



# Human population, social justice, and climate policy

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## Abstract

We illustrate how human population has been mostly ignored with regard to climate policy by conducting a systematic review of the literature in the context of social justice and six transformative steps for climate change mitigation. Despite this, implementing socially just population policies could make substantial contributions to climate mitigation and adaptation while also promoting social justice and gender equity. We detail how this is possible using a number of policy examples, including increasing the availability of voluntary family planning services and improving education for girls and young women.

**Keywords** Climate mitigation · Climate adaptation · Population policy

Recently, more than 11,000 scientists from 153 countries endorsed an article that declared a climate emergency warning that if we continue with business as usual, the result will be “untold human suffering” (Ripple et al. 2020). This article included a discussion of the importance of transformative actions that foreground social justice for all by prioritizing basic human needs and reducing inequality. It proposed six steps for mitigating climate change: (1) energy—replacing fossil fuels, (2) short-lived air pollutants—reducing methane, black carbon (soot), and hydrofluorocarbons, (3) nature—protecting and restoring Earth’s ecosystems for sequestering carbon, 4) food—eating mostly plant-based foods, improving cropping practices, and curbing food waste, (5) economy—shifting from unlimited GDP growth to ecological economics and sustainable monetary

practices, and (6) human population—curbing population growth in the context of social justice (Fig. 1). Motivated by this work, we analyzed the extent to which each of these six steps and social justice were included in commentary pieces on climate change policy in the world’s top two scientific journals, *Nature* and *Science*. We considered Comment and Commentary articles (*Nature*) and Policy Forum articles (*Science*) published since 1997 that at least in part addressed climate mitigation policy. We then developed a set of keyword search terms associated with each topic (e.g., ‘reforestation’ for the nature step). We categorized each article as being associated with a topic if it included a minimum of five references to at least two of the topic’s keywords. We also investigated trends in the frequency of climate policy articles over time.

In total, we identified 212 climate mitigation policy articles. Because they exhibited similar patterns in the rates at which topics were referenced, we pooled *Science* and *Nature* articles together (Fig. S1). The most frequently referenced keywords were in the energy category, including fossil fuel(s), renewable(s), and low carbon (Fig. S2). The proportion of articles dealing with climate policy tended to increase over time (Fig. S3). Energy was by far the most commonly referenced topic ( $n = 108$  articles; 50.9% of total), followed by economy ( $n = 39$ ; 18.4%) and nature ( $n = 36$ ; 17.0%); the least commonly referenced topics were population ( $n = 2$ ; 0.9%), social justice ( $n = 4$ ; 1.9%), and food ( $n = 9$ ; 4.2%) (Fig. 2).

Our finding on population policy being overlooked, despite its significant and important climate mitigation

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Christopher Wolf and William J. Ripple contributed equally to this work.

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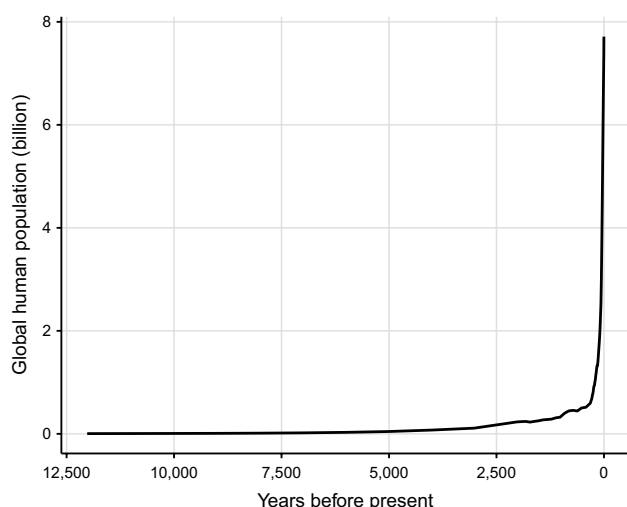
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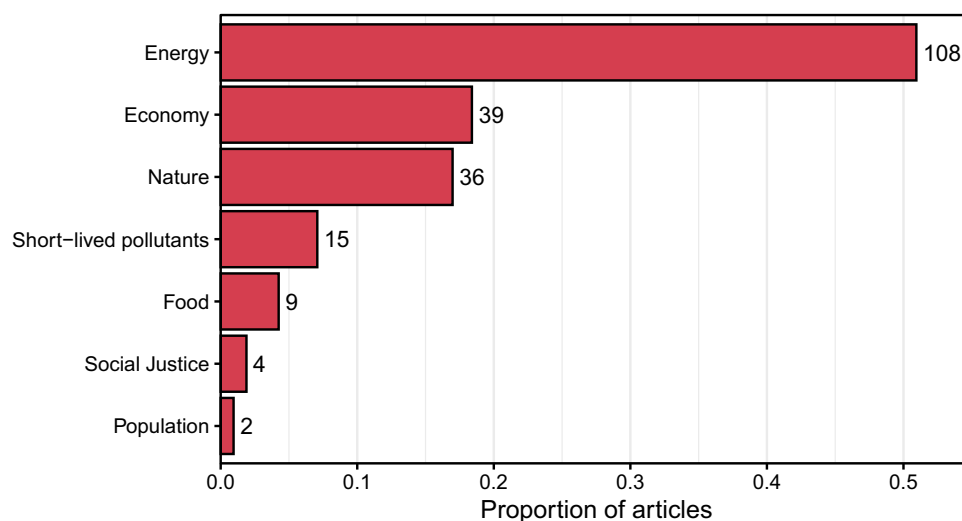
**Fig. 1** Human population size over the last 12,000 years. Population size estimates up to 2017 come from version 3.2 of the HYDE database (Goldewijk et al. 2017); data for 2018 and 2019 come from FAOSTAT (FAOSTAT 2020)

potential, is consistent with prior work (Stephenson et al. 2010; Bongaarts and O'Neill 2018; Wilkinson et al. 2020) and is in large part due to population-based policies often being viewed as taboo and detrimental to social justice and human rights (Stephenson et al. 2010). From China's one-child policy to forced sterilization campaigns (Patel 2017), the abhorrent history of coercive or manipulative "population control" programs must be acknowledged and never repeated. However, we cannot use this history to justify ignoring virtuous synergies between social justice and equitable population policies given the urgent need for greater equality and climate action. Policies that address health and education can greatly reduce fertility rates, and thus rank as having extraordinarily high mitigation potential—on the order of 85 Gt CO<sub>2</sub>-eq over the next thirty years

(Wilkinson et al. 2020). For example, total fertility rates in Ethiopia, Indonesia, and Kenya declined significantly following improvements in education for girls and young woman (Fig. S4). There is growing awareness of this potential, as evidenced by thousands of scientists calling for "the world population [to] be stabilized—and, ideally, gradually reduced—within a framework that ensures social integrity" (Ripple et al. 2020). Coincident with the stress of climate change, there are strong links between high rates of population growth and ecosystem impacts in developing countries vis-à-vis connections to water and food security and to human stability (Graves et al. 2019; Wilkinson et al. 2020).

Effective population policies can support achieving social justice in connection with climate adaptation in particular, given expected challenges around food and water security and the uneven geographical distribution of climate impacts (Dodson et al. 2020). Population policies have had surprisingly little assessment as an adaptation and mitigation strategy, despite their potential impact to ease environmental stresses, such as those on land, forests, and water, while at the same time, reducing poverty, benefiting women and girls, and improving human health (Young et al. 2009). Population policy, when designed and implemented in explicit alignment with the goal of promoting equality, becomes a powerful tool for empowering marginalized groups. Important examples of actions that promote equity while simultaneously decreasing fertility rates include: improving educational opportunities for girls and young women, which supports gender equality and reduces income inequality; ending the practice of child marriage; and increasing the availability of voluntary rights-based family planning services, which empower and improve the lives of all people, especially poor women (Bongaarts and O'Neill 2018; Wilkinson et al. 2020). In particular, voluntary family planning services have been associated with dramatic declines in fertility rates in developing countries (Dodson et al. 2020).

**Fig. 2** Proportion of the 212 Nature and Science climate change policy articles dealing with each topic. Numbers of articles are shown to the right of each bar. Notably, population policy and social justice were addressed the least commonly addressed categories. Only articles published in 1997 or later were considered

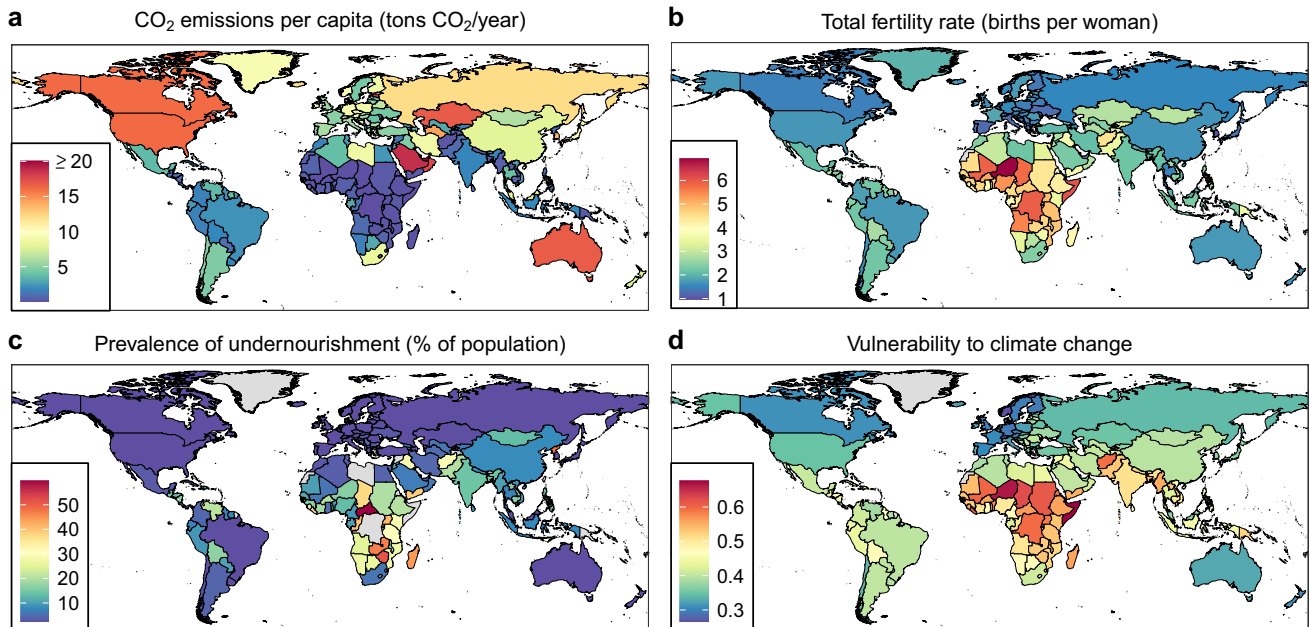


Non-governmental organizations are especially important in helping to manage population through educational programs, as well as enhancing the integrity of life-supporting ecosystems by working with communities on the ground that have their trust and have developed sincere relationships over time.

Appropriate action must occur on all levels. For example, funding can be mostly provided by developed nations, which are responsible for the bulk of historical and current (per capita) emissions (Fig. 3a). Because these policies both enhance social justice and lead to declining fertility rates, the effects will be greatest when they are implemented together. Additionally, other transformative steps toward climate mitigation, such as expediting large-scale nature protection, improving energy conservation, and increasing renewable energy capacity, must be implemented concurrently (Young et al. 2009; Ripple et al. 2020). Finally, affluent overconsumption must be addressed immediately through policies supporting degrowth (e.g., eco-taxes, cap and trade) (Wiedmann et al. 2020). It is lopsided to focus on fertility rates alone when wealthy governments, corporations, and individuals have been the primary contributors to CO<sub>2</sub> emissions and beneficiaries of fossil fuel consumption (Guillebaud 2016). In fact, the poorest 50% of the world population are currently

responsible for just 10% of global emissions (Gore 2015). However, barring a radical energy transition, this will change as poorer nations develop economically and consumption rates increase due to an expanding global middle class (Stephenson et al. 2010). This is already the case for China and India which together are now responsible for 33.4% of total global greenhouse gas emissions (Crippa et al. 2019)—a figure that includes emissions produced in the process of manufacturing goods for wealthy countries (Kanemoto et al. 2016).

Population and food security are intertwined. The observed overlap of regions with rapid population growth (Fig. 3b) and widespread malnutrition and hunger (Fig. 3c) demonstrates how rising human numbers exacerbate food insecurity. As climate conditions deteriorate with more droughts and other extreme weather events, millions of individuals will suffer and die from food shortages (Graves et al. 2019). This motivates further consideration of human diets and changing food production systems, a topic which according to our analysis has also received limited attention as a component of climate policy (Fig. 2). In particular, using productive croplands to generate animal feed is a moral and social justice issue through exhausting the world's food supply even as approximately 800 million people remain malnourished (The World Bank 2020). Globally, if a significant



**Fig. 3** Maps of per capita CO<sub>2</sub> emissions (a), total fertility rate (b), undernourishment (c), and vulnerability to climate change (d). Per capita CO<sub>2</sub> emissions data (a) come from the EDGARv5.0\_FT2018 dataset and include emissions related to fossil fuel use and industrial processes (Crippa et al. 2019). Total fertility rate estimates (b) come from the World Bank, and were developed using multiple sources including the United Nations Population Division (The World Bank

2020). Undernourishment data (c) show the proportion of the population with insufficient food intake to meet dietary energy requirements (The World Bank 2020). The vulnerability index (d) is a component of the Notre Dame-Global Adaptation Country Index that reflects exposure, sensitivity, and capacity to adapt to the negative effects of climate change (Chen et al. 2015)

portion of the land used for growing resource-inefficient animal feedstuffs were instead used to grow grains, vegetables, fruits, legumes, and nuts for direct consumption, extraordinary benefits would follow. It would facilitate the provision of needed food (Cassidy et al. 2013), enable some pastures and croplands to revert to natural areas, reduce rates of deforestation land clearing, and could sequester up to 65–92 Gt CO<sub>2</sub>-eq over the next thirty years, making it one of the top mitigation solutions (Wilkinson et al. 2020). Thus, a shift to healthy plant-rich diets coupled with declining fertility rates can dramatically reduce the incidence of under- and malnourishment while also helping to conserve biodiversity, promote human well-being, and significantly mitigate climate change (Wilkinson et al. 2020).

A related pressing intersection between population growth and social justice involves acting to prevent, in this time of compounding crises, as much human suffering, conflict, and premature death as possible. The world is on course to surpass the 1.5- to 2-degree warming that climate scientists have set as a safe boundary. Even under the best-case scenario of the international community finally addressing climate upheaval via economic and energy transitions at the needed scale, the hammering of climate-related emergencies will continue: droughts, floods, heatwaves, storms, sea-level rise, and mega wildfires (Ripple et al. 2020). These catastrophes will likely pummel and displace hundreds of millions of people. Taking proactive steps to stabilize then gradually reduce total human numbers—within a framework that itself enhances human rights—is a response that will support social justice and reduce the ordeals through migration, displacement, and conflict, expected in this century. We can single out justice for children in particular, even now experiencing the worst refugee crisis since World War II.

Social justice and the climate emergency demand that equitable population policies be prioritized in parallel with the other five steps (Ripple et al. 2020), especially given that poorer countries and people experience the worst effects of climate change, face food insecurity, and have the least ability to adapt (Levy and Patz 2015) (Fig. 3d). People in developing countries have every right to the same per capita consumption as the Earth's wealthiest countries, but this is only possible within a framework of 'contraction and convergence,' where total emissions rates are dramatically reduced (Stephenson et al. 2010). With irreversible climate tipping points and feedbacks looming that may be catastrophic, consideration of energy and economic policy alone is insufficient. We call on governments to invest in the social-justice causes of educating all girls, ending the practice of child marriage, and removing the formidable barriers in many settings (Guillebaud 2016) to women's access to voluntary rights-based family-planning, as important steps towards mitigating and adapting to the climate crisis.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s11625-021-00951-w>.

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