factor on population growth, at more granular levels of abstraction average total fertility rates in premodern societies, including hunter gatherers, have been recorded as four to six children per woman – around half the ten or more believed to be physiologically possible (Coale, 1984; Wilson and Airey, 1999; Page and French, 2020). However, although strong social norms confining sexual relationships and childbearing to marriage are common across cultures, evidence of widespread parity-specific fertility regulation (i.e., controlling the number of births) within marriage in traditional societies is almost non-existent (Cleland and Wilson, 1987). These two intriguing observations have led to considerable speculation about a possible homoeostatic mechanism regulating long-run population size so that it remained within the limits of the particular era's carrying capacity (Wilson and Airey, 1999).

However, as Wilson and Airey comment: 'a successful homeostatic theory of fertility must be able explicitly to link individual actions and aggregate processes' (1999: 124). In other words, any general theory must be able to shift seamlessly between micro and macro levels of abstraction. Yet, the breadth and diversity of social practices and institutions connected with moderate fertility (including extended breastfeeding, later age of marriage and infanticide amongst many others) and the manifold social, cultural, political and environmental contexts in which they occurred (Wilson and Airey, 1999) leave abstract macro theories of population homoeostasis somewhat wanting.

Human social and cultural life is complex, involving both conscious and unconscious motivations for individual actions, with agents drawing upon, and in turn reproducing, social structures (values, norms, institutions) which inform their hermeneutic frames of meaning. Moreover, while agents are knowledgeable about their social conditions of action, unacknowledged conditions produce unintended consequences. Macro level theories, such as theories of population homoeostasis, must therefore be able to account for the conscious motivations of actions for which agents can readily discursively account as well as those which form part of their practical consciousness – which includes taken for granted knowledge of their social world including prevailing social norms such as the age at which people marry (Giddens, 1979; 1984; Stones, 2005). Almost all the examples of fertility moderation cited by Wilson and Airey are the unintended

consequence of the intentions and meanings – themselves rooted in prevailing social norms – attached to the social practices in which agents were engaging.

The importance of agency to understanding demographic change could not be clearer than in the modern era where fertility is subject to a greater degree of individual control. The recognition of the reflexivity and purposefulness of agents acting in the context of acknowledged and unacknowledged social structural conditions and of the intended and unintended consequences of those actions is essential to understanding contemporary demographic change. For example, much of the recent decrease in fertility can be seen, amongst other things, as a mixture of intentional birth control and the unintended consequences of factors such as the extension of years spent in education, greater female participation in the economy, and the opportunity to order a hierarchy of priorities which may favour establishing material security in preference to childbearing. Despite individual fertility preferences, these factors potentially lead to family building later in the female reproductive window of opportunity and hence lower total fertility (Samways, 2022).

Agency is also critical to contemporary population and sustainability questions since it is pivotal to ethics. Without agency, moral choice, responsibility and accountability would be meaningless. I have argued elsewhere that the relationship between population and sustainability is intrinsically value-dependent and inseparable from politics and ethics, and that inequality and justice are central to the environmental crisis (Samways, 2021; 2022).

Clearly, demographic transition from high to low rates of mortality and fertility is not autonomous and predictably determined by universal drivers, but relatedly, and perhaps more importantly, the progress and timing of fertility transition is amenable to population management policies (Coole, 2018; Samways 2022). However, although population growth is acknowledged as a significant indirect driver of the environmental crisis (Brondízio et al., 2019; Almond et al., 2022; IPCC, 2023), tackling the rate of growth is frequently regarded as morally perilous since fertility decisions are closely associated with notions of personal autonomy and basic human rights. Moreover, the history of population control has been associated with coercion and discourses of racism, eugenics and imperialism (Samways, 2022).

Focussing on the climate crisis, Patrick Hassan's article published in this issue addresses many of these ethical questions in a critical examination of the charge of 'climate colonialism' – the perception that policies of rich nations attempt to shift responsibility and the economic burden of climate change onto developing countries. Proposals to tackle population growth as a climate mitigation strategy have been the subject of particular criticism, since the relatively small per capita emissions of low-income, high fertility, countries are juxtaposed with the very large per capita emissions of the low fertility rich world. Many, such as Monbiot (2020), have argued that population policies distract attention from dealing with the excessive consumption of the rich world.

However, in their latest report the IPCC (2023: 142) are clear that:

> 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 (*high confidence*).

While, due to population momentum, tackling population growth as a climate mitigation strategy is recognised as a long-term measure, it could nonetheless make a significant impact on future emissions (O'Neill et al., 2012). Moreover, deferring action that will shift the population growth curve decades down the line only endangers the welfare of future generations, especially those born in low-income countries.

Hassan points out that the logic of the I (impact) = P (population) x A (affluence) x T (technology) equation means that, if human impact is to be merely kept at the current level, then consumption must decrease and/or less impactful technology must be deployed to compensate population growth. Hassan shows that this 'Compensation Thesis' means that the objection that tackling population growth distracts from addressing consumption is fallacious since it is impossible to treat them in isolation. He points out that, if tackling population growth in developing countries is denied, then reducing consumption and/or employing less impactful technology are the only options left. However, as O'Neill et al. (2018) argue, the notion that a reduction in rich world consumption alone could allow all to live well is erroneous. Even with a social and technological revolution in welfare provisioning systems, O'Neill et al. conclude that an equally good life for all could

only be provided for seven billion people within planetary boundaries. Hassan argues that, if tackling population growth is morally out of bounds, then, in the absence of a 'miraculous' technological breakthrough, climate colonialism re-emerges if restrictions on consumption in the developing world are required. Therefore, he argues, tackling population growth will be necessary to offset the growth in consumption required to meet the welfare aspirations of people in the least developed countries without exacerbating the climate crisis.

However, imposing restrictions on reproductive autonomy is morally troubling and Hassan examines the range of non-coercive approaches to lowering fertility including choice-based approaches (e.g., improving female access to healthcare, family planning, education and economic participation), fertility preference adjustment (nudging family size preferences) and incentive models (e.g., financial rewards for smaller completed family size). Whilst these methods are non-coercive they are not without possible difficulties in terms of autonomy; moreover it can be argued that ideological displacement of traditional cultural values and practices with those from a typically more powerful exogenous culture is itself a form of climate colonialism. Hassan comprehensively neutralises such arguments, contending that much comes down to the nature of the delivery programmes themselves. Importantly, he points out that, as with many climate colonialism arguments, it is a genetic fallacy to conflate past examples of colonial manipulation with non-coercive policies aimed at changing fertility outcomes.

Hassan recognises that it follows from the compensation thesis that the consumption of affluent countries must be tackled and technology transferred to developing countries in order to lower emissions and meet developmental aspirations. However, these will not be sufficient to tackle the climate crisis and non-coercive policies directed at reducing population growth in high fertility, low-income countries are necessary and morally defensible. Moreover, Hassan raises the disturbing possibility that coercive fertility policies could be morally justified if it was determined that they were required to avoid a global climate catastrophe that produced massive suffering. Even this, he argues, could not be construed as climate colonialism if equally radical sacrifices were initiated in affluent countries. Finally, on the rhetoric of climate colonialism as an objection to population limitation, Hassan remarks:

> Even the most sincere proponents of [the] charge of climate colonialism, out of genuine concern for the just treatment of developing nations, will do harm to all, and especially to those same developing nations that will feel the early effects of global warming the hardest. Given the alarming stage of climate change is now impossible to ignore, as well as doubts about the efficacy of technological fixes and consumption decreases, it would be deeply irresponsible to wholly ignore the real variable of population size in our attempts to reduce emissions. (pp.X)

Whilst critically important to long-term global sustainability, global population growth is not the only demographic variable relevant to sustainability when considered at more regional scales. Although about eighty million people are added to the global population annually and most of the forward growth in population will occur in high fertility counties of Sub-Saharan Africa (O'Sullivan, 2023), in below replacement fertility countries such as the UK and USA population continues to grow mainly due to immigration (Cangiano and Brindle, 2024; US Census Bureau, 2024).

In his article published in this issue, Philip Cafaro examines US immigration trends and policy in respect of both national and global environmental sustainability. Working from a 'Nature Needs Half' perspective involving the restoration of wilderness (Crist et al., 2021), Cafaro argues that the global population is already three or four times that which can be justly sustained at good levels of human welfare. In line with these principles, he contends that the current US population of 340 million is several hundred million more than is ecologically and morally defensible.

Cafaro shows how the immigration policies of various administrations have led to a missed opportunity to shrink the population of the United States to sustainable levels. Moreover, he argues that the US Census Bureau projections of national population growth are based upon the assumption of large decreases in net immigration from current levels – even incorporating a projection based on the improbable scenario of zero migration. Developing his own model, Cafaro shows that using actual net migration figures for 2020 (750,000) and 2023 (3 million) leads to a US population ranging from 340 to 615 million by 2100 rather than the Census Bureau's range of 217 to 436 million by the same date.

Cafaro argues that US congressionally mandated immigration policy has been between 1.1 and 1.2 million annually; however various factors including the Covid pandemic and a tolerance of illegal immigration led to significant differences in the actual numbers in recent years with net immigration during the Trump administration averaging 1 million and during the Biden years 2 million. He concludes that the environmental and demographic implications of the wide divergence in policies actually pursued should be reflected and communicated in official national population projections.

Taking his argument further, Cafaro produces a projection based upon the recommendations of the 1997 US Commission on Immigration Reform (known as the Jordan Commission) – i.e., limiting immigration to around 300,000 a year by only meeting the need for exceptional workers, providing sanctuary to genuine political refugees and enabling spousal reunification. Following this scenario, Cafaro forecasts US population to fall to 285 million by 2100 and to as low as 168 million by 2200, conferring substantial environmental and social benefits. He contends that the implications of a low immigration policy would extend beyond the boundaries of the United States and lower fertility rates in developing world since, he argues, the flow of remittances from immigrants to their countries of origin incentivises larger families.[4]

Like Patrick Hassan, Cafaro argues that, rather than a choice between the two, population reduction is a complimentary strategy to the reduction of consumption and that affluent nations must take the lead in reducing ecological overshoot by reducing their consumption. However, he concludes: 'But if they are to share the world's resources more fairly and show the way forward by creating prosperous yet sustainable societies, developed nations must reduce their bloated populations.' (pp.79)

This issue of the *JP&S* also includes Anastasia Pseiridis' review of *Capitalism, Degrowth and the Steady State Economy* by Theodore Lianos. In the broadest

4 In in the interests of balance, it should be noted that there is considerable debate about the positive and negative effects of remittances on both fertility and environmental impact. For environmental impact see: Hecht et al., 2006; Davis and Lopez-Carr, 2010; Jaquet et al., 2016; Oldekop et al., 2018; Edwards 2022. On the effect on fertility see: Anwar and Mugha 2016; Ifelunini et al., 2018; Green et al., 2019; Paul et al., 2019.

terms, Lianos' work is concerned with the ecological imperatives requiring humanity to challenge discourses of endless economic growth and actively disrupt and remake our apparently autonomous and structurally constraining economic system. Tackling the apparent autonomy of global population growth is part of the transformative process which will enable sustainable prosperity for all.

The idiom of the devil being in the details is pertinent to all fields of study and, as the articles in the issue of the *JP&S* attest, understanding the relationship between demographic dynamics and the physical environment is no exception. At macro levels of abstraction, impersonal forces have shaped long-run human population growth, while, at more granular levels of abstraction, the intended and unintended outcomes of individual choices and actions, in particular given social and physical contexts, aggregate to form these macro level trends. Thus, to paraphrase Marx: 'humans make their own history, but under existing circumstances, given and transmitted from the past'. Agency is critical to understanding the production and reproduction of social systems, but also pivotal to ethics, values and responsibilities which motivate social change at both the individual and collective level.

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