

The Optimal Global Population

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As the Earth's carrying capacity continues to wane under the strain of a growing population, the scientific and academic community is beginning to consider if population control is a viable solution. While the nature of this consideration is quite questionable, there are many reasons which suggest that population control is in the best interest of people. Currently, two scenarios lay ahead, that the population either peaks at 14 billion by the turn of the century, or falls to a more sustainable size of 7 billion (UN, 2022). The former scenario could mean a planet without adequate resources to provide a comfortable living to its inhabitants, which could act as fuel for conflict. In this essay, the 'why' behind population control is explored, as well as the ideal fertility rate, to ensure the prevention of climate disasters driven by excessive population ballooning.

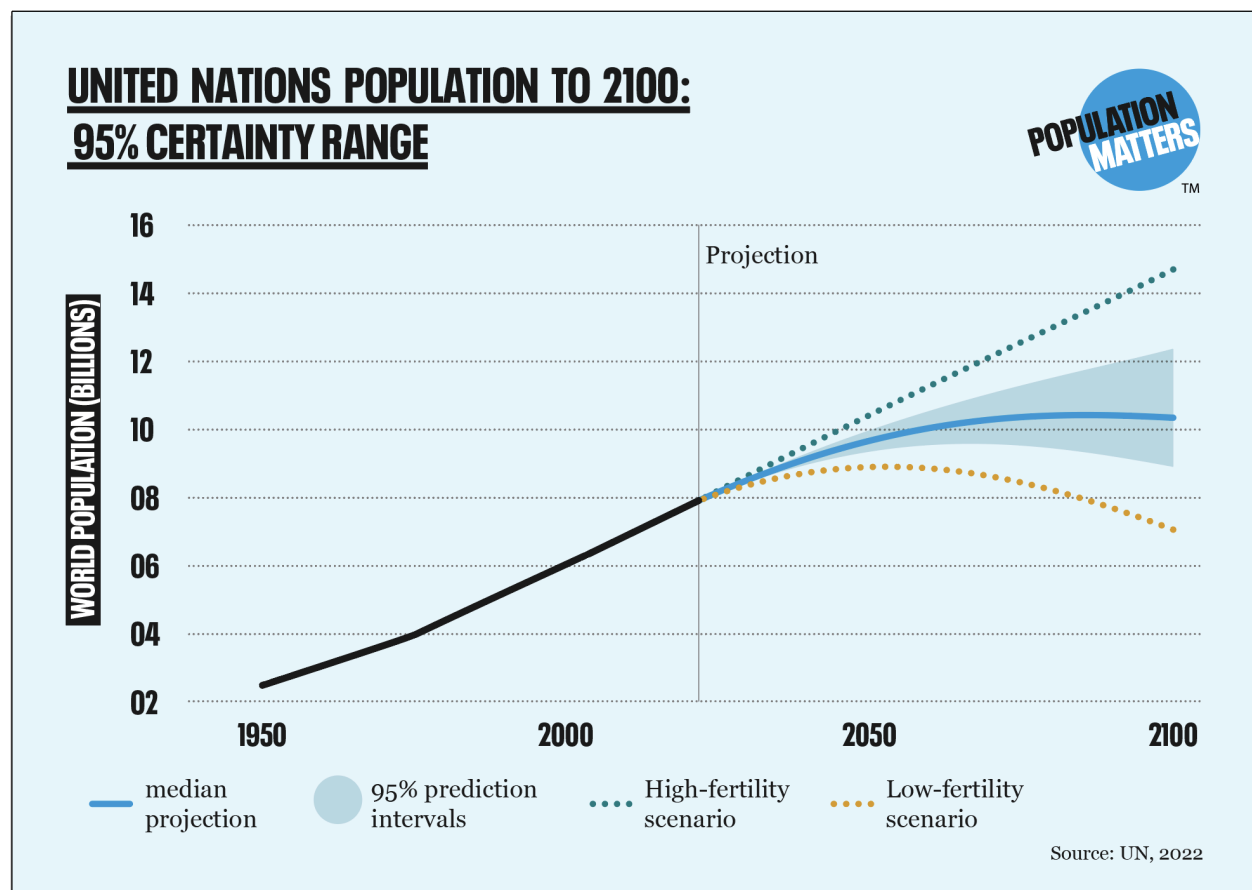


Figure 1, UN Population Projection 2022

To start with, there needs to be an understanding of why there was an excessive growth in population in the first place. The 20th century saw a rapid increase in life expectancy in all parts of the world due to

enhancements in medical technology, including regions like Africa and Asia with high fertility rates. Africa itself is a core consideration in this essay, as the two projections mentioned earlier depend on slight fluctuations in fertility rates there. Getting to the main issue, excessive population growth is growing to be a direct cause of climate change, as well as environmental degradation. Each area of land has a designated 'carrying capacity', which, if exceeded, results in its degeneration (Mortimore, 1993). An increase in population density results in an increase in the frequency of cultivation, because of which long fallow is replaced by short fallow, which limits the extent to which animals can graze the land. Considering Ethiopia, there is rapid soil degradation and a decline in land holdings because of increasing population density (Stephenson et al., n.d.). This problem is made larger when considering India, which has the largest population across the globe. In that society, the poor are more heavily dependent on natural resources than the rich, since the 'invisible hand' of the market has failed to adequately allocate resources to them, which results in the depletion of those natural resources. The idea of the 'invisible hand' is discussed in great depth by UC Santa Barbara biologist Garrett Hardin in 'The Tragedy of the Commons,' who discusses the failure of the market to fairly allocate resources held in common, such as air, water and land. This depletion of resources is perfectly mapped out by the Malthus projection (1798): it shows that, while the population increases exponentially, resources do so linearly, which results in a point at which there is scarcity. And with a lack of shift in traditional norms among families in high-fertility societies, the populations would only continue to spiral out of control, worsening living conditions for them, along with the issues already persistent owing to climate change. There seems to be a direct correlation as well between areas with high fertility rates and areas which are heavily impacted by climate change. Guy Irvin Burch and Elmer Pendell even made the bold proposition that Russia had turned to communism due to population-induced resource shortages. The stark reality, then, are regimes like the Soviet Union, which imposed harsh rationing that resulted in events like the Ukrainian Holodomor of the 1930s, which killed millions.

Building on the dwindling supply of resources, there can be a deeper examination of the Malthus Projection. The Malthusian projection portrays the population to be like a logistic curve, in which the population initially rises at a slow rate (pre-1800), then rises sharply (which we saw between the 1950s and 1980s) and then a drop (which is currently occurring) until it eventually stabilises. Moreover, a mathematical model was put forth in 1835 by Lambard Quetelet that obstacles to population growth were proportional to the square of the speed with which the population tends to increase, which supports the stabilization idea (Merchant, 2022). An extension of this is the model that the rate of population increase equals the natural tendency to increase minus the resistance to population increase, where the natural tendency is proportional to the population size, and the resistance to population increase is proportional to the square of population size. Of course, a larger population does extinguish resources, driving up the demand for scarce resources, and increasing the cost of living, which is the primary reason why societies like South Korea oversee couples choosing to have fewer children. If not for that, countries might implement a one-child policy similar to that of China. It is worth considering, however, that even though the policy was revoked by the Chinese government in 2015, couples still chose to have a maximum of one child due to high living costs. Considering the depletion of resources, the two primary considerations here are water and energy availability. Coming to water first, out of the 113,000 cubic kilometres of freshwater that falls annually, only 41,000 cubic metres is usable. Even out of that, only a fraction is available for human use, as 28,000 cubic kilometres is flood runoff. From the remaining amount, 4,000-5,000 cubic kilometres falls on uninhabited regions, so only 9,000 cubic kilometres of infiltrated

water remains for populated regions (Cohen, 1998). Considering reservoirs as well, their useful capacity is less than two-thirds of their total capacity. In Africa, an estimated 160 million people live under water scarcity conditions (Falkenmark, 1990). Adequate water supply for the population is necessary in that it brings about improved health for the population, as well as ensuring that enough water is available for industrial development as well. Moving to energy, there has been an almost 20-fold rise in world energy use since 1850, and in the US population growth accounted for 66% of it. The major issue is not fully that resources are not available, but that low-cost energy sources extracted by today's wealthy economies have been depleted, resulting in countries having to make do with smaller, more difficult and distant resources of this kind, or more abundant yet expensive resources, like coal, uranium and solar energy, all too for a growing population. This point is explored in depth later.

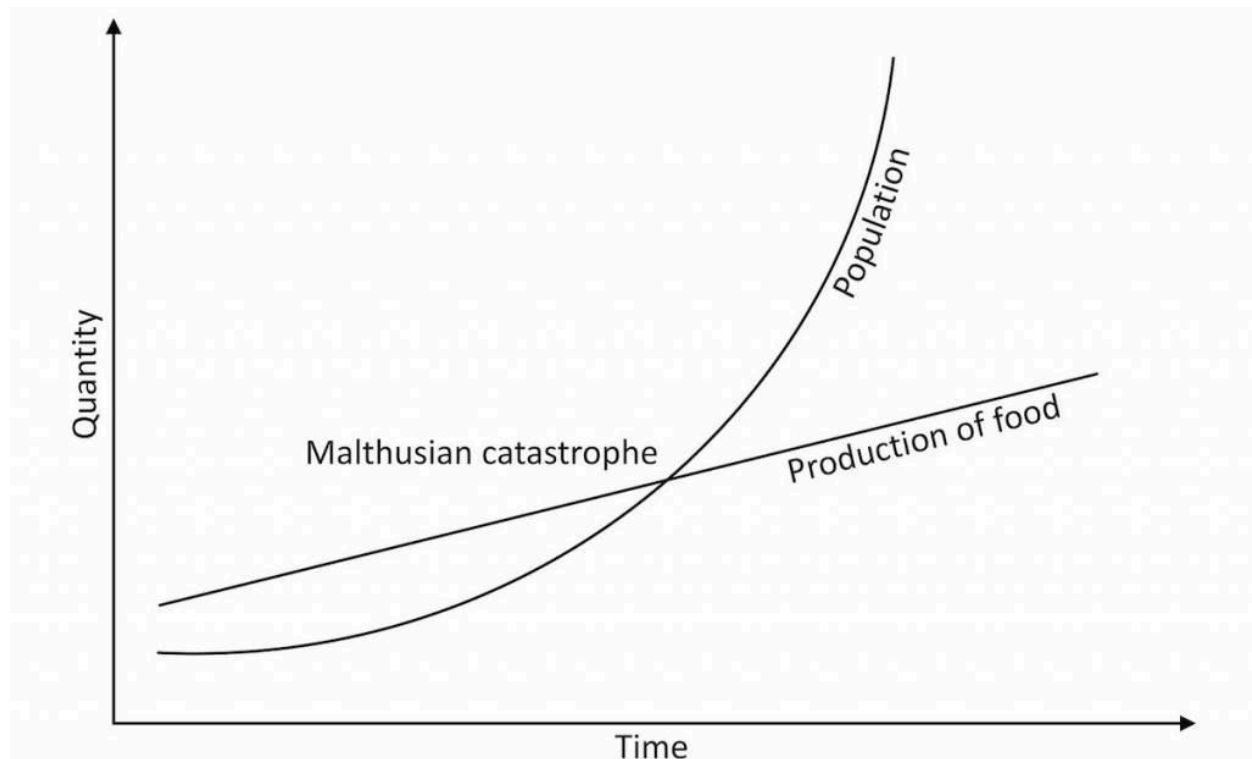


Figure 2, *Malthus Catastrophe Theory*

Additionally, there needs to be a consideration of the harsh realities in which an ever-growing population would be living. Studies show that interactions between climate and population are usually the largest cause of human exposure to extreme heat (Dodson et al., 2020). Added to this is the projected increase in hydroclimatic intensity, in which increases in the frequency of more extreme rain showers will be complemented by a decrease in the recurrence of light to moderate precipitation, resulting in an increase in 'precipitation whiplash' in certain regions (Swain et al., 2020). One side of this reality is represented by the estimation that, by 2060, between 31-35% of the world population will be exposed to a >50% probability of hydroclimatic deficit (Mankin et al., 2017). On the other hand, there are examples such as the China-Pakistan corridor, which has seen a significant rise in extreme precipitation, an example of which would be the 2022 floods in Pakistan, which resulted in the deaths of 1,739 people, and economic losses of \$15.2 billion, along with collateral damage worth \$14.8 billion (2022 *Pakistan Floods*, n.d.). This part of the world (South Asia) also represents the most densely populated region, and one

excessively impacted by climate change, despite the fact that Pakistan accounts for around 1% of carbon emissions. Figures 3 and 4 illustrate the correlation between areas with high fertility rates and with large levels of annual precipitation. Taking all these factors into account, the apt global fertility rate seems to be 1.75, as per the Gietel-Basten projections (2013), in which case the global population would settle to 8.5 billion by 2100 and then 3.2 billion by 2300.

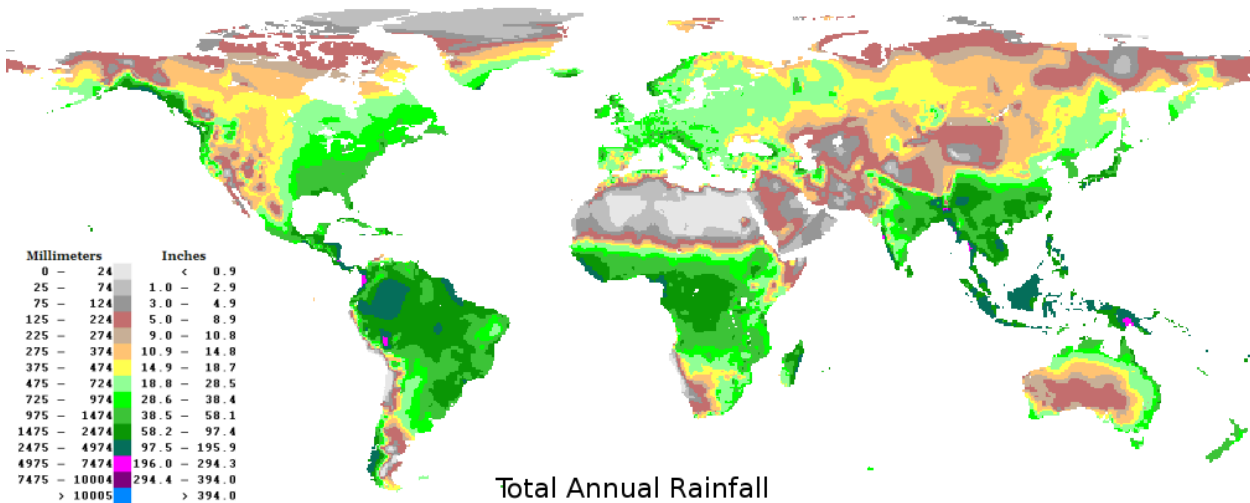


Figure 3, Global precipitation map
(The World Average Annual Precipitation, n.d.)

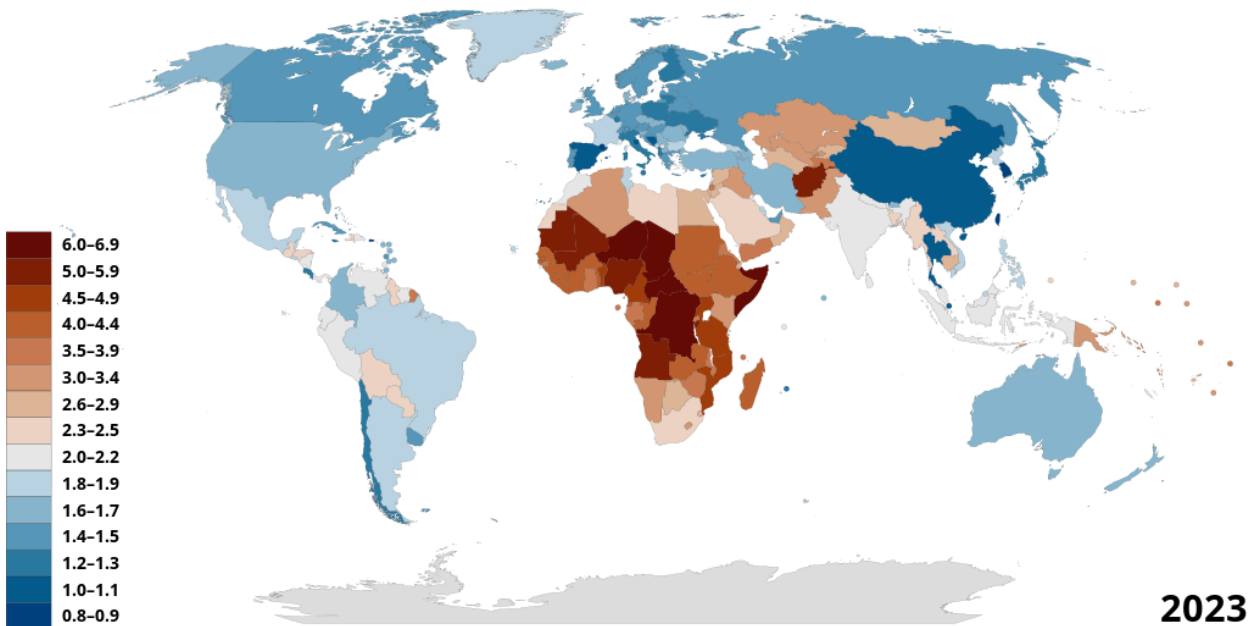


Figure 4, Global fertility map
(List of Countries by Total Fertility Rate, n.d.)

Moving forward, there is a need to establish an effective means of population management. One of the most effective ways to manage the population in developing economies is through education. This spreads awareness that resources are finite and depleting, which can encourage family planning. For this, there needs to be a focus on women. Empowering women in these societies to be able to stress to their partners, and in some cases extended family, that they want to build a family in a manageable manner can go even further than simply giving them access to contraceptive measures and reproductive health services (such as medically assisted reproduction). Focusing on Africa again, the norm to have a large family (up to an average fertility rate of 6 children in places like Niger) can be dissolved through educated women in professional roles, who have been found to prefer a smaller family size. Even education a fraction of women can shape the norms in their local areas (Kim & IZA World of Labour, 2016). But the benefits are that, as research suggests, cognitive learning experiences driven by education lengthen planning and self-control skills. Keeping women busy in jobs, which already helps improve GDP, also limits the number of children they can feasibly care for. Not only that, a study on Norway's education between 1960 and 1972 found that one extra year of schooling led to an 8% reduction in teenage pregnancy among girls. An issue is that, as shown by a study on 8 developing economies, women think of contraceptive pills as being dangerous (Grubb, 1987). Increasing awareness and acceptability of contraceptives simply through simple campaign slogans such as 'Family Planning is Safe' can help improve this (Pratsa, 2009).

To add depth to this debate, it is important to consider alternatives to focusing on population control, particularly in the context of climate change. The broad ethical issues are apparent, but something to consider is that this approach puts the pressure of managing climate change on developing countries. The countries for whom population control is not even an issue are cleared of the responsibility of taking drastic measures to resolve it, while other countries are forced to take drastic measures like population control to combat it. And, more importantly, the issue may not even be a large population. According to Barry Commoner (1971), the increase in pollution in the US since World War 2 has stemmed mostly from new production methods and rising per-capita consumption rather than from population growth. For example, the US per capita consumption was \$52,542 in 2022 (*Per Capita Expenditure in the U.S. - Statistics & Facts*, n.d.), while for Niger the household disposable income per capita was \$550 in 2024 (*Consumption Indicators - Niger*, n.d.). Moreover, as mentioned earlier, simply focusing on reducing the cost of energy source extraction can help resolve the energy crisis, which should be the responsibility of the developed world. Additionally, a greater focus on policies mandating waste reduction in parts of the world with high consumer consumption is warranted for.

To conclude, this essay highlights the main reasons to consider population management as a high-priority and correct policy for the international community. It discusses how the growing population is facing risk from climate-induced catastrophes, including flooding in densely-populated South Asia; how there is a growing in extreme hydroclimatic activity; how environmental depletion is being exaggerated by human activity, such as soil degradation in places like Africa and India; as well as the dwindling supply of energy and water for this ballooning population. It explores female education, family planning awareness and contraceptive access as the most viable solutions to population management, along with other factors to consider aside from just population control.

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