Is overpopulation misinterpreted by the media and global opinion?

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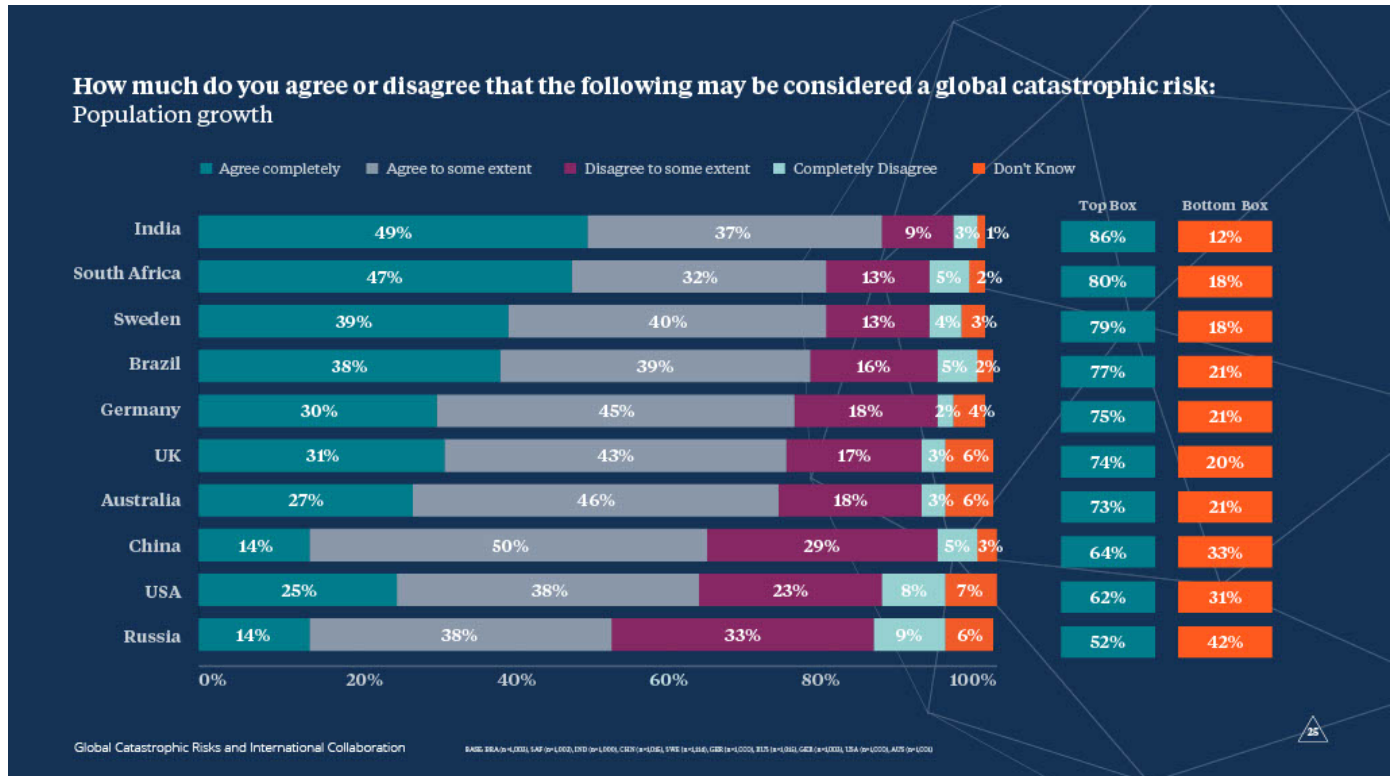
Data Science & Analytics

Data Visualisation and Dashboarding

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The Problem

In recent years, the global population has been a topic of discussion and controversy. Many people believe that overpopulation is one of the biggest threats to humanity and our planet, and that we must find ways to reduce the population in order to save the environment and ensure a sustainable future.

Examples

How much do you agree or disagree that the following may be considered a global catastrophic risk: Population growth

Survey responses regarding whether population growth is a global catastrophic risk. "Top box" to the right shows the percentage who answered "Agree completely" or "Agree to some extent," while "Bottom box" shows the percentage who answered "Disagree to some extent" or "Completely disagree". Source: Global Challenges Foundation, Global Catastrophic Risks and International Collaboration: Opinion Poll 2020. (https://globalchallenges.org/wp-content/uploads/GCF_Global_Challenges_2020-High.pdf)

> "The population of the world is growing at a fast rate, and it is expected to reach 10 billion by 2050. This is a big problem, because the resources of the world are limited, and the more people there are, the less resources there are for each person. This is why it is important to understand the population growth and the factors that affect it."

This was written by an AI - Copilot by GitHub, after simply writing "Population Projections" and clicking return key in a code editor.

Goal

However, this paper aims to shed light on the fact that population growth is not as much of a threat as it is often portrayed to be. Instead, we should focus on addressing other pressing issues such as climate change, poverty, and undernourishment.

In this report, we will analyze global population data and trends, as well as fertility rates and life expectancy, using R and R Markdown. Furthermore, we will evaluate the chosen technology and charting methods to ensure a comprehensive understanding of the topic at hand.

Data Preparation

World Bank data

An initial exploratory analysis was conducted after preparing the data, which was mostly clean with some missing values for years before 1992. The data contained some regions and groups of countries, which were removed by filtering out rows with an empty string as the Region, indicating they were regions themselves. This data was separated in a metadata file and then inner joined with the population growth data on the Country.Code column, resulting in only country-level data.

The country-level data was reshaped to a long format with each row representing a country and year. The population growth rate was calculated by multiplying the population by the growth rate and summing the results. Finally, the worldwide population growth rate was obtained by dividing the sum of the weighted growth rates by the sum of the population. The already calculated worldwide population growth rate was also saved in a separate dataset for comparison purposes.

The libraries - `scales`, `dplyr`, `gridExtra` and `tidyverse` were used to prepare the data. The `scales` library was used to format the numbers in the plots, `dplyr` was used to reshape the data, `gridExtra` was used to arrange the plots in a grid and `tidyverse` was used to filter out the regions and groups of countries.

Since the datasets from the World Bank data are in the same format, most of the analysis was abstracted away into a function that will be used further in the paper to prepare, clean and format the data for visualisations.

Other sources

While most of the paper is based on data from the World Bank, there are also two other sources - United Nations and Our World in Data. These two sources are completely different from the World Bank and needed their own data preparation and cleaning. Also the data from the data from the UN came in Excel format, which needed another library - `readxl` to be read into R.

Both of these were handled without creating abstraction functions as they were used only once in code, additionally the data from the Our World in Data was already in a long format, so it only needed to be cleaned, while the data from the UN needed to be reshaped to a long format, similarly to the World Bank data.

More information about the data sources can be found in the Sources of Data chapter.

Population Worldwide

Worldwide Population
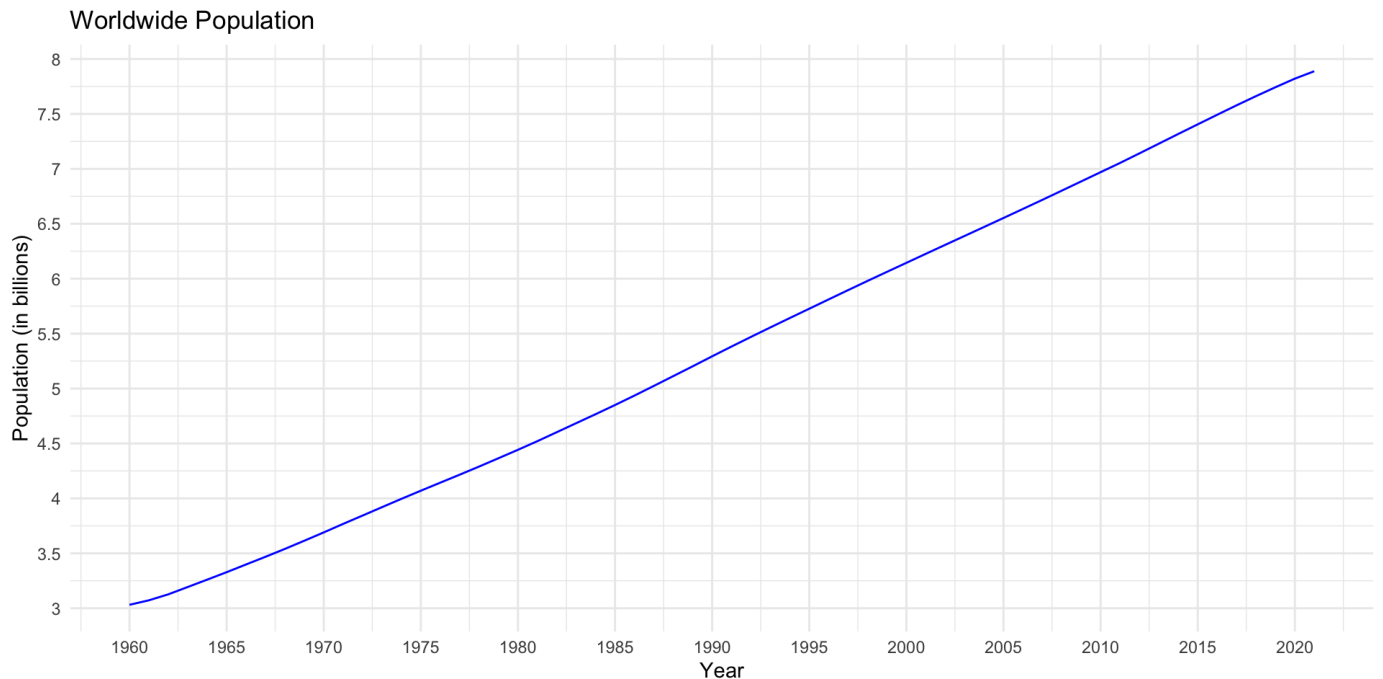
Lets start by looking at the population worldwide, when faced with this chart alone, it seems the easy conclusion is, yes, there is a problem, the population is rising out of control, 61.6% in 60 years. But is it really?

Worldwide Population Growth Rate

The growth rate of a population is determined by the difference between births and deaths during a specific time period, relative to the initial population size. It is expressed as a percentage and known as the population growth rate. The available data provides year-by-year statistics for each country in the world, along with several groups of countries, and the worldwide population growth rate, however the is no information about how the worldwide population growth rate is calculated, hence it will be calculated in this chapter.
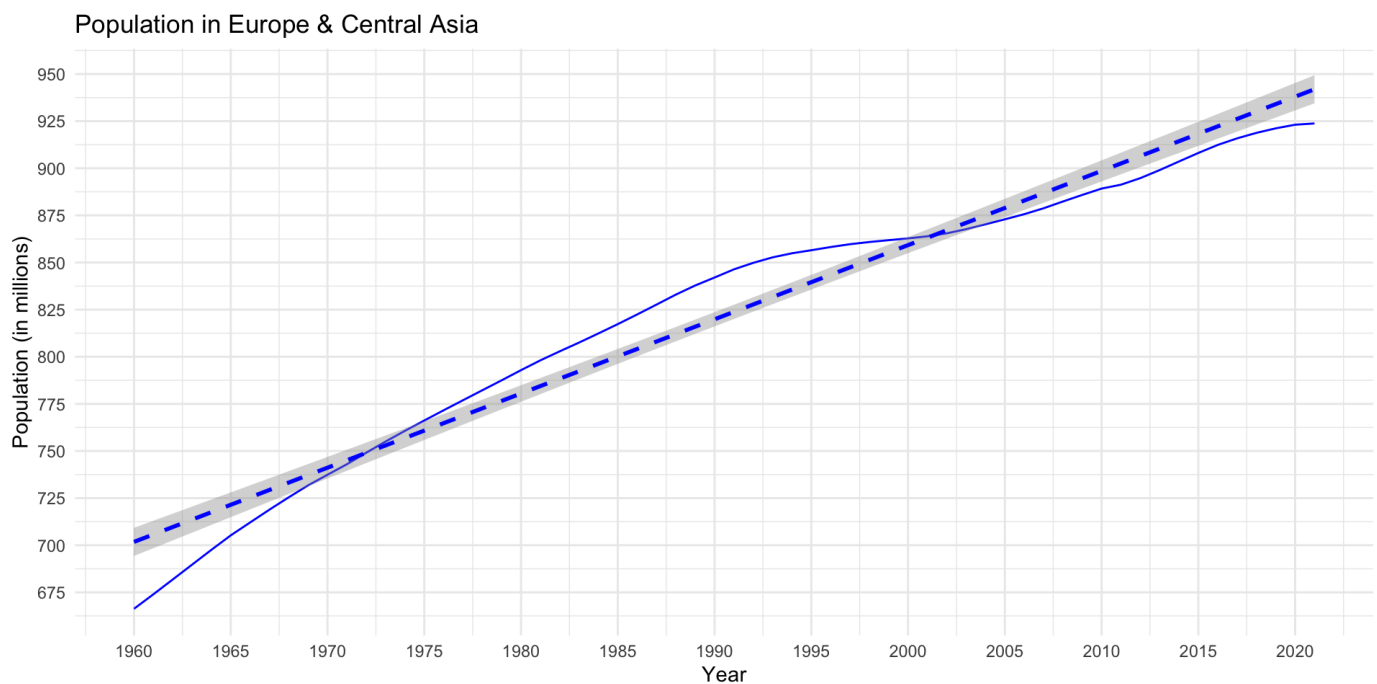
Worldwide Population Growth Rate
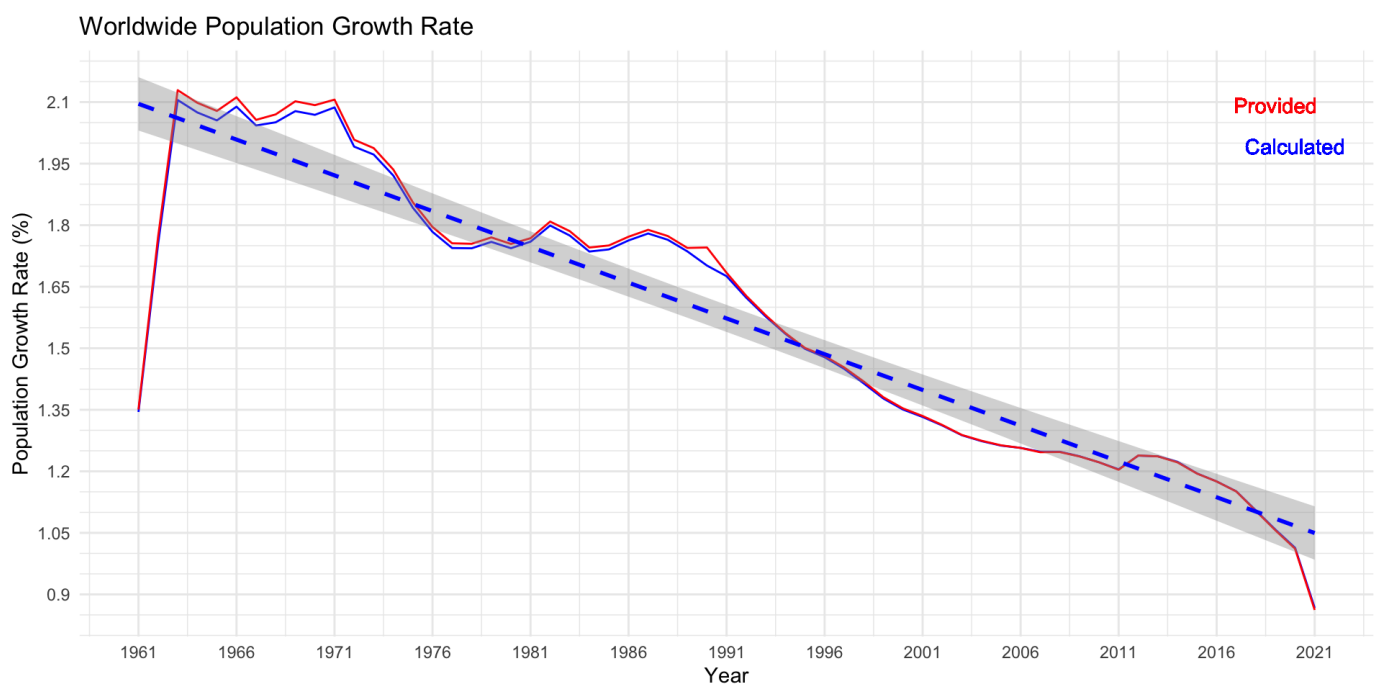
Calculation analysis

An analysis of the provided data revealed that the median difference between the two growth rates is negligible, at 0.48%, with a mean difference of 0.47%. The largest difference between the two growth rates is 2.52%, and it occurred in 1990. The biggest differences were found in the period between 1961 and 1992, which is the period with the most missing and inaccurate data. However, starting from 1993, the provided data is more accurate, and the differences are almost non-existent, with a median of 0.12%.

Conclusion

It can be concluded that the provided data was calculated correctly, taking into account the populations of different countries, and therefore is accurate and trustworthy enough to be used for analysis. After examining the worldwide population growth rate, it is evident that the growth rate is not constant and is rapidly decreasing by 169.3% since its climax in 1963, which could indicate that the population numbers will start decreasing in the near future.

Population in Europe & Central Asia

Population in Europe & Central Asia

It may seem at first that the population growth rate in Europe & Central Asia is similar to the worldwide population growth rate, but is that really the case?

Examining the data, it becomes clear that the population in Europe & Central Asia has grown at a significantly slower rate than the worldwide population, increasing by only 38.6% over the last six decades.

Fertility in Europe & Central Asia

Fertility in Europe & Central Asia
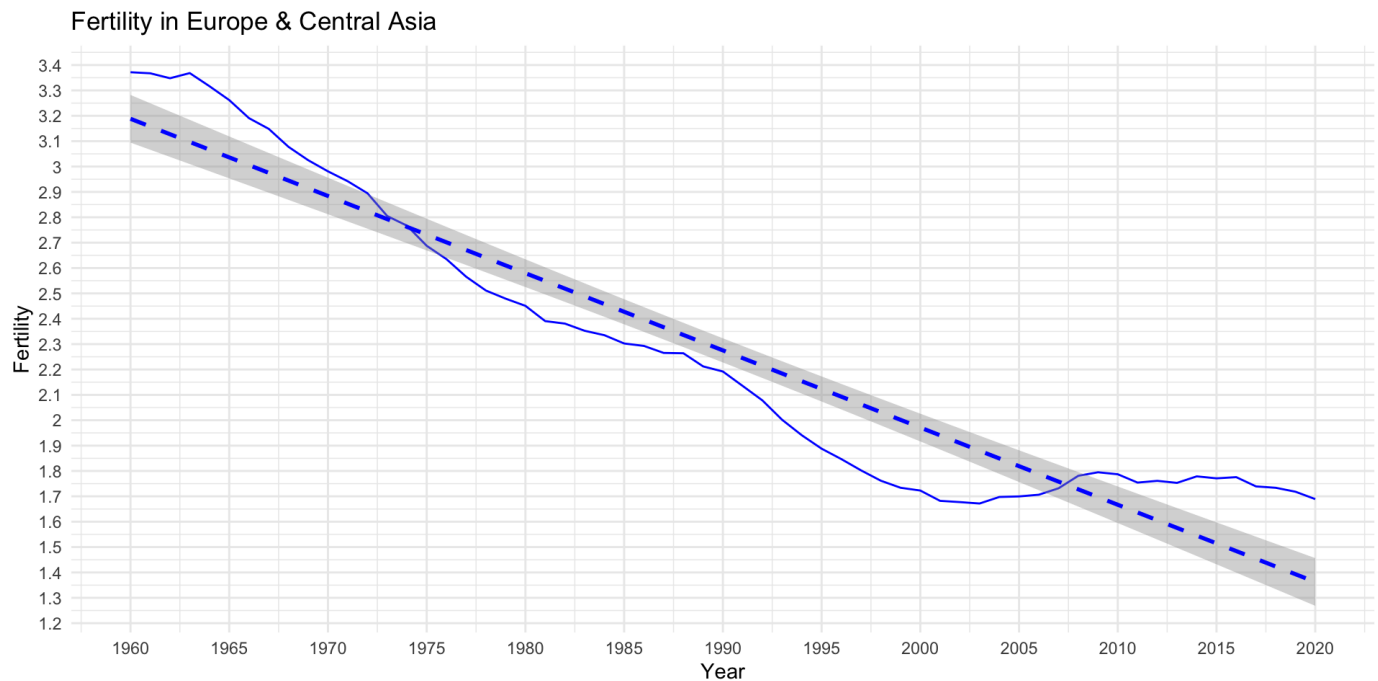
However, a different trend emerges when we examine the fertility data. In fact, the fertility rate has decreased by a significant 49.9% in the last 60 years. Although there was a brief period of rebound in fertility from 2002-2016, the trend has since continued its downward trajectory.

Furthermore, when we examine both the fertility and population growth rate graphs together, a clear correlation emerges. The rebound in fertility rate is followed by a rebound in population growth rate, with a minor delay. However, given the clearly downward trend in fertility rate, we can anticipate a slow down or even a plateau in population growth rate in the future. Only time will tell.

Central Europe and the Baltics

Population in Central Europe and the Baltics
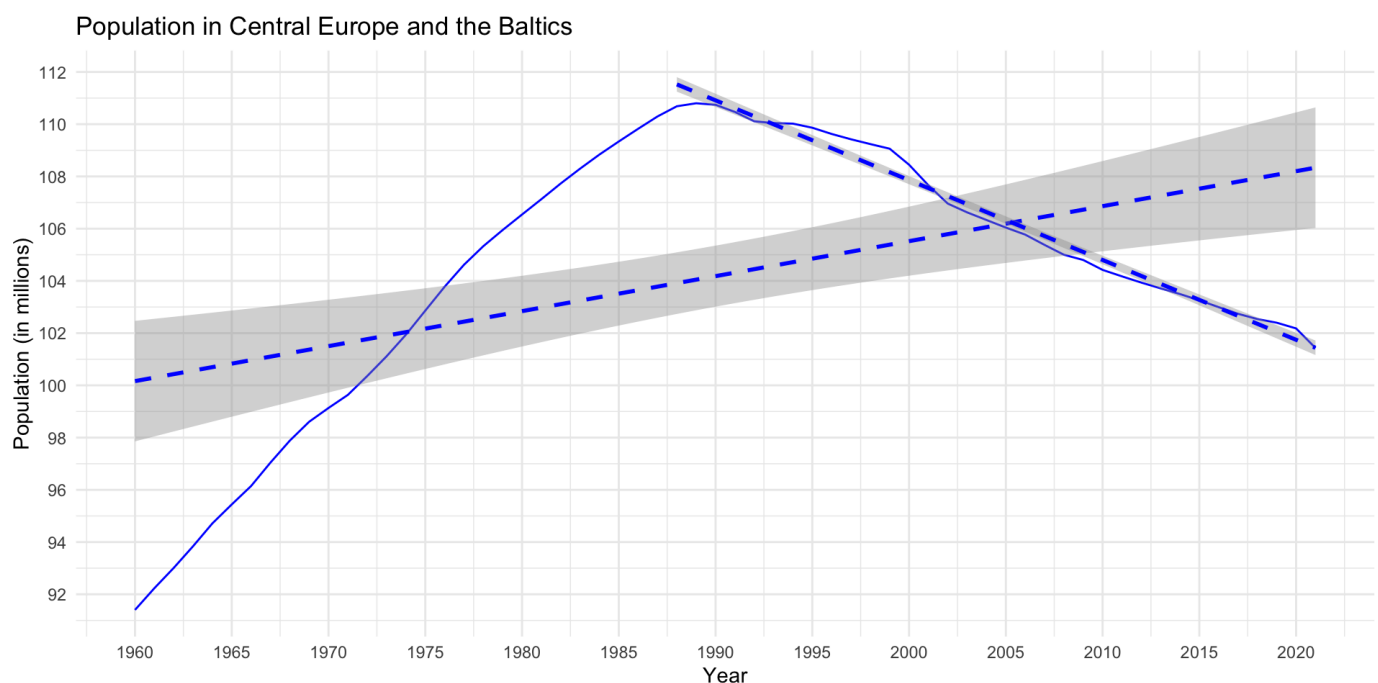
Upon examining the data on Central Europe and the Baltics, it is apparent that the population is not growing but rather decreasing. The growth rate of the population was positive from 1960 to 1987, having increased by 21.2% during that time. However, it has been in decline since then and has dropped by 8.5% from its peak. The trend implies that the population in this region will continue to decrease significantly in the foreseeable future.

Population in Sub-Saharan Africa


Population in Sub-Saharan Africa
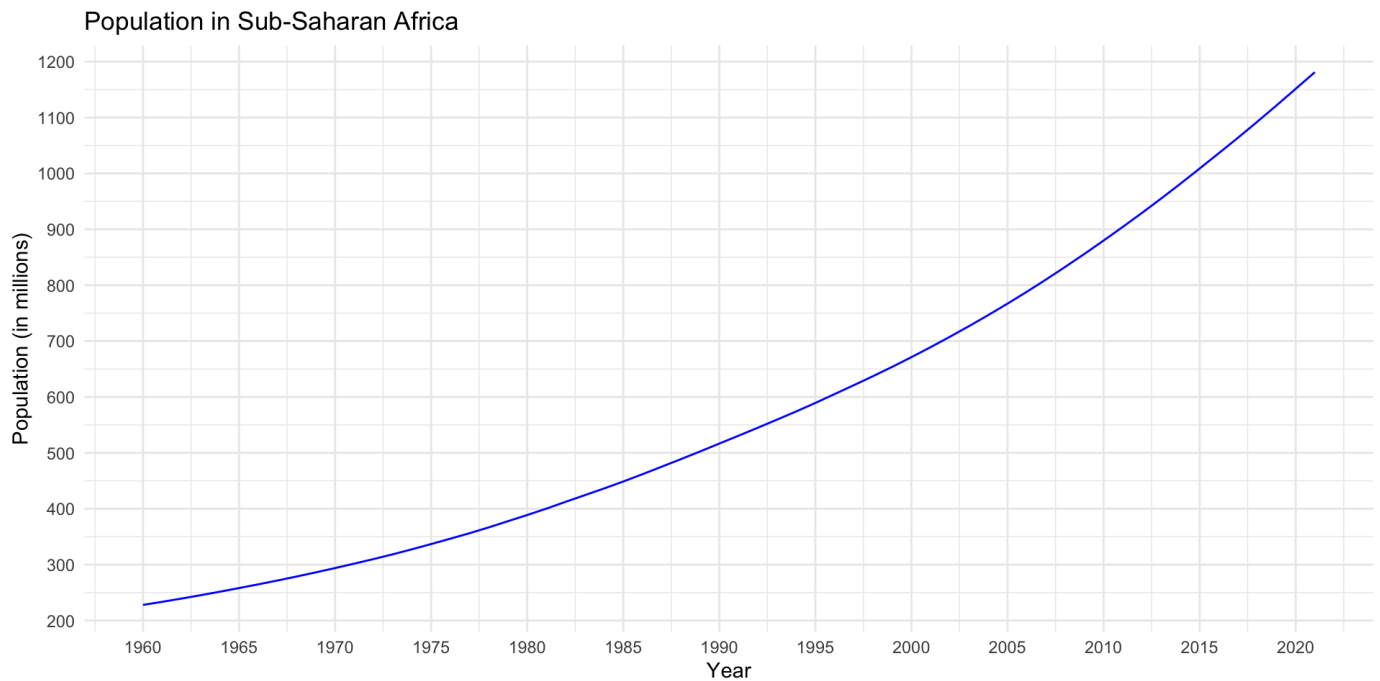
In contrast to Europe & Central Asia, Africa presents a different situation where the population is increasing at a rapid pace. The data shows that since 1960, the population has grown by 418.2%, which is over ten times the growth rate of Europe & Central Asia over the same period.

Fertility in Sub-Saharan Africa

Fertility in Sub-Saharan Africa
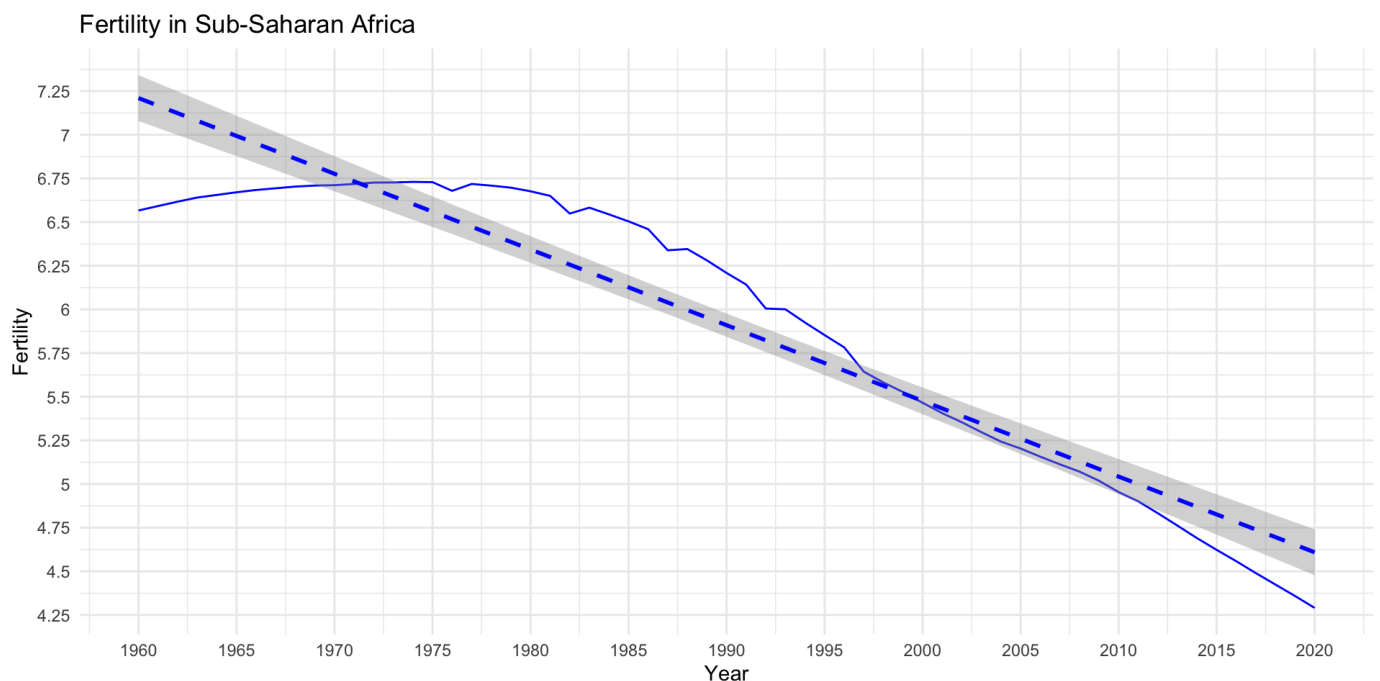
Despite a much higher fertility rate in Africa compared to Europe & Central Asia, the fertility rate in Africa has been declining rapidly since its peak in 1974, having already decreased by 36.3%. This is a similar pattern to what has been observed in Europe & Central Asia, and as population growth slows down, it may eventually come to a halt or even reverse.

World Fertility vs Life Expectancy
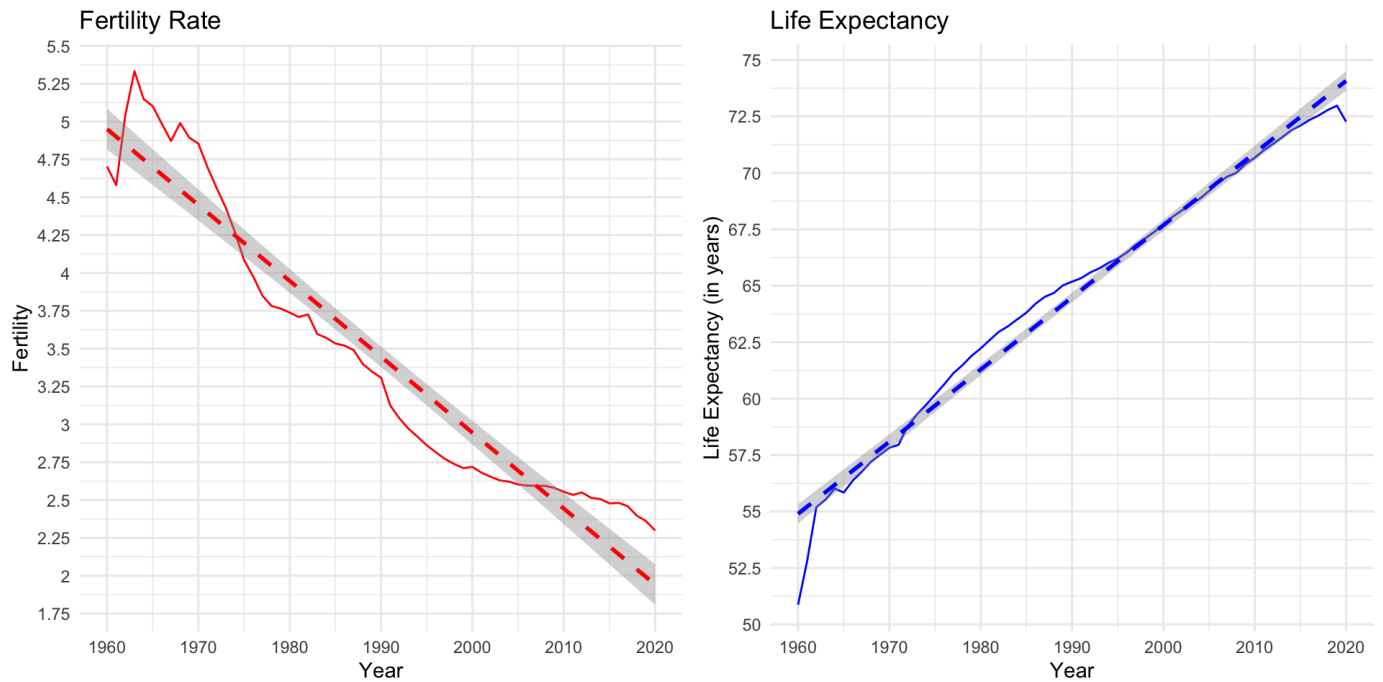
Apart from fertility rate, another factor that impacts global population growth is the life expectancy. In the past 60 years, life expectancy has increased by 42.1% and is expected to continue to rise in the future. At the same time, the fertility rate has dropped by 56.9% during the same period, and is expected to continue decreasing in the future.

This further highlights how the current world population growth is likely to slow down and ultimately cease. It can be inferred that the main contributing factor to maintaining global population growth is the extended life expectancy. However, considering the higher rate of change in fertility rate, it is probable that the population growth will not only stop, but also decline in the future.

UN Projections

## World Population

UN World Population Projections
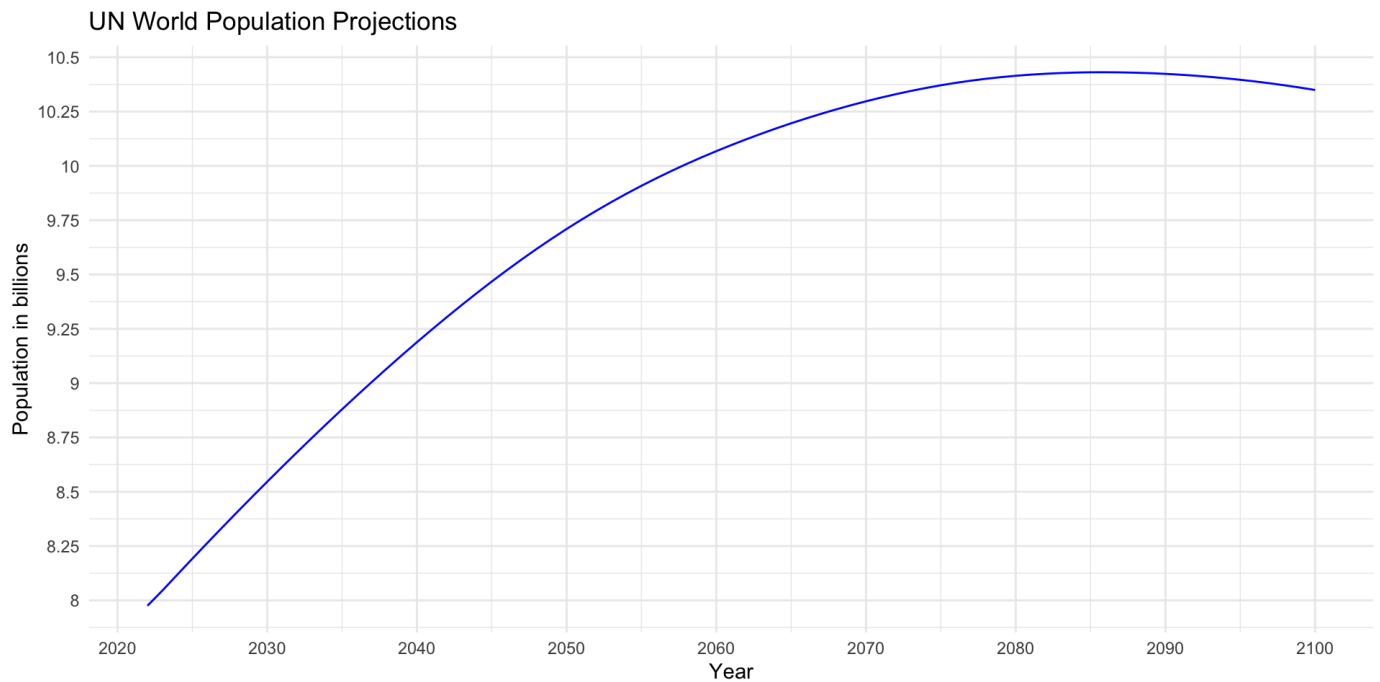
According to the UN Population Projections, the world population is expected to continue growing but at a decreasing rate and eventually stabilize. The projected peak population is estimated to be reached in 2086 with 10.43 billion people, indicating an increase of 30.8% from the current population. Following that, the population is expected to decline to 10.35 billion people by 2100, which is a decrease of 0.8% from the peak in 14 years. While this decrease may not seem significant, it marks a turning point in the world's population growth.

UN World Population Projections



Population in Central Europe and the Baltics
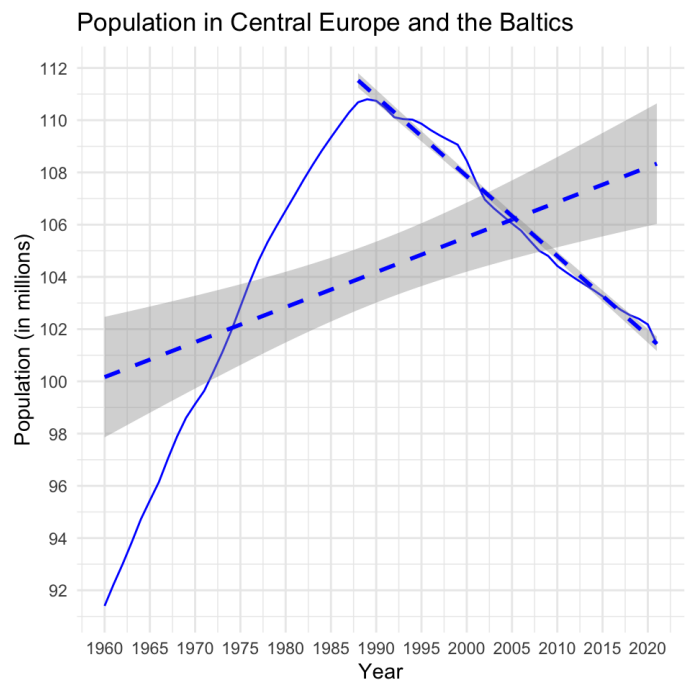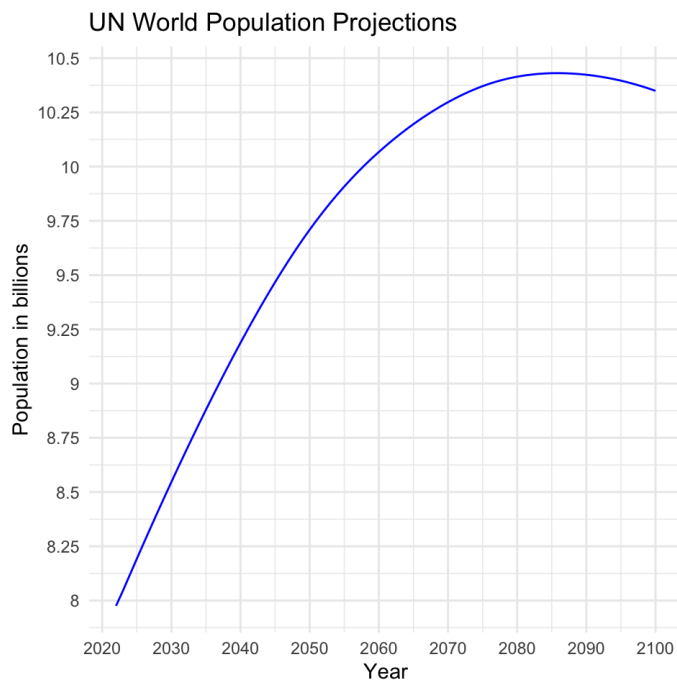
Furthermore, if we compare the Central Europe and the Baltics charts, we can see some similarity. If this region is any indication of the world's population growth, then it suggests that a significant decline in population is likely in the foreseeable future.

World Fertility

UN World Fertility Projections
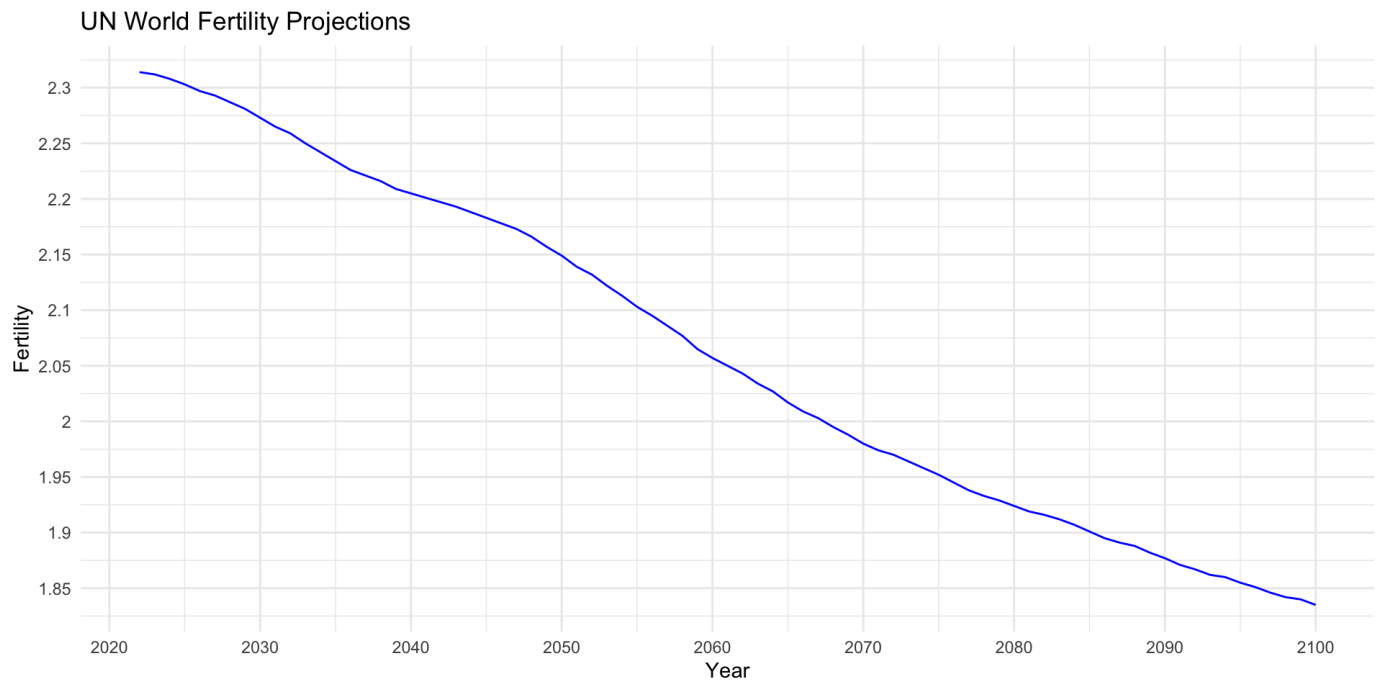
The fertility projections show that the fertility rate is projected to decrease to 1.83 by the year 2100, representing a decrease of 20.7%. Based on the previous population-fertility trends, it is expected that the population will follow suit with a drop, although the exact timing of this decline is unknown. However, we can infer from the example of the Central Europe and the Baltics region that a significant population decline can be expected in the future.

Problems - Undernourishment, Poverty, School Enrollment and Global Warming

Undernourishment, Poverty & School Enrollment
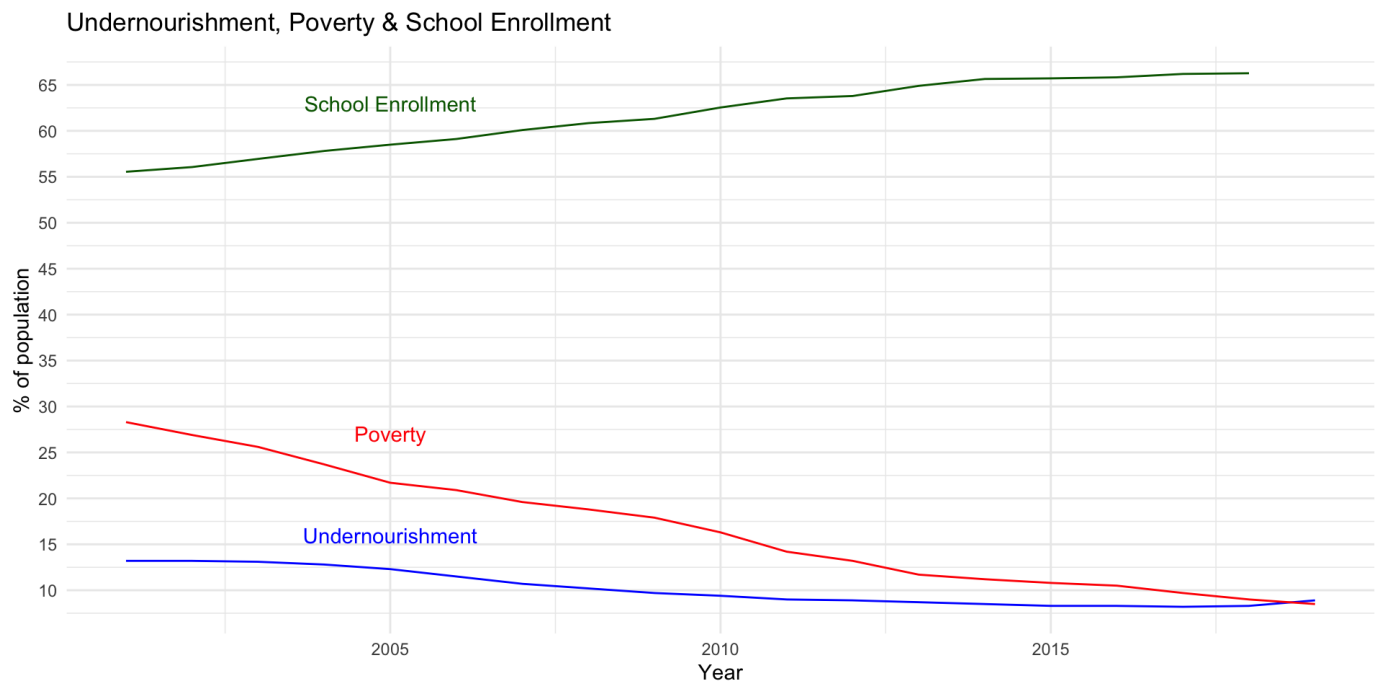
Scope, outcomes and conclusions

I want to begin by acknowledging the importance of the problems we face as a global community, as examples I will discuss undernourishment, global hunger, poverty, and climate change. These issues are incredibly serious and require our attention and action to make progress towards a more sustainable future.

However, all of these are often associated with overpopulation, and I want to take a moment to provide some hope and optimism for the future. While some may try to scare us with concerns of overpopulation, judging by the data, we can see that rapid population growth is not the cause of these problems. In fact, we have seen progress in reducing undernourishment and poverty over the years, and this progress is expected to continue while the global population is still on the rise. While there was a rebound in undernourishment in 2018, we know that this was likely caused by other factors such as climate change and the COVID-19 pandemic.

While I have not delved deeply into the topic of global warming in this paper, I believe it is a problem that we can address through fighting pollution and taking action to mitigate the effects of climate change. We do not need to focus on limiting population growth, as the data shows that population growth is already slowing down and will likely come to a stop or decline in the near future.

In closing, I want to emphasize that while we still have work to do to address the challenges we face, we should also take hope in the progress we have made and the promise of a more sustainable future. Let us continue to focus on the real issues and work towards a better world for all.

Summary

In conclusion, presenting the population growth as one of the biggest threats to humanity is inadequate and misleading. Instead, we should adopt a more optimistic perspective, viewing the growing population not as a threat, but as a challenge that we can overcome. We must focus on addressing the real problems that humanity faces and strive towards creating a better world for everyone.

An increase in population also means an increase in the number of intelligent individuals who can contribute to finding solutions for the problems we face. As our population grows, so does our collective knowledge, creativity, and capacity for innovation.

It is easy to fall for the extreme narrative that portrays people as the source of all problems, but this perspective is not accurate. We should not be afraid of the future; instead, we should embrace it with hope and determination. By working together and leveraging our collective intelligence, we can overcome the challenges of population growth and create a world that is not only sustainable but also thriving.

This optimistic view is shared by philosopher William MacAskill in his book **What We Owe the Future: A Million-Year View** (MacAskill, 2022). In it, he argues for longtermism – the idea that positively influencing the distant future is a key moral priority of our time.

Let this conclusion serve as an inspiration for future research, policy-making, and individual actions. Together, we can shape a future that is not only optimistic but also truly transformative for generations to come.

Sources of Data

To study population growth across different facets of human life, this research has relied on data from several sources, including the World Bank, United Nations, and Our World in Data.

World Bank

The World Bank is renowned for providing a wide array of indicators related to population, education, and poverty. The following indicators were included in the analysis:

1. Total Fertility Rate (SP.DYN.TFRT.IN): This metric calculates the average number of children born per woman, considering the prevailing age-specific fertility rates throughout her reproductive period (World Bank, n.d.a). The data is available at: https://data.worldbank.org/indicator/SP.DYN.TFRT.IN (https://data.worldbank.org/indicator/SP.DYN.TFRT.IN).
2. Life Expectancy at Birth (SP.DYN.LE00.IN): This figure estimates the mean number of years a newborn is expected to live, assuming that current mortality patterns persist throughout their life (World Bank, n.d.b). The data is available at: https://data.worldbank.org/indicator/SP.DYN.LE00.IN (https://data.worldbank.org/indicator/SP.DYN.LE00.IN).
3. Population Growth Rate (SP.POP.GROW): This metric highlights the annual percentage increase in the population (World Bank, n.d.c). The data is available at: https://data.worldbank.org/indicator/SP.POP.GROW (https://data.worldbank.org/indicator/SP.POP.GROW).
4. Total Population (SP.POP.TOTL): This value represents the overall number of individuals living in a specific country or region (World Bank, n.d.d). The data is available at: https://data.worldbank.org/indicator/SP.POP.TOTL (https://data.worldbank.org/indicator/SP.POP.TOTL).
5. Poverty Headcount Ratio at $1.90 per day (SI.POV.DDAY): This figure captures the percentage of the population surviving on less than $1.90 per day at 2011 international prices (World Bank, n.d.e). The data is available at: https://data.worldbank.org/indicator/SI.POV.DDAY (https://data.worldbank.org/indicator/SI.POV.DDAY).
6. Net Enrollment Rate in Primary Education (SE.PRM.NENR): This ratio expresses the number of children of the official primary school age who are enrolled in primary education as a percentage of the total official school-

age population (World Bank, n.d.f). The data is available at:
https://data.worldbank.org/indicator/SE.PRM.NENR (https://data.worldbank.org/indicator/SE.PRM.NENR).

The World Bank is a credible institution, and its data is frequently used in academic research and policy studies. However, it is important to consider potential data coverage or accuracy limitations for specific countries or time periods.

United Nations

The United Nations Department of Economic and Social Affairs provides population data through the World Population Prospects. This dataset contains population estimates and projections for all countries and regions, including a range of demographic indicators such as population size, growth, and composition (United Nations, n.d.). The data is available at: https://population.un.org/wpp/Download/ (https://population.un.org/wpp/Download/).

Our World in Data

Our World in Data is another data source utilized in this study. This non-profit research organization provides datasets and visualizations related to a range of global issues, including undernourishment. The proportion of the total population experiencing undernourishment has been included in this study (Our World in Data, n.d.). This data is publicly accessible at https://ourworldindata.org/hunger-and-undernourishment (https://ourworldindata.org/hunger-and-undernourishment).

It is important to note that while these data sources are widely recognized and respected, limitations such as data accuracy or coverage issues may be present for specific countries or time frames.

Technology Evaluation: R and R Markdown

R is a popular and widely-used programming language for statistical computing and graphics, which makes it an ideal choice for data analysis and visualization tasks (R Core Team, 2021). Moreover, R Markdown is a powerful tool that allows for the creation of dynamic documents, combining the functionality of R programming with the flexibility of Markdown, a lightweight markup language (Xie et al., 2018). This combination provides a seamless and efficient way to conduct data analysis and present the results in a clean and organized manner.

In this paper, we have utilized line charts to display the data. Line charts are a common and effective way to visualize trends and changes over time (Few, 2009). They allow for easy comparisons between variables and help in identifying patterns or anomalies in the data. Line charts are particularly useful when dealing with time-series data, as they clearly represent the progression of the variables over the years. In our case, line charts have enabled us to efficiently showcase the relationship between variables such as fertility rates, life expectancy, population growth, and other factors.

The whole report is written in R Markdown and available at https://github.com/beeinger/world-overpopulation (https://github.com/beeinger/world-overpopulation), all data preparation is visible there and can be easily reproduced by opening the `report.rmd` in RStudio or any other IDE that supports R Markdown.

References

Few, S. (2009) Now You See It: Simple Visualization Techniques for Quantitative Analysis. Analytics Press.

R Core Team (2021) R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Available at: https://www.R-project.org/ (https://www.R-project.org/) (Accessed: 7 May 2023).

Xie, Y., Allaire, J.J., and Grolemund, G. (2018) R Markdown: The Definitive Guide. CRC Press.

Project, O.R. (2021) Survey shows the general public is ready for discussions about population, The Overpopulation Project. Available at: https://overpopulation-project.com/survey-shows-the-general-public-is-ready-for-discussions-about-population/ (https://overpopulation-project.com/survey-shows-the-general-public-is-ready-for-discussions-about-population/) (Accessed: 7 May 2023).

MacAskill, W. (2022) What We Owe the Future: A Million-Year View. Oneworld Publications.