

# **THE CLIMATE CRISIS: WHY POPULATION MATTERS**

A Population Matters Briefing

# EXECUTIVE SUMMARY

1. The global human population has increased from 3.7 billion in 1970 to approximately 8 billion today. The UN's current medium projection is for a population of 9.7 billion in 2050 and 10.4 billion in 2100.
2. The significant contribution of population growth to past and future greenhouse gas emissions has been recognised by key scientific bodies, including the World Scientists' Warning of a Climate Emergency and the Intergovernmental Panel on Climate Change (IPCC). The IPCC has identified potential future high population growth as a "*key impediment*" to hitting the critical target of limiting global warming to 1.5°C above pre-industrial levels.
3. In 2022, the world-leading study of climate change solutions, Project Drawdown, concluded that empowering voluntary actions – boosting access to family planning and education – to bend population growth to the UN's medium population projection for 2050 would save about 69 gigatonnes (Gt) of emissions by 2050, making them the third most effective solution in limiting warming to 2°C, and the seventh most effective in limiting warming to 1.5°C, by 2100.
4. The essential requirements for decent human living, including food, energy, housing and infrastructure, are all needs that cannot at present be supplied without producing greenhouse gas emissions. Human population growth acts as a driver and multiplier of these requirements and the resulting emissions.
5. Population growth adversely affects the Earth's ability to withstand climate change by driving the destruction of carbon sinks, particularly forests, to make way for agriculture and infrastructure.
6. Climate change has historically been, and continues to be primarily driven by the wealthiest through their consumption patterns. Due to high *per capita* emissions in the Global North, choosing a smaller family is an essential consideration for people of reproductive age in high-income countries to limit their emissions.
7. The gap between the emissions of the Global North and the Global South is narrowing. As people move out of poverty, their consumption increases and their carbon footprints expand. The current growth in consumption is greatest in countries where population growth has until recently been amongst the highest: India, China and South East Asian countries. Between 1990 and 2019, more than 80% of the global increase in CO<sub>2</sub> emissions was confined to only four countries – China, India, Iran and Indonesia – which together accounted for almost 41% of the world population in 2019.
8. The climate crisis is already severely impacting the countries and regions that are projected to see the highest rates of population growth. This population explosion will exacerbate the negative effects of climate change, including drought, economic hardship and conflict.
9. Empowering solutions that address population growth – the provision of voluntary, modern family planning and access to good quality education – benefit people and the planet. Women and girls are able to make choices about their bodies and their lives, helping them and their communities to escape poverty, and to adapt to and build resilience against climate change impacts. That essential, long-term climate mitigation benefits also arise reinforces the importance of achieving them.



# INTRODUCTION

As part of the 2015 Paris Agreement, every nation on the planet pledged to limit global warming in this century to below 2°C (3.6°F), and ideally to 1.5°C (2.7°F) above pre-industrial levels.<sup>1</sup> In 2018, the Intergovernmental Panel on Climate Change (IPCC) found that limiting global warming to 1.5°C will require rapid and far reaching transitions in land, energy, industry, buildings, transport and cities, with global net human-caused emissions of carbon dioxide (CO<sub>2</sub>) falling by about 45% from 2010 levels by 2030, and reaching net zero around 2050<sup>2</sup> – net zero being the point at which a balance is achieved between the amount of human-caused CO<sub>2</sub> emissions produced and the amount removed from the atmosphere.

The UN Climate Change Conference of the Parties, known as COP26, in Glasgow in November 2021 brought together all nations to accelerate action towards the goals of the Paris Agreement. While progress was made, much more needs to be done to “keep 1.5 alive”.

Whilst governments all over the world have launched plans to tackle climate change, one driver is all too often absent from policy discussions and frameworks, and was again at COP26 – the rapid and ongoing growth of the human population. Although the immediate climate change priority is the urgent implementation of solutions which will have the greatest impact over the coming years to 2030, slowing and ending population growth through ethical, globally beneficial means will help to reduce emissions, protect carbon sinks and maximise the effectiveness of all the other solutions. Addressing population is therefore not a substitute for other climate mitigation actions – it is an essential complement and accelerant to them.



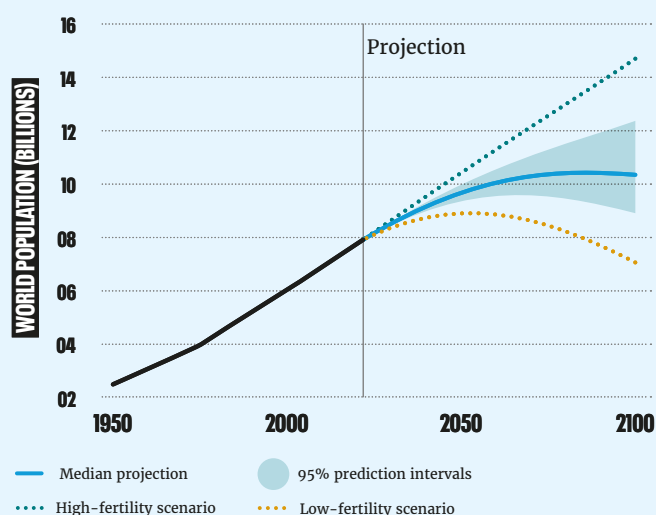
# POPULATION PROSPECTS

The global human population has increased from 3.7 billion in 1970 to approximately 8 billion today. The UN currently projects that it will continue to increase throughout this century, with a 50% chance of a peak at 10.43 billion in 2086. Its medium projection is for a population of 9.7 billion in 2050, and 10.4 billion in 2100 (with a 95% certainty range of 8.9 – 12.4 billion).<sup>3</sup>

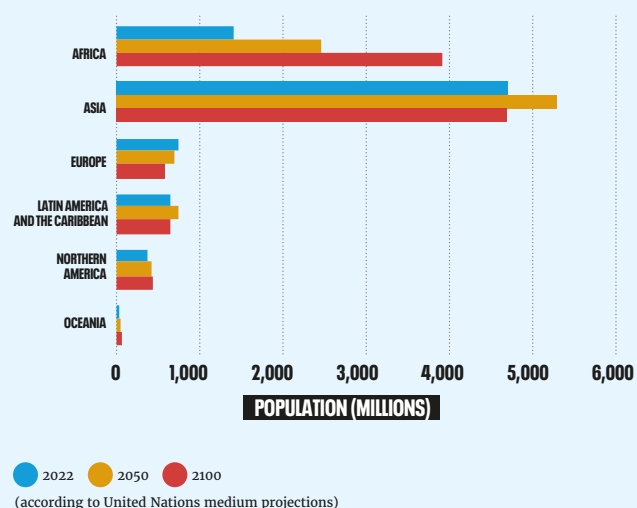
While population growth is highest in the Global South, and relatively low in most parts of the Global North, consumption, resource use and carbon emissions are far greater in the richest parts of the world. This means that the global impact on the climate of each individual in high-income countries is far higher than that of each individual in low- to middle-income countries. The size of the overall population in the Global North therefore matters, too.



## UNITED NATIONS POPULATION PROJECTIONS TO 2100: 95% CERTAINTY RANGE



## POPULATION GROWTH BY CONTINENT, 2022-2100



# POPULATION GROWTH AND CLIMATE CHANGE

## The science

Authoritative scientific reports and studies in recent years have directly acknowledged the role of population growth in fuelling climate change. A 2018 Special Report on global warming by the Intergovernmental Panel on Climate Change (IPCC) identified potential future high population growth as a “key impediment” to hitting the critical target of limiting global warming to 1.5°C above pre-industrial levels<sup>4</sup>, while its most optimistic pathway modelled a population of 7 billion by 2100 – far below the current UN projection. This was followed by the IPCC’s 2022 report on climate change mitigation, which stated that “globally, GDP per capita and population growth remained the strongest drivers of CO<sub>2</sub> emissions from fossil fuel combustion in the last decade”<sup>5</sup>.

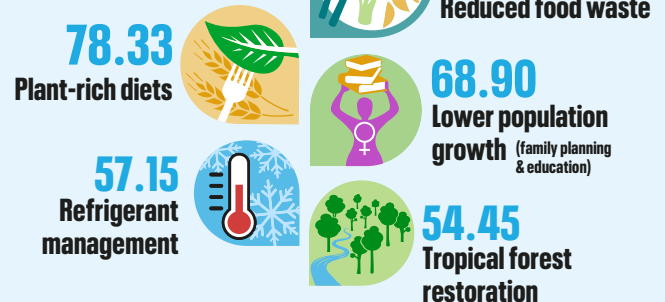
2017 research, which looked at different socio-economic pathways and their energy, land use, and greenhouse gas emissions implications, found that if global population growth meets or exceeds the UN’s medium projection (10.9 billion people by 2100), avoiding more than 2°C of warming would become impossible.<sup>6</sup>

The 2019 *World Scientists’ Warning of a Climate Emergency*, signed at the time of publication by more than 11,000 scientists from 153 countries, cited population growth as one of the key drivers of climate change, and its six policy solutions included a call for global population to “be stabilized – and, ideally, gradually reduced – within a framework that ensures social integrity”<sup>7</sup>. This call was reiterated in the 2021 *Warning*, by then signed by over 14,000 scientists, which also stated that “stabilizing and gradually reducing the population [...] is imperative given the intensifying urgency of the climate crisis.”<sup>8</sup>

In 2020, the value of population action to address climate change was quantified by the world-leading study of climate change solutions, Project Drawdown. It stated that “as we consider the future of climate solutions, it matters how many people

will be eating, moving, plugging in, building, buying, using, wasting, and all the rest. Population interacts with the primary drivers of emissions: production and consumption, largely fossil-fuelled.”<sup>9</sup> In 2022, Drawdown analysed 93 available practical policy options for minimising CO<sub>2</sub> emissions, ranging from plant-based diets to refrigerant management. It concluded that empowering voluntary actions to bend population growth to the UN’s medium population projection for 2050 would save 68.9 gigatonnes (Gt) of emissions by 2050, making them the third most effective solution in limiting warming to 2°C, and the seventh most effective in limiting warming to 1.5°C, by 2100. This makes these ethical population actions a more effective climate solution in the 2°C scenario than each of the technological solutions, including electric cars, onshore and offshore wind turbines, and solar and nuclear power.<sup>10</sup>

## Top 5 solutions to climate change



Source: Project Drawdown, 2022

## Population vs other solutions

Population growth can and does reduce the efficacy of other climate change solutions. A 2020 peer-reviewed article found that globally, from 1990 – 2019, more than 80% of the decrease in energy use resulting from the reduction in the energy intensity of GDP was offset by the increase in population; and over 77% of the reduction in CO<sub>2</sub> emissions resulting from the decrease in the energy intensity of GDP and the decrease in the carbon intensity of energy use was offset by the increase in population.<sup>11</sup>

\*Gigatonnes CO<sub>2</sub> equivalent reduced/sequestered (2020–2050), in line with 2°C temperature rise by 2100



# DRIVERS OF CLIMATE CHANGE

The link between population and climate change is self-evident – each additional person on the planet adds their own carbon footprint. The essential requirements for decent human living, including food, energy, housing and infrastructure, are all needs that cannot at present be supplied without producing greenhouse gas emissions. Human population growth therefore acts as a driver and multiplier of these greenhouse gas-producing requirements.

## Food demand

Modern food systems are the number one driver of climate change. In 2015, food system emissions amounted to 18Gt (gigatonnes) CO<sub>2</sub> equivalent per year globally, representing 34% of total greenhouse gas emissions. The largest contribution (71%) came from agriculture and land use/land-use change.<sup>12</sup>

A 2018 report by the World Resources Institute concluded that 56% more food would be needed in 2050 than was available in 2010, with population growth driving the majority of demand.<sup>13</sup> The landmark 2019 EAT–Lancet Commission on feeding the world sustainably concluded that, with radical changes to food production and consumption, providing enough food for everyone is possible.<sup>14</sup> However, critically, it also concluded that even these profound changes are unlikely to make it possible to feed everyone in just a generation or two from now if current population projections come true: *“Global population is expected to exceed 11 billion people by 2100 unless actions are taken to stabilise population growth. Healthy diets from sustainable food systems are possible for up to 10 billion people but become increasingly unlikely past this population threshold.”*<sup>15</sup>

## Energy demand

Most energy-related emissions come from energy use in industry (particularly through manufacturing and oil and gas extraction), in buildings (through electricity generation for lighting, appliances, cooking and heating), and

from transport.<sup>16</sup> If current policy and technology trends continue as they are today, energy-related CO<sub>2</sub> emissions will increase as a result of population and economic growth.<sup>17</sup> By 2050, global energy use will increase by nearly 50% compared with 2020, mostly a result of non-OECD economic and population growth, particularly in Asia.<sup>18</sup>

## Population and climate buffers

In addition to its contribution to driving up emissions, population growth also adversely affects the Earth’s ability to withstand climate change by driving the destruction of carbon sinks, which absorb and store greenhouse gases. For example, due to the ability of trees to absorb CO<sub>2</sub>, forest conservation and restoration have been identified as critical in meeting climate targets; but ever more people means ever less nature.



Deforestation and forest degradation continue to take place at alarming rates, with the area of primary forest worldwide having decreased by over 80 million hectares (Mha) since 1990.<sup>19</sup> From 2001 to 2020, there was a total of 411Mha of tree cover loss globally, equivalent to a 10% decrease in tree cover since 2000 and 165Gt of CO<sub>2</sub> emissions.<sup>20</sup> While the construction of infrastructure and the expansion of urban areas contribute significantly to deforestation and forest degradation, and the associated loss of forest biodiversity, agricultural expansion continues to be the main driver<sup>21</sup>, in turn driven by the need to feed ever more people.

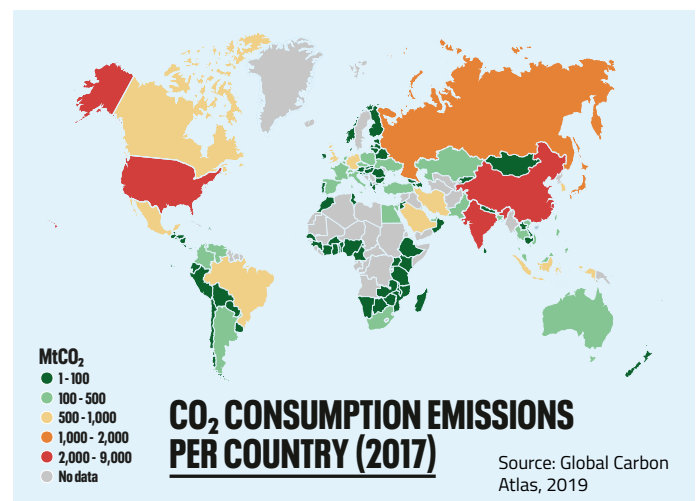
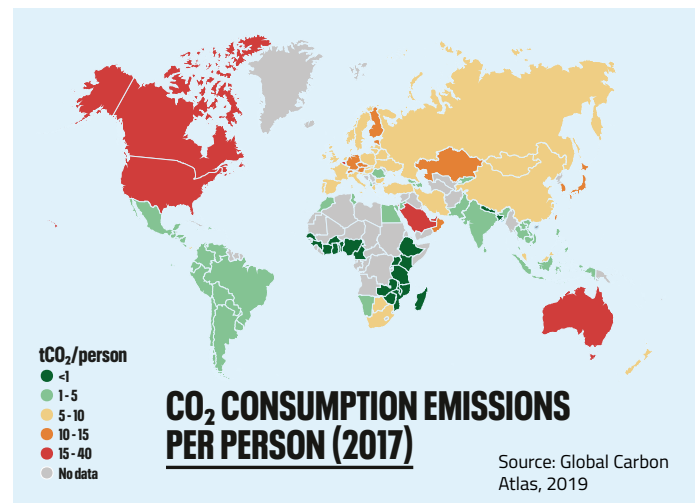
# POPULATION AND CONSUMPTION: THE SPECIAL RELATIONSHIP

## Consumption in the Global North

Climate change has historically been, and continues to be primarily driven by the wealthiest. In 2019, the average Briton was responsible for producing 38.5 times more CO<sub>2</sub> emissions than the average person in Malawi – 7.7 tonnes CO<sub>2</sub> (tCO<sub>2</sub>) vs 0.2tCO<sub>2</sub><sup>22</sup>; and from 1990 – 2015, the richest 5% of the global population (about 315 million people) were responsible for over a third (37%) of the total growth in CO<sub>2</sub> emissions, while the total growth in CO<sub>2</sub> emissions of the richest 1% (about 63 million people) was three times that of the poorest 50% (about 3.1 billion people).<sup>23</sup>

Household consumption is a major contributor to greenhouse gas emissions, and the United Nations Environment Programme's (UNEP) *Emissions Gap Report 2020* identified a key role for personal lifestyle choices in tackling climate change.<sup>24</sup> Due to high *per capita* emissions in the Global North, choosing smaller families is an effective individual action.

Research conducted in 2017 comparing individual behaviour changes, such as dietary change or driving electric cars, suggested that the single most effective measure an individual in the developed world could take to cut their carbon emissions over the long term would be to have one fewer child.<sup>25</sup> The study relied on estimates of future *per capita* climate emissions, which are likely to change significantly, so its emissions savings figures must be treated with caution. It illustrates, however, how other individual climate actions – all of which remain effective and positive – lack the impact of limiting the number of new consumers, each with their own lifetime of emissions production. For people of reproductive age in high-income countries, choosing a smaller family is therefore an essential consideration for limiting their emissions.



## Growing consumption in the Global South

However, the gap between the emissions of the Global North and the Global South is narrowing. As people move out of poverty, as is their right, their consumption increases and their carbon footprints expand, while land and forests are cleared for agriculture, housing and infrastructure, and pollution and waste increases. From 2000 – 2013, the emissions of developing countries increased by 43.2%, largely attributable to increased industrialisation and enhanced economic output.<sup>26</sup> For example, Nigeria was the world's seventeenth biggest emitter of greenhouse gases in 2015<sup>27</sup>, and its greenhouse gas emissions from fossil fuel production and use increased by 16% from

2015 – 2020.<sup>28</sup> During that period, its population increased by 13.8% from about 181 million to 206 million<sup>29</sup>, and is projected to grow to just over 400 million by 2050.<sup>30</sup> Indeed, the current growth in consumption is greatest in countries where population growth has until recently been amongst the highest: India, China and South East Asian countries. In fact, between 1990 and 2019, more than 80% of the global increase in CO<sub>2</sub> emissions was confined to only four countries – China, India, Iran and Indonesia – which together accounted for almost 41% of the world population in 2019.<sup>31</sup>

The increase in emissions is also attributable to the growth in affluence of these countries and the rising number of higher-level consumers. In line with rising affluence, resource use *per capita* was projected by the United Nations in 2017 to be 71% higher by 2050.<sup>32</sup> According to Oxfam's 2020 report on carbon inequality, people earning between \$6,000 and \$38,000, making up 40% of humanity in the global middle class (about 2.5 billion people), accounted for almost half (49%) of the total CO<sub>2</sub> emissions growth between 1990 and 2015, and 41% of cumulative emissions.<sup>33</sup> While it is crucial not to forget the impact of the richest (the top 10% of people earning over \$38,000 – about 630 million people – accounted for 46% of the total CO<sub>2</sub> emissions growth and 52% of cumulative emissions in that 25-year period<sup>34</sup>), the impact of the growth of the global middle class is also a critical factor in future emissions growth.

A 2020 peer-reviewed article found that, globally, growth in economic activity per person is the primary driver of energy use and carbon emissions, but that population growth has accounted for a third of emissions over the past 29 years<sup>35</sup>; whilst the UNEP's *Emissions Gap Report 2020* noted that the target global average *per capita* emissions of 2.1tCO<sub>2</sub> would see *per capita* emissions triple for the poorest half of humanity.<sup>36</sup> Most of the extra two billion people projected by 2050 will be born into that half.<sup>37</sup> Everybody on the planet has the right to a good quality of life; the emissions of low-income countries and the number of people who live there are therefore only unimportant if people who live in poverty remain in poverty.

A 2016 study modelled two scenarios and concluded that an immediate and rapid expansion of global renewable energy production, from just 9% in 2014 to 50% by 2028, is required to keep global warming to under 2°C, end energy poverty in the Global South, and meet the demands of both growing population and consumption levels. The authors reported that “*finding a beneficial solution to the interrelated problems of population growth, energy poverty, energy scarcity, and global warming is one of the great challenges of the 21st century.*”<sup>38</sup>

## Consumption, population and climate vulnerability

Despite growing consumption levels in the Global South, it is historic and unsustainable consumption in the Global North that has led the world to the brink of climate catastrophe. Yet it is countries in the Global South that are currently experiencing the worst effects of climate change. The climate crisis is already severely impacting the countries and regions that are projected to see the highest rates of population growth. A 2021 report by the Atlantic Council warned that the Western Sahel is on track for a population explosion that will exacerbate the negative effects of climate change, including drought, economic hardship and conflict.<sup>39</sup>

This and other studies<sup>40</sup> highlight the continuing dismal status of women and girls as the main reason for the region's very high fertility rates. Child and forced marriage, polygamy and violence against women and girls remain common due to patriarchal attitudes and poor enforcement of existing laws. A 2020 report by the International Union for Conservation of Nature (IUCN) also found that, as a result of gender inequality, women and girls are worst affected by climate change impacts, while climate impacts further exacerbate gender-based violence and injustice, creating a vicious cycle.<sup>41</sup> In 2018, more than half of the 41 million people displaced by climate change were women and girls.<sup>42</sup>



# EMPOWERING SOLUTIONS

## Positive population action

Significant results from any action intended to slow global population growth will take at least a generation to manifest, but will have permanent and irreversibly positive effects throughout this century and beyond. Action to ensure future population growth does not drive climate change, or endanger climate change mitigation achieved through other means, is therefore essential now.

This action is positive, voluntary, in line with people's aspirations, and consistent with global demographic trends. Coercive and reprehensible "population control" methods are as unnecessary as they are unacceptable. For example, Bangladesh reduced its fertility rate from above 7 in the early 1970s to 2.2 in 2014 through a creative and ethical family planning programme.<sup>43</sup> Fertility rates are declining almost everywhere, but more can and must be done. The UN projects about a 50% chance of global population peaking by the end of the century<sup>44</sup>, while an estimated 270 million women of reproductive age worldwide are still in need of but without modern contraception.<sup>45</sup> This is an increase of 40 million since 1990, due to the provision of services failing to match population growth. More must therefore be done to plug this shortfall through greater funding and political will.

Mechanisms to secure lower fertility and sustainable populations through voluntary means are positive and effective. Most are already explicitly featured in the Sustainable Development Goals:

- End poverty and reduce inequality – **SDGs 1 and 10**
- Provide universal access to high quality education – **SDG 4**
- Women's empowerment – **SDG 5**
- Access to and uptake of modern family planning – **SDGs 3 and 5**

The provision of equal and unhindered access to modern family planning and good quality education, which empowers women and girls to make choices about their bodies and their lives, as well as helping to lift families and entire communities out of poverty, benefits everyone, everywhere.

In addition, these ethical actions also play a vital role in equipping women and girls, and in turn their communities, to adapt to and build resilience against inevitable climate impacts.<sup>46,47</sup> That essential, long-term climate change mitigation benefits also arise reinforces the central importance of redoubling our efforts to achieve them.



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"When girls are educated and when they stay in schools, they get married later in their lives, then they have less children and that helps us to reduce the impacts of climate change that the population increase brings."

Malala Yousafzai

## Smaller families

In addition to the four structural changes in the Sustainable Development Goals outlined on page 9, a final component of slowing population growth is encouraging the choice to have smaller families. This is particularly important in high-income countries which have largely met the four goals

(although significant inequality may still exist within them), and which currently have relatively low fertility levels. These countries are also those with the highest *per capita* carbon footprint.



## CONCLUSION

The planet and humanity are under threat from human-induced climate change, and will face increasingly deadly consequences unless we take consistent and united action now on multiple fronts. Our future survival depends on it. In order to tackle the drivers of the climate crisis effectively on a global scale, we must not ignore the issue of human population growth.

A more just global system, in which resources are distributed more equitably, is essential. In order to ensure that there is enough to meet everyone's right to a decent standard of living, the richest must do their part by choosing smaller families and consuming more sustainably. However, it is ethically irresponsible, and in direct contradiction

of the UN Sustainable Development Goal 1: No Poverty, to expect that the climate crisis can be solved by providing solutions only to the carbon-heavy lifestyles of the rich, whilst allowing many to remain trapped in poverty, and avoiding the issue of a rapidly rising global human population.

Fortunately, solutions are at hand, and are extremely effective. By addressing population growth through positive, ethical and choice-based means, we give ourselves the opportunity to enhance the quality of people's lives and maximise the effectiveness of all the solutions to the climate crisis that must be implemented. It is a win-win solution for people and for the planet.

# REFERENCES

- 1 United Nations (2015) *The Paris Agreement*, [https://unfccc.int/sites/default/files/english\\_paris\\_agreement.pdf](https://unfccc.int/sites/default/files/english_paris_agreement.pdf)
- 2 The Intergovernmental Panel on Climate Change (2018) *Special Report: Global Warming of 1.5°C*, <https://www.ipcc.ch/sr15/>
- 3 United Nations Population Division (2022) *World Population Prospects 2022: Summary of Results*, [https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022\\_summary\\_of\\_results.pdf](https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022_summary_of_results.pdf)
- 4 The Intergovernmental Panel on Climate Change (2018) *Special Report: Global Warming of 1.5 °C*, <https://www.ipcc.ch/sr15/>
- 5 The Intergovernmental Panel on Climate Change (2022) *AR6 Climate Change 2022: Mitigation of Climate Change*, [https://report.ipcc.ch/ar6wg3/pdf/IPCC\\_AR6\\_WGIII\\_FinalDraft\\_FullReport.pdf](https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_FullReport.pdf)
- 6 Riahi, K. *et al.* (2017) *The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview*, ScienceDirect, <https://www.sciencedirect.com/science/article/pii/S0959378016300681>
- 7 Ripple, W.J. *et al.* (2020) *World Scientists' Warning of a Climate Emergency*, BioScience <https://academic.oup.com/bioscience/article/70/1/8/5610806>
- 8 Ripple, W.J. *et al.* (2021) *World Scientists' Warning of a Climate Emergency*, BioScience, <https://academic.oup.com/bioscience/advance-article/doi/10.1093/biosci/biab079/6325731>
- 9 Project Drawdown (2020) *Sector Summary: Health and Education*, <https://drawdown.org/sectors/health-and-education>
- 10 Project Drawdown (2022), *Table of Solutions*, <https://drawdown.org/solutions/table-of-solutions>
- 11 Chaurasia, A.R. (2020) *Population effects of increase in world energy use and CO<sub>2</sub> emissions: 1990-2019*, The Journal of Population and Sustainability, [https://jpopus.org/full\\_articles/population-effects-of-increase-in-world-energy-use-and-co2-emissions-1990-2019/](https://jpopus.org/full_articles/population-effects-of-increase-in-world-energy-use-and-co2-emissions-1990-2019/)
- 12 Crippa, M. *et al.* (2021) *Food systems are responsible for a third of global anthropogenic GHG emissions*, Nature, <https://www.nature.com/articles/s43016-021-00225-9>
- 13 World Resources Institute (2018) *Creating a sustainable food future: A Menu of Solutions to Feed Nearly 10 Billion People by 2050*, <https://www.wri.org/publication/creating-sustainable-food-future>
- 14 Willett, W., MD *et al.* (2019) *Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems*, The Lancet, [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)31788-4/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)31788-4/fulltext)
- 15 *ibid*
- 16 Our World in Data (2020) *Sector by sector: where do global greenhouse gas emissions come from?*, <https://ourworldindata.org/ghg-emissions-by-sector>
- 17 U.S. Energy Information Administration (2021) *International Energy Outlook 2021*, <https://www.eia.gov/outlooks/ieo/>
- 18 *ibid*
- 19 Food and Agricultural Organization of the United Nations (2020) *The State of the World's Forests 2020*, <https://www.fao.org/state-of-forests/en/>
- 20 Global Forest Watch (2020), <https://www.globalforestwatch.org/dashboards/global/>
- 21 Food and Agricultural Organization of the United Nations (2020) *The State of the World's Forests 2020*, <https://www.fao.org/state-of-forests/en/>
- 22 Global Carbon Atlas, <http://www.globalcarbonatlas.org/en/CO2-emissions>
- 23 Oxfam International (2020) *Confronting Carbon Inequality: Putting climate justice at the heart of the COVID-19 recovery*, <https://www.oxfam.org/en/research/confronting-carbon-inequality>
- 24 United Nations Environment Programme (2020) *Emissions Gap Report 2020*, <https://www.unep.org/emissions-gap-report-2020>
- 25 Wynnes, S. & Nicholas, K.A. (2017) *The climate mitigation gap: education and government recommendations miss the most effective individual actions*, Environmental Research Letters (Vol.12, No.7), IOPscience, <https://iopscience.iop.org/article/10.1088/1748-9326/aa7541>
- 26 United Nations Statistics Division (2019) *The Sustainable Development Goals Report 2019*, <https://unstats.un.org/sdgs/report/2020/goal-13/>
- 27 Carbon Brief (2020) *The Carbon Brief Profile: Nigeria*, <https://www.carbonbrief.org/the-carbon-brief-profile-nigeria>
- 28 *ibid*
- 29 Statista (2021), *Population of Nigeria in selected years between 1950 and 2021*, <https://www.statista.com/statistics/1122838/population-of-nigeria/>
- 30 Statista (2021) *Forecasted population in Nigeria in selected years between 2025 and 2050*, <https://www.statista.com/statistics/1122955/forecasted-population-in-nigeria/>
- 31 Chaurasia, A.R. (2020) *Population effects of increase in world energy use and CO<sub>2</sub> emissions: 1990-2019*, The Journal of Population and Sustainability, [https://jpopus.org/full\\_articles/population-effects-of-increase-in-world-energy-use-and-co2-emissions-1990-2019/](https://jpopus.org/full_articles/population-effects-of-increase-in-world-energy-use-and-co2-emissions-1990-2019/)
- 32 United Nations Environment Programme International Resource Panel (2017) *Assessing Global Resource Use: A systems approach to resource efficiency and pollution reduction*, <https://www.resourcepanel.org/reports/assessing-global-resource-use>
- 33 Oxfam International (2020) *Confronting Carbon Inequality: Putting climate justice at the heart of the COVID-19 recovery*, <https://www.oxfam.org/en/research/confronting-carbon-inequality>
- 34 *ibid*
- 35 Chaurasia, A.R. (2020) *Population effects of increase in world energy use and CO<sub>2</sub> emissions: 1990-2019*, The Journal of Population and Sustainability, [https://jpopus.org/full\\_articles/population-effects-of-increase-in-world-energy-use-and-co2-emissions-1990-2019/](https://jpopus.org/full_articles/population-effects-of-increase-in-world-energy-use-and-co2-emissions-1990-2019/)
- 36 United Nations Environment Programme (2020) *Emissions Gap Report 2020*, <https://www.unep.org/emissions-gap-report-2020>
- 37 United Nations Population Division (2019) *World Population Prospects 2019: Highlights*, [https://population.un.org/wpp/Publications/Files/WPP2019\\_10KeyFindings.pdf](https://population.un.org/wpp/Publications/Files/WPP2019_10KeyFindings.pdf)
- 38 Jones, G.A. & Warner, K.J. (2016) *The 21st century population-energy-climate nexus*, ScienceDirect, <https://www.sciencedirect.com/science/article/abs/pii/S0301421516300830>
- 39 Atlantic Council (2021) *What future for the Western Sahel?* <https://www.atlanticcouncil.org/in-depth-research-reports/report/what-future-for-the-western-sahel/>
- 40 Graves, A. *et al.* (2019) *Avert catastrophe now in Africa's Sahel*, Nature, <https://www.nature.com/articles/d41586-019-03445-z>
- 41 IUCN (2020) *Gender-based violence and environment linkages*, <https://portals.iucn.org/library/node/48969>
- 42 CARE International (2020) *Evicted by Climate Change: Confronting the Gendered Impacts of Climate-Induced Displacement – Executive summary for policymakers*, <https://careclimatechange.org/wp-content/uploads/2020/07/CARE-Executive-Summary-Policymakers-v0.3.pdf>
- 43 Rizvi, N. (2014) *Spectacular achievement*, article published on Development and Cooperation website, <https://www.dandc.eu/en/article/successful-family-planning-bangladesh-holistic-approach-leads-lower-fertility-rates-rates>
- 44 United Nations Population Division (2022) *World Population Prospects 2022: Summary of Results*, [https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022\\_summary\\_of\\_results.pdf](https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022_summary_of_results.pdf)
- 45 Kantorová, V. *et al.* (2020) *Estimating progress towards meeting women's contraceptive needs in 185 countries: A Bayesian hierarchical modelling study*, PLoS Medicine, <https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1003026>
- 46 Andrijevic, M., Crespo Cuaresma, J., Lissner, T. *et al.* (2020) *Overcoming gender inequality for climate resilient development*, Nature Communications 11, 6261. <https://doi.org/10.1038/s41467-020-19856-w>
- 47 Project Drawdown (2021) *Girls' Education and Family Planning: Essential Components of Climate Adaptation and Resilience*, <https://www.drawdown.org/publications/drawdown-lift-policy-brief-girls-education-and-family-planning>



# ABOUT POPULATION MATTERS

Population Matters is a UK-based charity which campaigns to achieve a sustainable human population, to protect the natural world and improve people's lives. We promote positive, practical, ethical solutions – encouraging smaller families, inspiring people to consume sustainably,

and helping us all to live within our planet's natural limits. We believe everyone should have the freedom and ability to choose a smaller family. We support human rights, women's empowerment and global justice.



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