

2023 World Population Data Analysis

-Yathartha Shrestha on 12/08/2023

Data Preprocessing

(Dataset)

To get started with this project the first thing I needed to do was to have a relevant dataset that I could analyse and visualize in a meaningful manner. I could access a ready-made dataset provided by the World Population Review website, but it needed some modifying as it lacked fields like 'Continents' which would be a key part of my analysis later. ([Worldpopulationreview](https://worldpopulationreview.com/), 2023)

The initial dataset provided by World Population Review website had fields like Country names, Area, Growth Rate, World Population Percentage, Density and Population numbers for the years 1980, 2000, 2010, 2022, 2023, 2030 (Projections), 2050 (Projections) etc.

I modified this dataset in Excel by adding new columns like 'Continents' as it would be a good feature to divide the Countries from which analysis could be done and Population numbers for the years of 1990, 2015 extracted from previous versions of the dataset provided by the World Population Review website. This would help get more interesting analytics and visualizations done as we would have more 'years' fields to work with. I also took out columns I felt were unnecessary for my analytics for this project. I took out the projecting years as that I something I want to build on my own. After I was done modifying the dataset, I uploaded it on a Github repository from where I could host the dataset online by making it public so it could be accessed by everyone.

Exploratory Data Analysis & Visualizations

Once the dataset was in order, it was time to get started with the coding and analytics part. For this project coding and analytics was done in Jupyter notebook, an interactive platform for computing based on the web that can be used as an environment for Python programming. (Datalab, 2023)

From Colab coding work was done from which we extracted key findings from our analysis and visualizations which help understand the data at hand in a more user-friendly manner. The libraries used in this project was Pandas, NumPy, Matplotlib, Seaborn, Pyplot, Sklearn and packages pf these libraries. The findings obtained from the code is as follows.

To get started after importing the libraries, we import the dataset using pandas library and store it in 'df' variable. This is what our dataset looks like.

# Importing Modified dataset																
In [11]: df = pd.read_csv('https://raw.githubusercontent.com/yrtha/worldpopulation2023/main/World-Population-2023.csv') df.head()																
Out[11]:																
	Rank	cca3	Country	Capital	Continent	2023	2022	2020	2015	2010	2000	1990	1980	1970	Area	netC
0	36	AFG	Afghanistan	Kabul	Asia	42239854	41128771	38972230	33753499	28189672	19542982	10694796	12486631	10752971	652230.0	
1	138	ALB	Albania	Tirana	Europe	2832439	2842321	2866849	2882481	2913399	3182021	3295066	2941651	2324731	28748.0	-
2	34	DZA	Algeria	Algiers	Africa	45606480	44903225	43451666	39543154	35856344	30774621	25518074	18739378	13795915	2381741.0	
3	214	ASM	American Samoa	Pago Pago	Oceania	43914	44273	46189	51368	54849	58230	47818	32886	27075	199.0	
4	203	AND	Andorra	Andorra la Vella	Europe	80088	79824	77700	71746	71519	66097	53569	35611	19860	468.0	

Figure 1 Dataset

Current Population and Trends

After doing the data analysis we could gather quite a lot of data regarding the current world population. First, we could calculate the total world population of 2023 to be slightly over 8 billion. (8,043,615,390 to be precise).

```
In [18]: #lets check current world population 2023
df['2023'].sum()

Out[18]: 8043615390
```

Figure 2 Current world population calculation

This World Population as of today is approximately 8.05 billion. (Worldometer, 2023). If we compare this number with our findings, it is almost identical. This huge number represents a significant increase from the estimated world population of 3.7 billion in 1970 (United Nations, 2021). The increase in world population is largely due to a combination of factors, including advances in technology and medicine, improvements in living conditions, and declining fertility rates in some regions of the world (United Nations, 2019).

It is important to note that while population growth can bring about economic and social benefits, it can also create challenges related to resource management, environmental sustainability, and social inequality (United Nations, 2021). As such, it is important to carefully manage population growth through policies that promote sustainable development and equitable access to resources.

Now, Let's look the population trend from 1970 to the current time period.

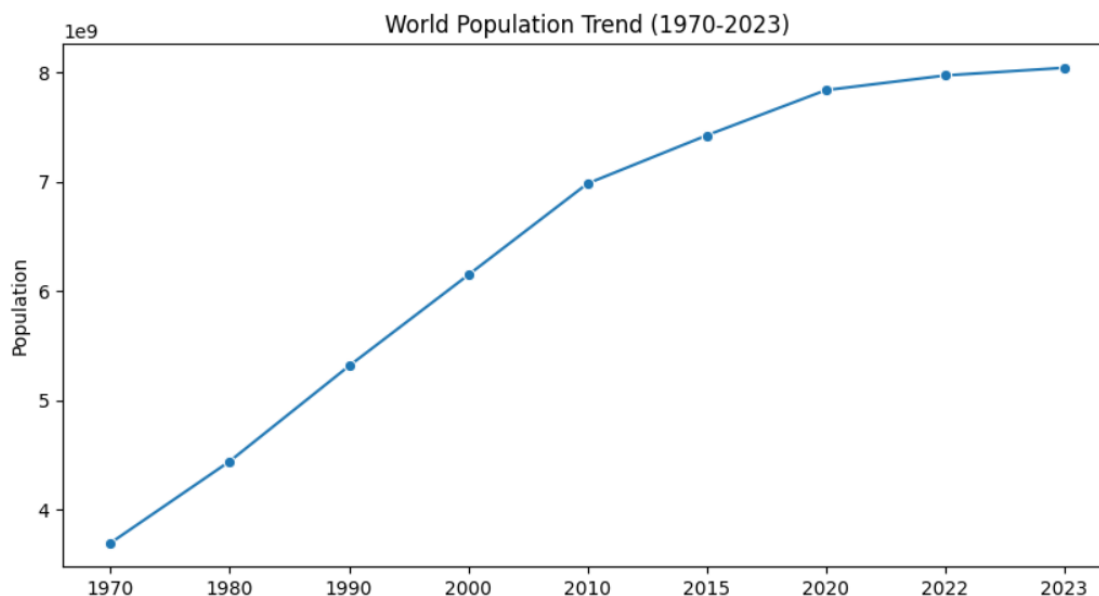


Figure 3 World population trend through the years

From this trend line we can observe that the population rapid population growth in the mid-20th century to more moderated growth in recent decades. This is further emphasized when we do our projections for the future later in our projections section. Factors such as advancements in healthcare, changes in fertility rates, and shifting societal norms have shaped these transitions. The mid-20th century's unprecedented growth set the stage for subsequent shifts in fertility, mortality, and migration patterns.

This trend is consistent with global demographic patterns, which show a steady increase in population over time. According to the United Nations Department of Economic and Social Affairs, the world population is projected to reach 8.5 billion by 2030 and 9.7 billion by 2050 (World Population Prospects, 2019). This growth is largely due to increases in life expectancy and declining fertility rates in some regions of the world (United Nations, 2019).

The data suggests a positive trend in the population from 1970 to 2023, which is consistent with global demographic patterns. However, it is important to note that the trend may not hold true for all regions of the world and that there may be other underlying factors influencing population growth.

Next, we look at an interactive visualization with the help of pyplot and pycountry libraries where we get a map of the entire world with parameters that highlight the population. This visualization can be better seen on the code.

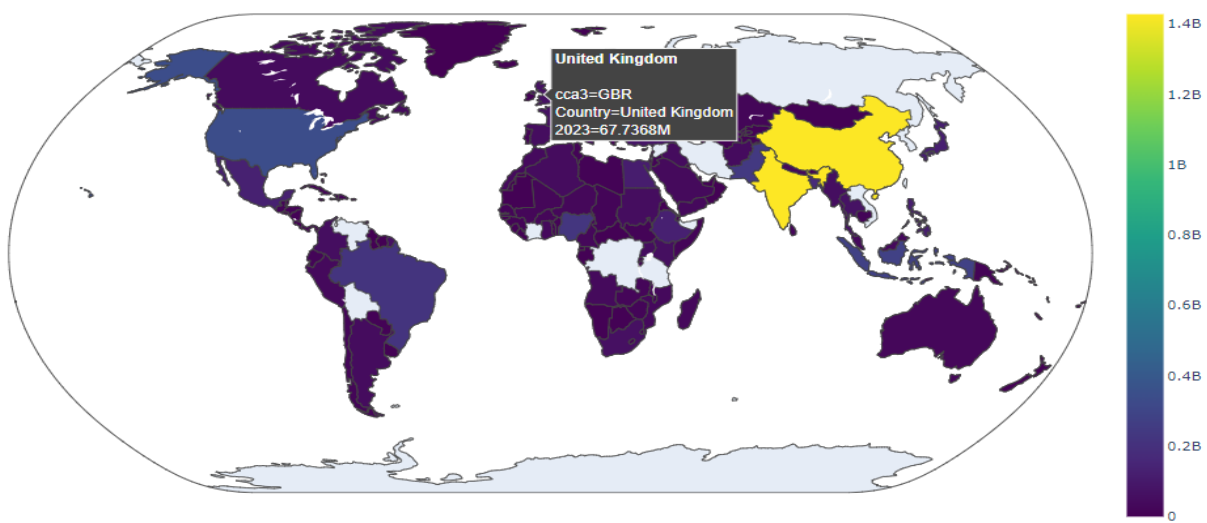


Figure 4 Interactive world map with population index

Most Populated Countries

India is the most populated country in the world currently overtaking China who held top spot for the longest time one of the biggest reasons for this is the fertility rates in India and them having a younger age demographic in comparison to China. People under 25 account for 40% of India's population while countries like China and USA have ageing population. (Silver, 2023) India and China are by far the most populated nations right now. They have quite a significant distance between them and the rest. Both nations having population above 1.4 billion. They are followed by the USA having 330 million people. Indonesia and Pakistan make up the top 5 with them having population in the range of 200-250 million. Nigeria, Brazil, Bangladesh, Russia, and Mexico make of rest of the top 10. This data can be illustrated in a bar chart below.

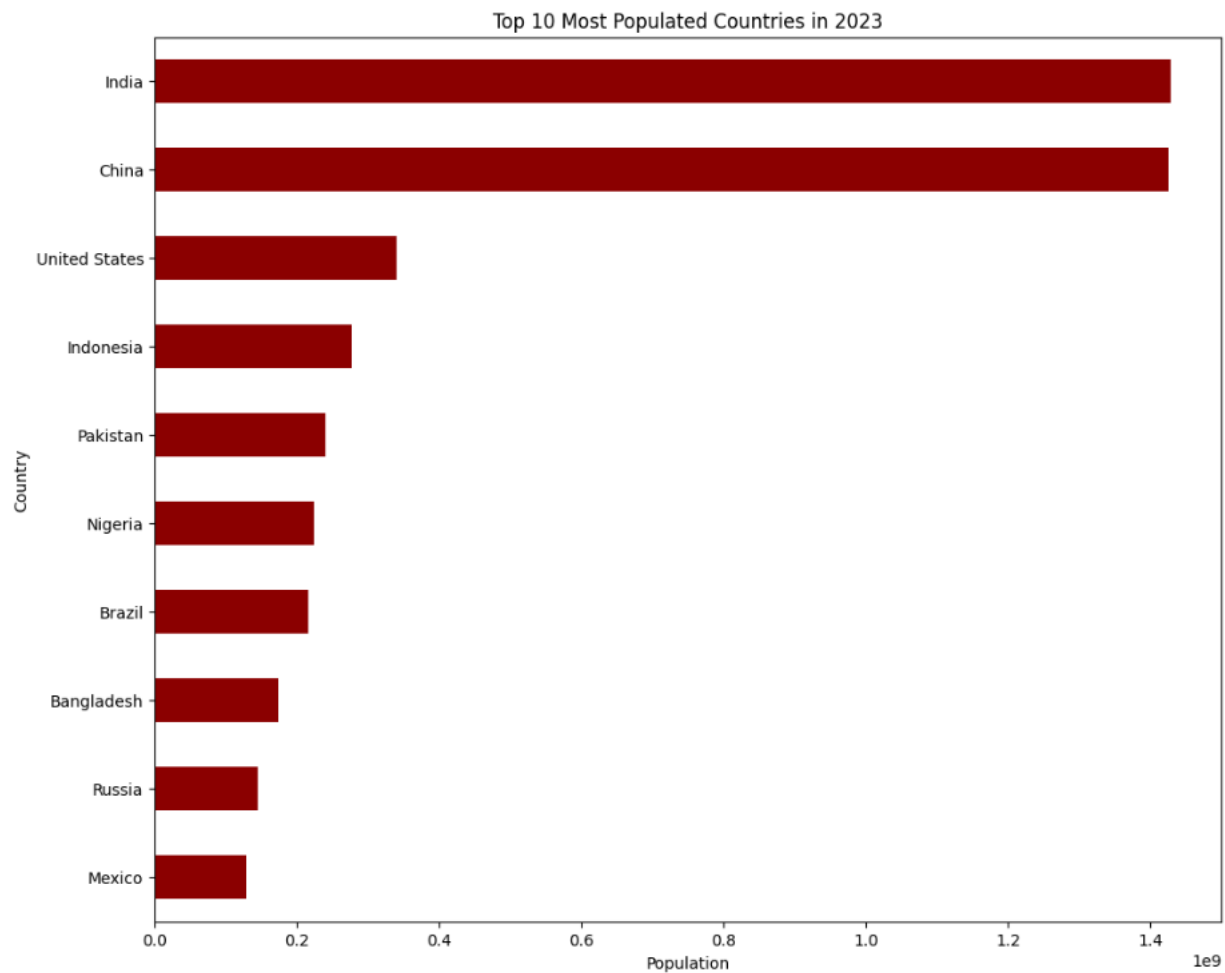


Figure 5 Most populated countries in 2023

Representing the same data in the form of a pie chart it makes gives us a big takeaway. The pie chart is illustrated below.

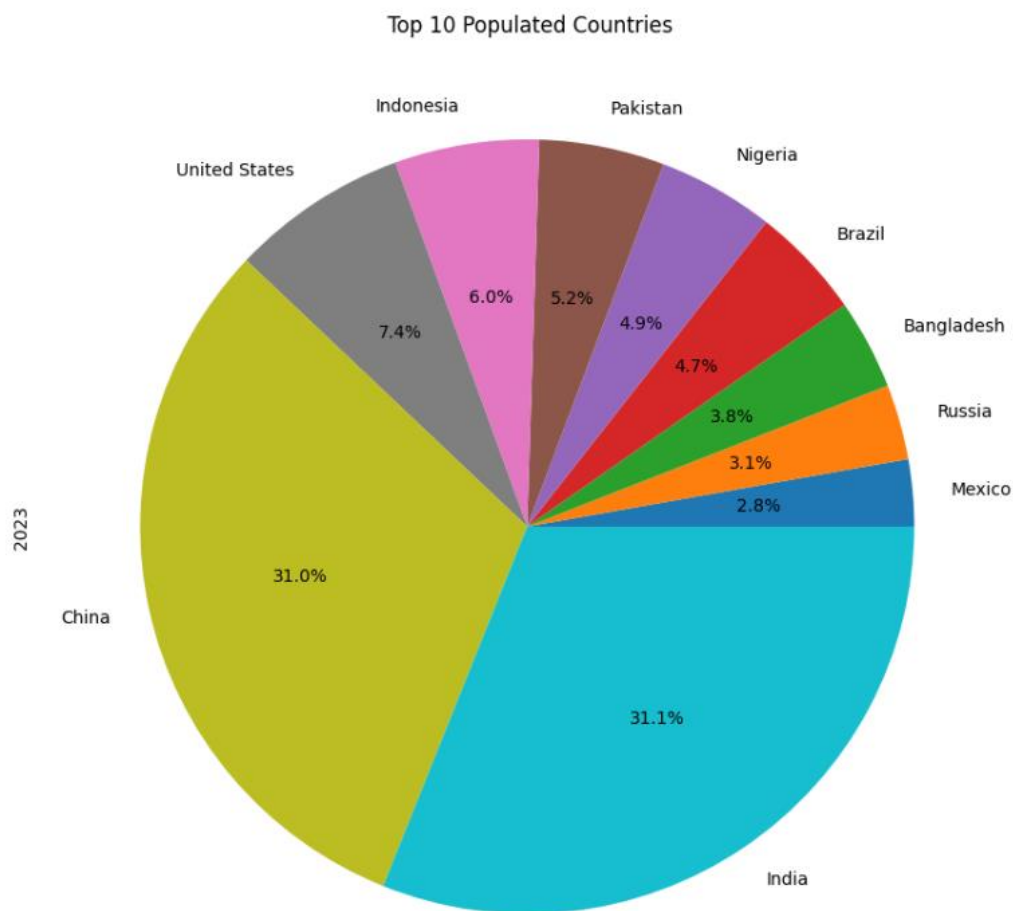


Figure 6 Pie chart of top 10 countries population distribution

The biggest takeaway is the fact that India and China on their own account for 62% of the top 10. Both combined are more than 35% of the entire population. They are far and away the two biggest countries in terms of population in the whole world. There is a significant gap between them and the next biggest country which is the United States.

The following figure shows the trend line of these top 10 populated nations over the decades. While there is gradual increase in all the nations the most glaring rise is the rise made from India compared to other countries.

The rest of the nations besides India and China have seen growth but it pales in comparison to them. Besides the United States being constant 3rd there have been few fluctuations between the remaining 6 nations.

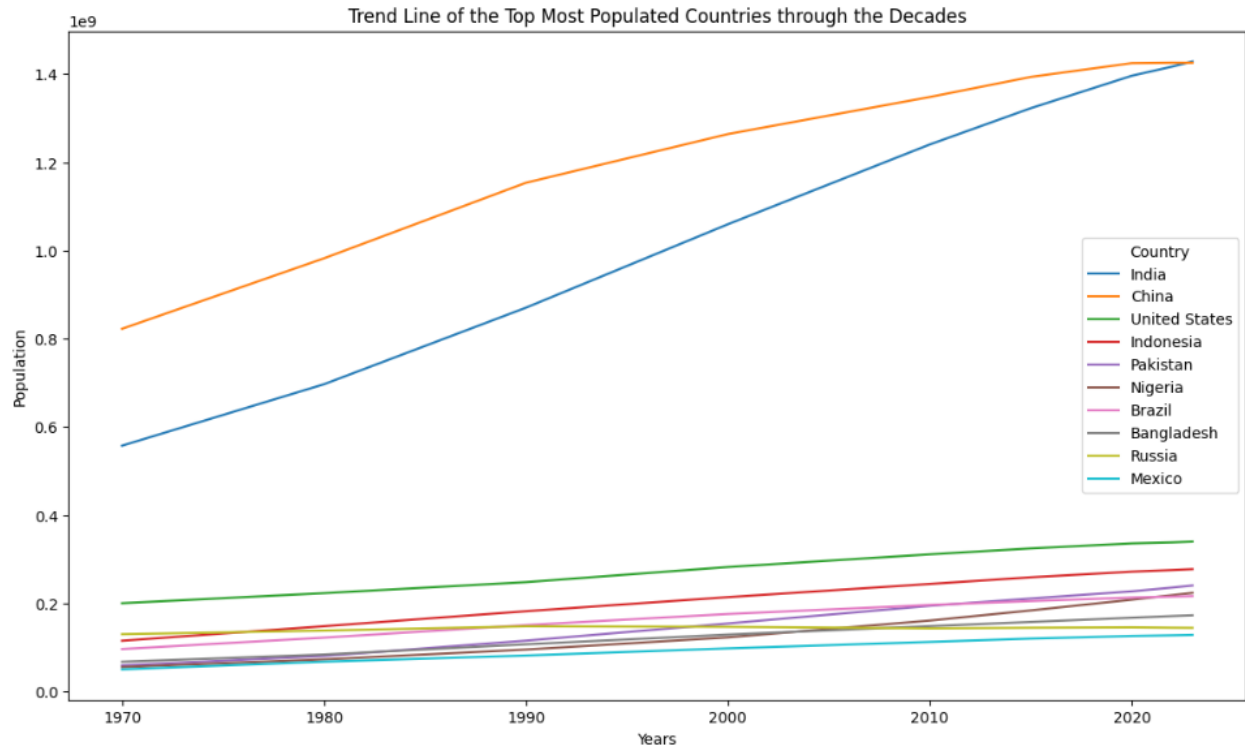


Figure 7 Trend line of the top 10 populated countries over the decades

It's interesting how close India and China are to each other. If we look at the trend of just these two countries, we will see India has overtaken China as the most populated nation as of now. The gap between got closer and closer over the years. This can be seen in the figure below.

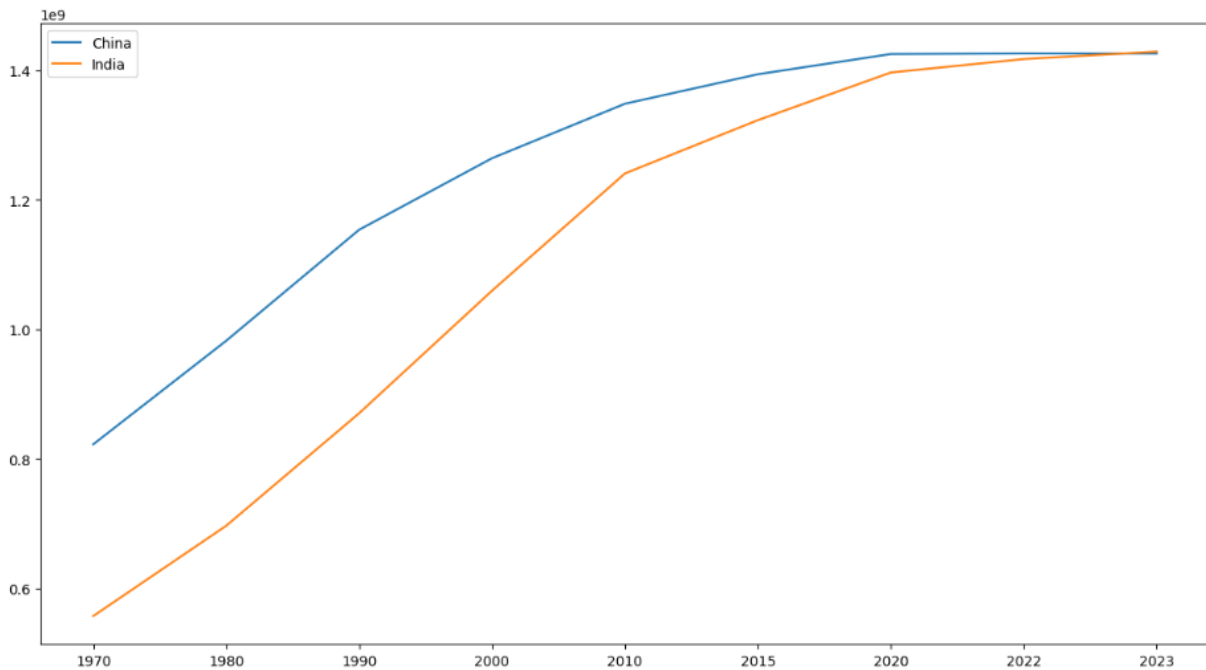


Figure 8 India vs China trend line

Least Populated Countries

Vatican City is the nation that is least populated in the world with approximately only 800 living there. Countries like Tokelau, Niue, Falkland Islands, Montserrat, Saint Pierre and Miquelon, Saint Barthelemy, Tuvalu, Wallis and Futuna, Nauru are the other countries that make up the top 10 least populated countries respectively. Some of the countries seen in the list may also be considered islands. The data is illustrated below in a bar graph.

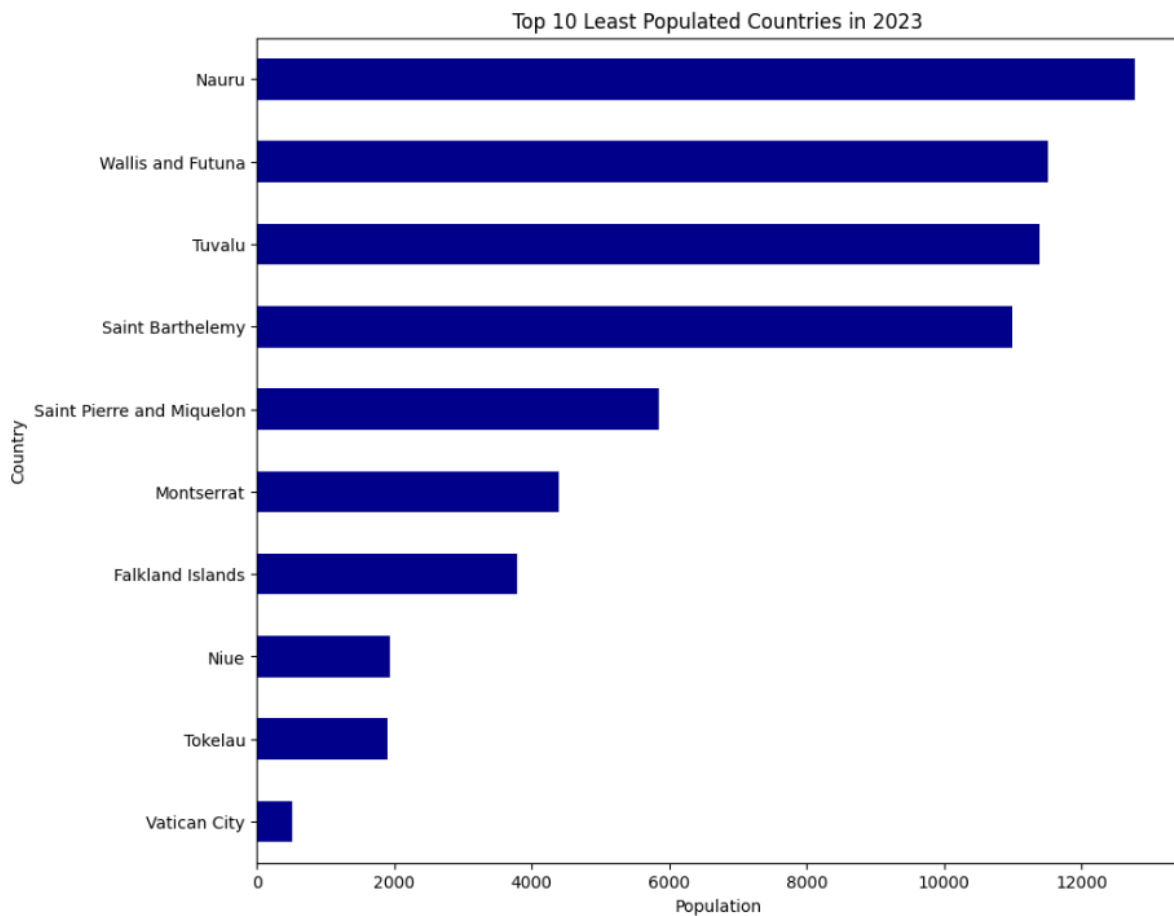


Figure 9 Top 10 least populated countries

If we have a look at the trend line of these scarcely populated countries through the decades (below), we see a lot of fluctuations between most of the countries. The one thing that has remained constant is that Vatican City is the least populated nation throughout. Their population if anything is going down. Tokelau also does not see much change in it's trendline. Some interesting observations that can be made is that Saint Barthelemy has gone from the 4th bottom country in terms of population to 6th bottom. Montserrat have gone from being the 10th bottom to 5th. Nauru, Saith Barthelemy and Tuvalu have seen a gradual growth overtime.

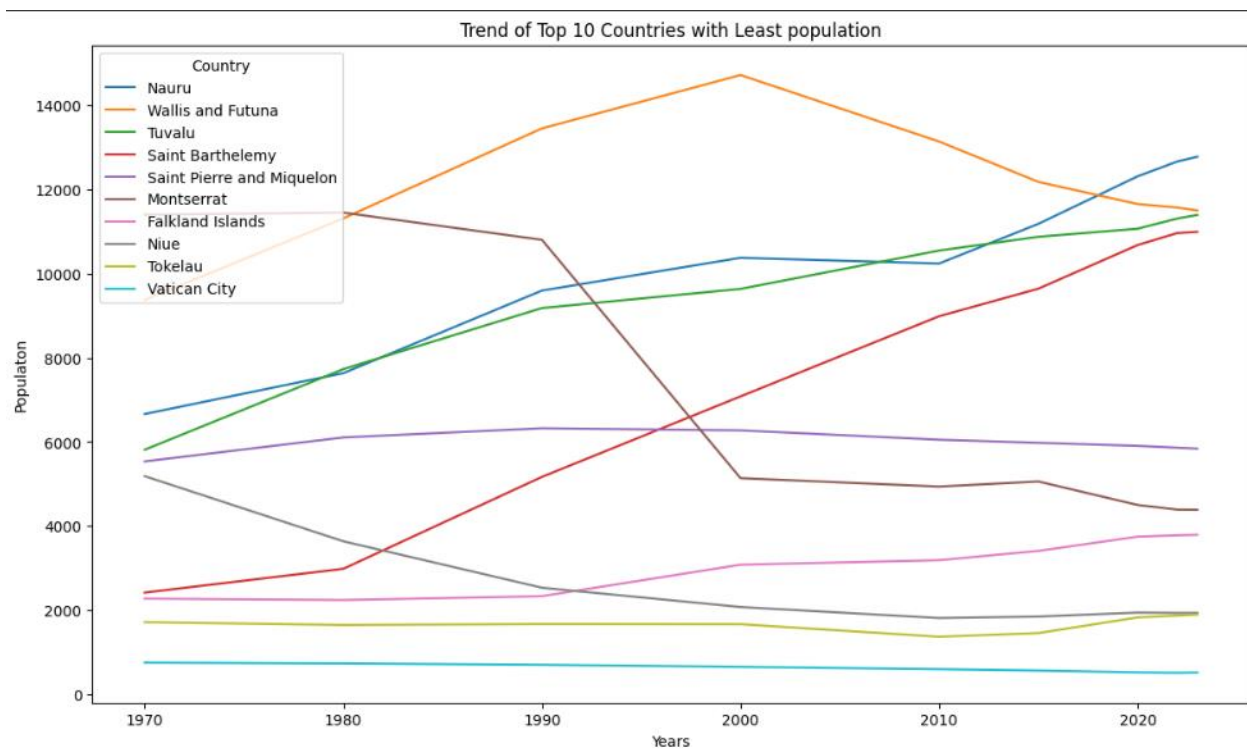


Figure 10 Trend line of the bottom 10 populated countries over the decades

The trend among the top 10 countries with the lowest populations is characterized by their unique geographical, cultural, and socio-economic factors. These nations, ranging from microstates to remote island nations, share commonalities in their challenges and opportunities. Their small size and unique attributes often present both challenges and advantages, shaping their demographic trajectories and influencing their roles on the global stage.

Population Analysis by Continents

Population Distribution by Continents

The Continents was one of the additional columns we added to our dataset. There are 7 continents on earth. Asia, Europe, Africa, South & North America, Oceania, and Antarctica. But since there are no countries present in the continent of Antarctica, no analysis based on countries can be done for that continent.

As we learned earlier India and China alone take up major share of the world population. They both are in Asia along with quite a few other countries in the top 10. So, it's no surprise to see Asia with the highest percentage with 59.1% when it comes to population. Africa are 2nd with 18.2%, followed by Europe with 9.2%. North and South America have 7.5% and 5.5% respectively. Finally, Oceania are the lowest with it occupying just 0.6%. Below this data can be represented in the form of a pie chart.

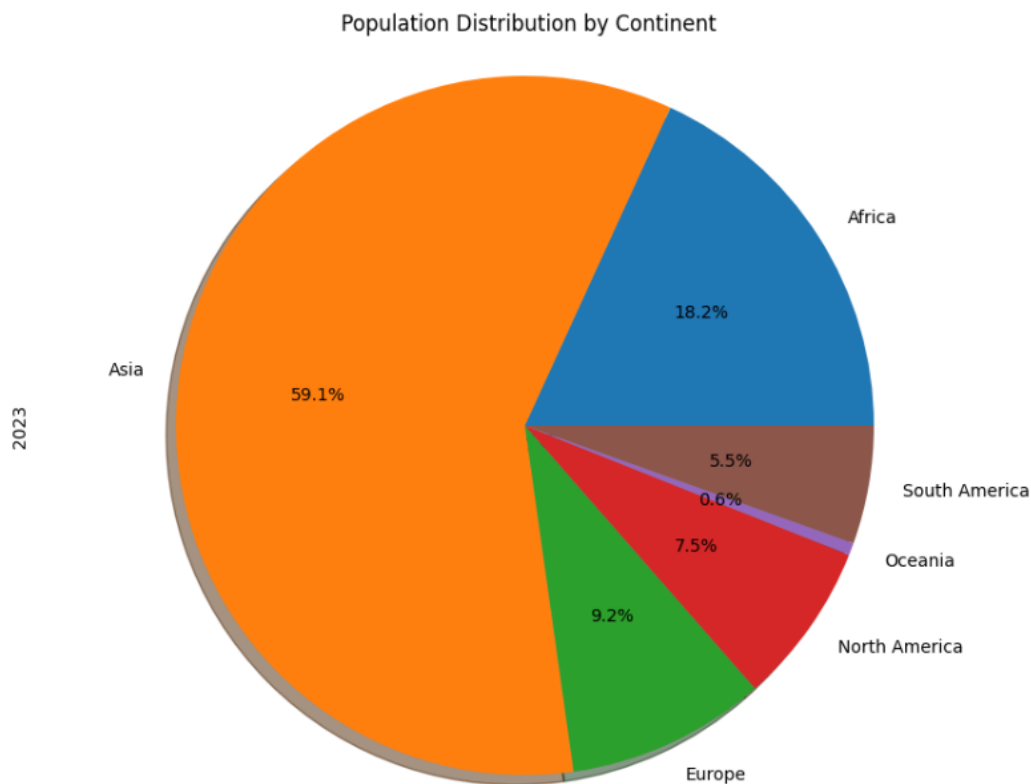


Figure 11 Pie chart showing population distribution by continents.

We will look at this data in the form of a bar chart below so we can have an idea of the actual population numbers each continents comprises instead of percentages.

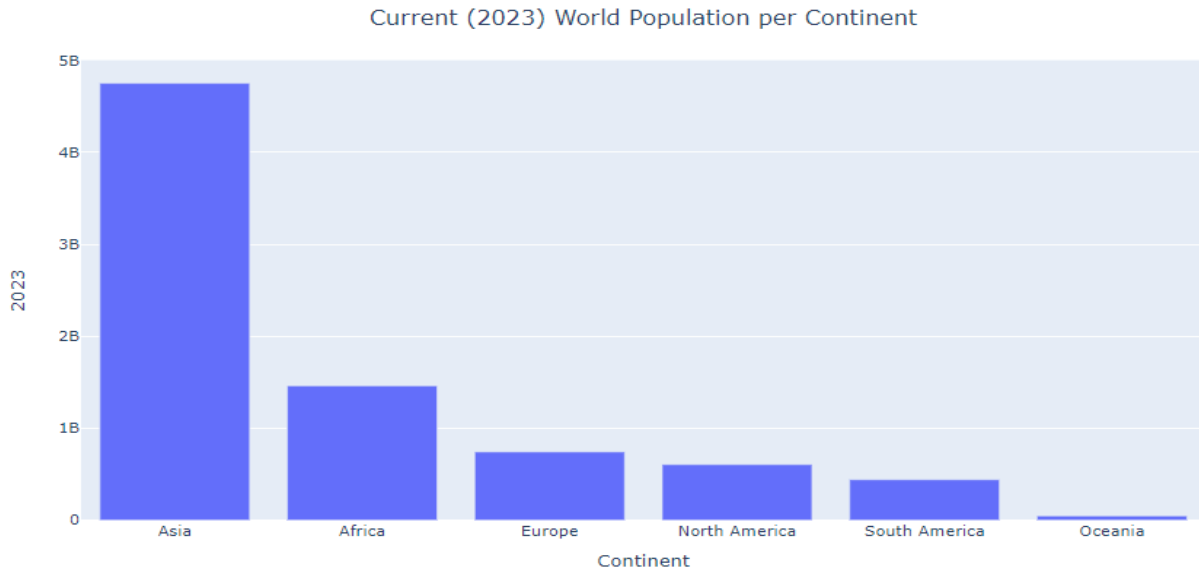


Figure 12 Bar chart showing population distribution by continents.

This just highlights how much the market is dominated by Asian countries. Africa are the only other continent to cross the 1 billion number. We can see how many countries are present in each continent.

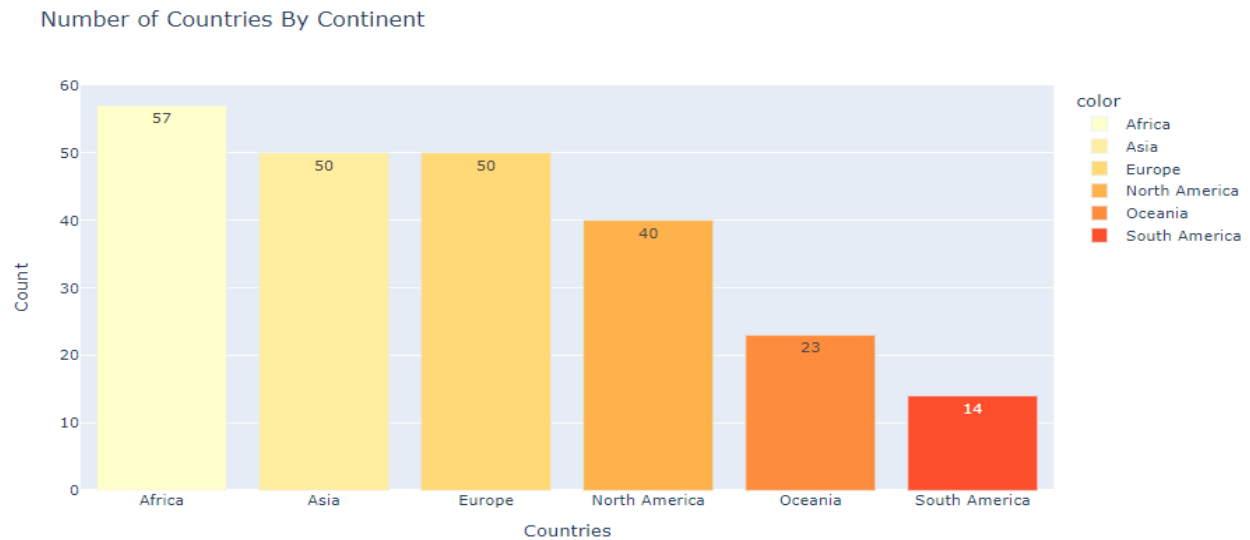


Figure 13 Number of countries in each continent

Few interesting observations can be made here. Africa take top spot on this list despite it being way less populated than Asia which means countries present in Africa aren't that well populated. Asia and Europe have the same number of nations and South America take bottom spot ahead of Oceania despite them being the least populated continent.

Most Populated Countries in each Continent

2023 Treemap

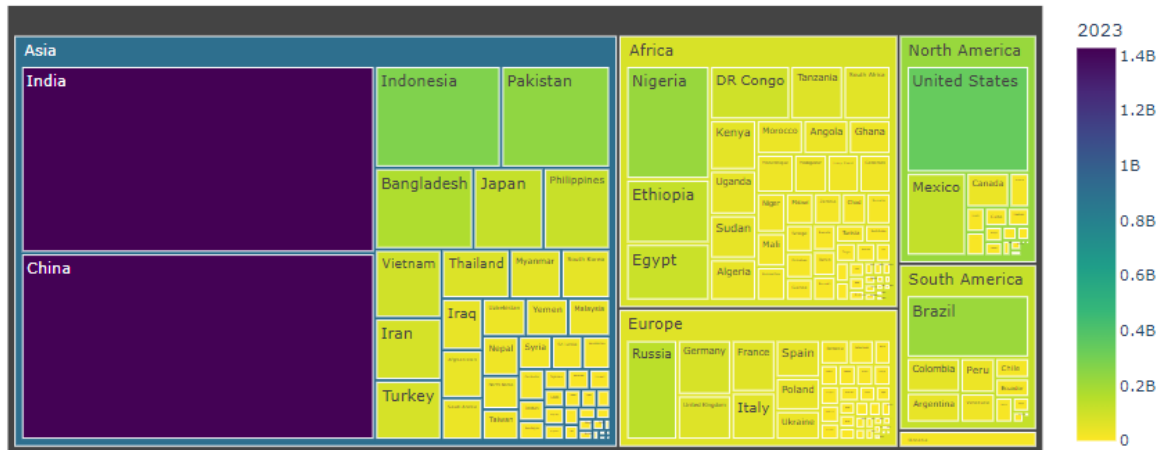


Figure 14 Most populated countries in each continent

As of 2023, the most populated countries in each continent continue to shape the global demographic landscape, reflecting a range of cultural, economic, and social dynamics. These most populous countries in each continent underscore the complexity of global demographics and the varying factors that contribute to their populations. As these nations navigate economic development, social changes, and cultural diversity, they continue to play integral roles in shaping the world's future trajectory.

India and China being the biggest country in Asia goes without saying with its vast population exerting a significant influence on the world stage.

As far as other continents are concerned, Russia maintains its status as the most populated country, spanning both Europe and Asia. Its vast landmass and historical significance contribute to its considerable population. Germany and the United Kingdom make up the other top 3 spots in Europe.

In Africa, Nigeria showcasing the continent's dynamic population growth and potential. Nigeria's youthful population and diverse cultural heritage have positioned it as a key player in regional and global affairs, with opportunities and challenges arising from its demographic trends.

In North America, the United States retains its position as the most populous country. Its diverse society, economic power, and cultural influence contribute to its demographic weight, making it a melting pot of cultures and ideas.

South America's most populous country is Brazil, known for its vibrant culture, diverse ecosystems, and economic potential. Brazil's large population spans various landscapes, from the Amazon rainforest to urban centres like São Paulo and Rio de Janeiro.

In Oceania, Australia stands as the most populous country, with its relatively moderate population density. Its cities, such as Sydney and Melbourne, are hubs of culture and innovation, showcasing the continent's unique blend of indigenous heritage and global connectivity.

These most populated countries showcase the intricate interplay between demographics, culture, and global influence. Their substantial populations drive economic growth, shape cultural exchanges, and pose challenges related to resource management, urbanization, and sustainability.

Least Populated Countries in each Continent

We have a good idea of the most populated countries in each continent. Let's dig deeper into the smaller nations in each continent.

These least populated countries in each continent offer insights into the intricate relationship between geography, culture, and population dynamics. While their sparse populations present unique challenges and opportunities, they contribute to the global tapestry of diverse human experiences. We will go continent by continent.

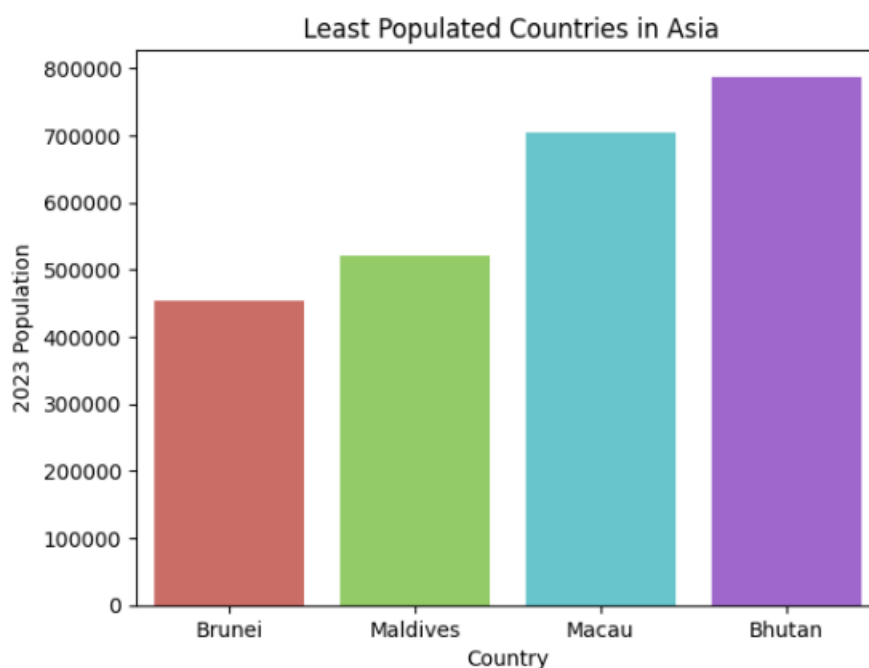


Figure 15 Least populated countries in Asia

In Asia, Bhutan stands as one of the least populated countries. Nestled in the Himalayas, its mountainous terrain has historically limited population growth, while the nation places a strong emphasis on environmental conservation and cultural preservation. Brunei is statistically the least populated Asian country with its population being 452,524.

In North America, Greenland remains the least populated country, maintaining its sparse population due to its Arctic climate and challenging living conditions, despite being an autonomous territory of Denmark. Other tinier nations in North America may be considered Islands as minute amount of people reside there.

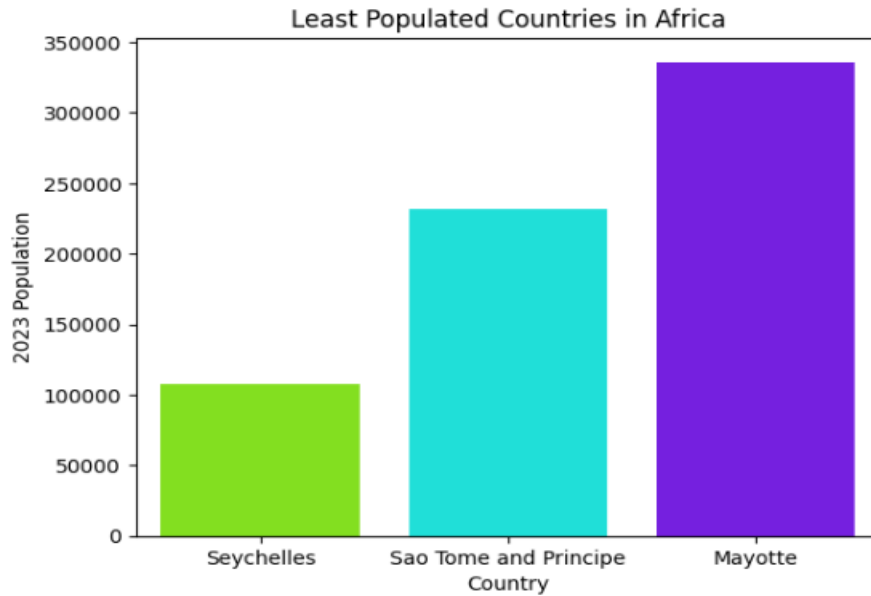


Figure 16 Least populated countries in Africa

Africa's least populated country in 2023 remains the Republic of Seychelles, an archipelago in the Indian Ocean. Its limited land area and isolation have resulted in a relatively small population, with a focus on tourism and sustainable development to maintain its delicate ecosystems.

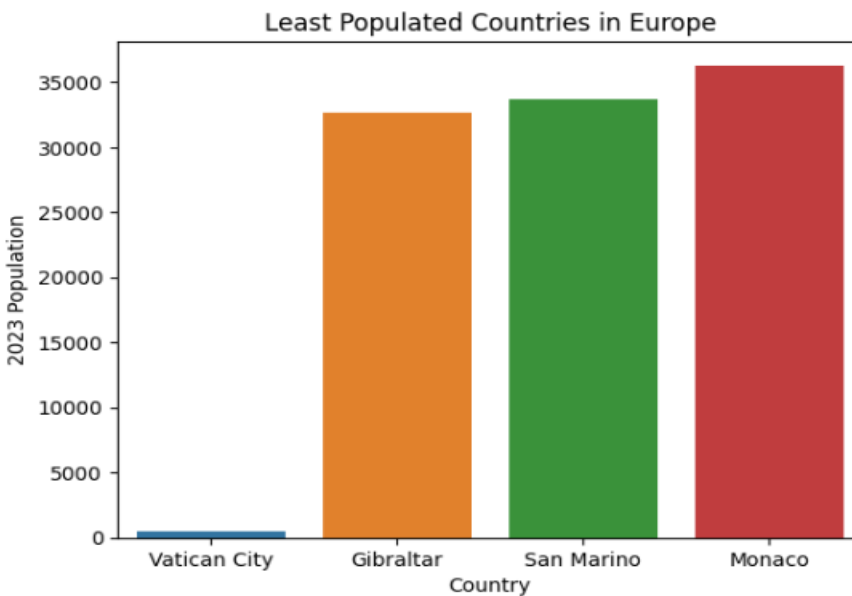


Figure 17 Least populated countries in Europe

Most interesting reading here is that Monaco and Gibraltar not only have one of the lowest populations but also one of the lowest areas which we come onto later making them two of the densest nations in the world.

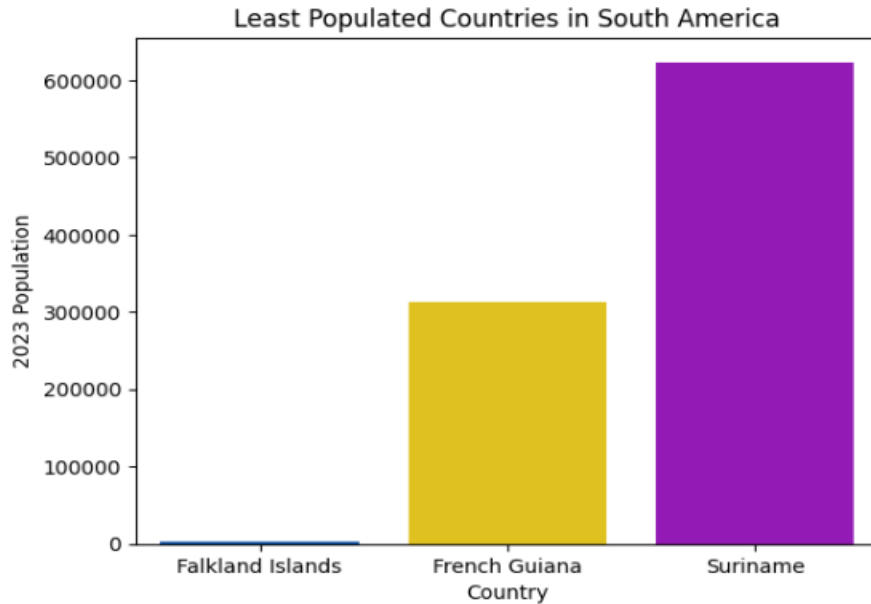


Figure 18 Least populated countries in South America

Suriname remains one of the least populated countries in South America. Its dense rainforests and remote areas contribute to its low population density, with most of its citizens residing in urban centres along the coast. Falkland Islands is one of the lowest populated countries in general.

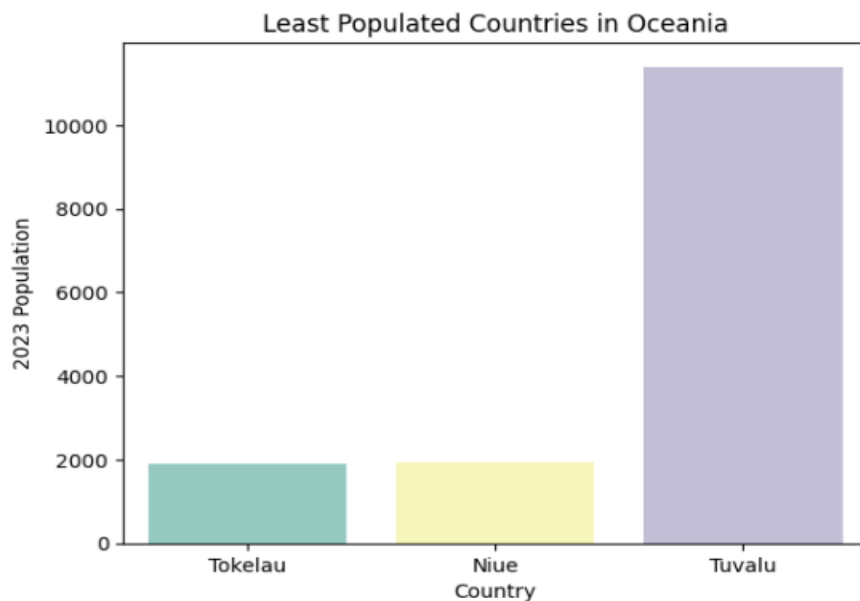


Figure 19 Least populated countries in Oceania

In Oceania, the Pacific Island nation of Tuvalu stands as one of the least populated countries. Its small land area and vulnerability to rising sea levels have limited its population growth, with its people facing unique challenges related to climate change.

Key Factors for Population Analysis

Area

Area plays a significant role in shaping population dynamics and trends, as it directly influences the distribution, density, and growth of human populations. The size and characteristics of a specific geographic area can have profound effects on how populations are distributed and how they interact with their environment.

Different to the population the area is a lot more evenly distributed between continents.

The area distribution between continents can be seen below in a pie chart.

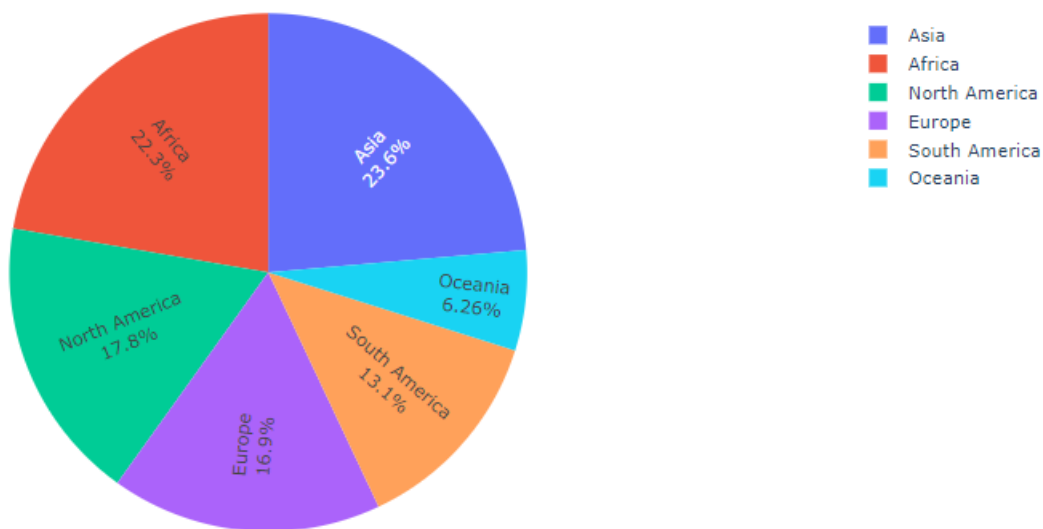


Figure 20 Area distribution between continents

Asia, Africa, and North America are the 3 biggest continents in terms of area. Asia, the largest continent, spans from the Middle East to the Pacific Islands, hosting a multitude of cultures, languages, and ecosystems. Its immense landmass is home to some of the world's most populous countries and varied geographic features, ranging from the Himalayas to the vast deserts.

North America, with its expansive territories including Canada, the United States, and Mexico, ranks third in terms of land area. The continent's economic power and technological advancements have made it a key player in the global arena.

Africa, known for its rich biodiversity and cultural heritage, is the second-largest continent. Its vast land area spans from the Sahara Desert in the north to the expansive savannas and rainforests

in the south. Africa's diverse ecosystems are home to unique wildlife and diverse ethnic groups, contributing to its cultural richness and ecological significance.

These continents with the most land area play crucial roles in shaping global geopolitics, culture, and environmental diversity. Their vast expanses house a wealth of natural resources, support diverse ecosystems, and provide habitats for an array of species. The interactions and intersections of these continents have influenced the course of history and continue to have a profound impact on the world's development and interconnectedness.

The Tree map below shows us the biggest countries in terms of area in each continent with the colours indicating amount in km^2 . We can figure out Russia is the biggest land occupied nation. China, Canada, United States, Brazil, and Australia are the other big countries area wise.

Area Treemap

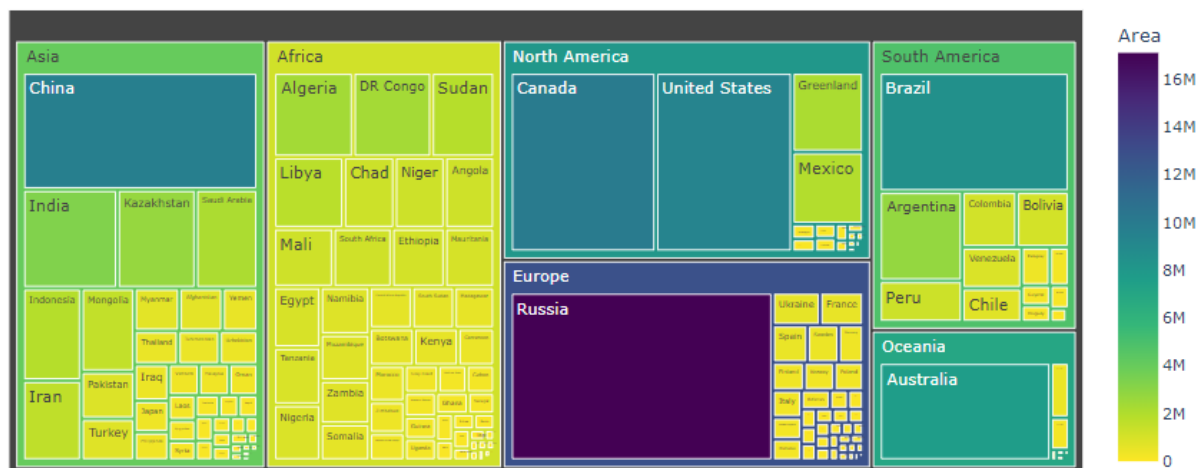


Figure 21 Countries that have the biggest Area in each continent

These large countries often encompass diverse landscapes and ecosystems, leading to varying patterns of settlement and resource distribution. Countries with vast landmasses might have pockets of dense population in urban centres, surrounded by sparsely populated rural regions.

One observation that can be made from this data is that Russia carries most of the weight for Europe in we talk about area cover. Similarly, Brazil and Australia for South America and Australia respectively.

In contrast, smaller areas, like cities or islands, might experience high population density due to limited available land.

Let's look at the actual top 10 countries with most Area. It is shown in a bar horizontal graph below.

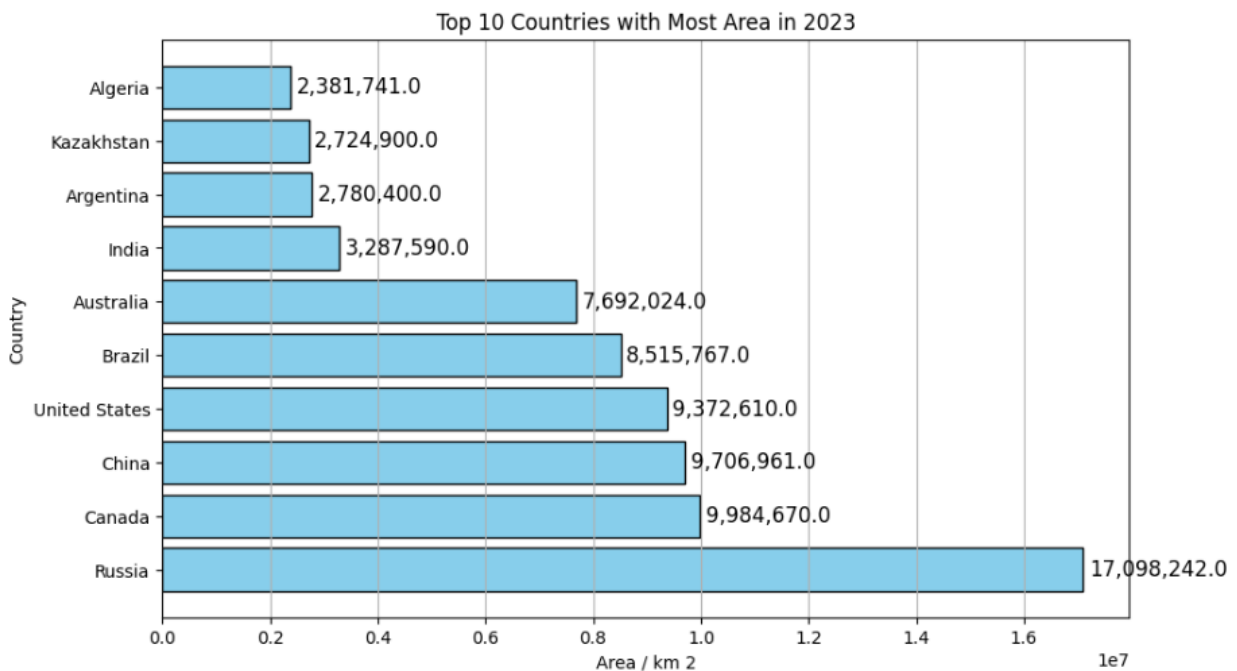


Figure 22 Top 10 countries occupying the biggest area per km²

The countries with the largest land areas in the world encompass vast expanses of territory that contribute to their prominence on the global stage. Nations like Russia, Canada, and China stand out as some of the largest countries in terms of land area. Russia is the biggest country when it comes to Area with its area being approximately 17098242 km². From our previous findings we know Russia is 9th when comes to population so it suggests it has a lot of land that is unpopulated. Canada is another one of those countries. It's also interesting that India despite having one of the most population doesn't fall in the top 6 of the countries with most area.

Overcrowding has long been a pressing issue in India, arising from the country's vast population and limited available resources. With a population of over 1.3 billion people, India faces significant challenges in providing adequate living space, infrastructure, and essential services to its citizens. The concentration of people in urban areas, fuelled by rural-to-urban migration and economic opportunities, has led to densely populated cities struggling to accommodate their residents. (Chandrasekhar,2022)

If we look at the other end of the spectrum, the countries with lowest Area are shown below. We will see familiar names that were there in the least populated nations list.

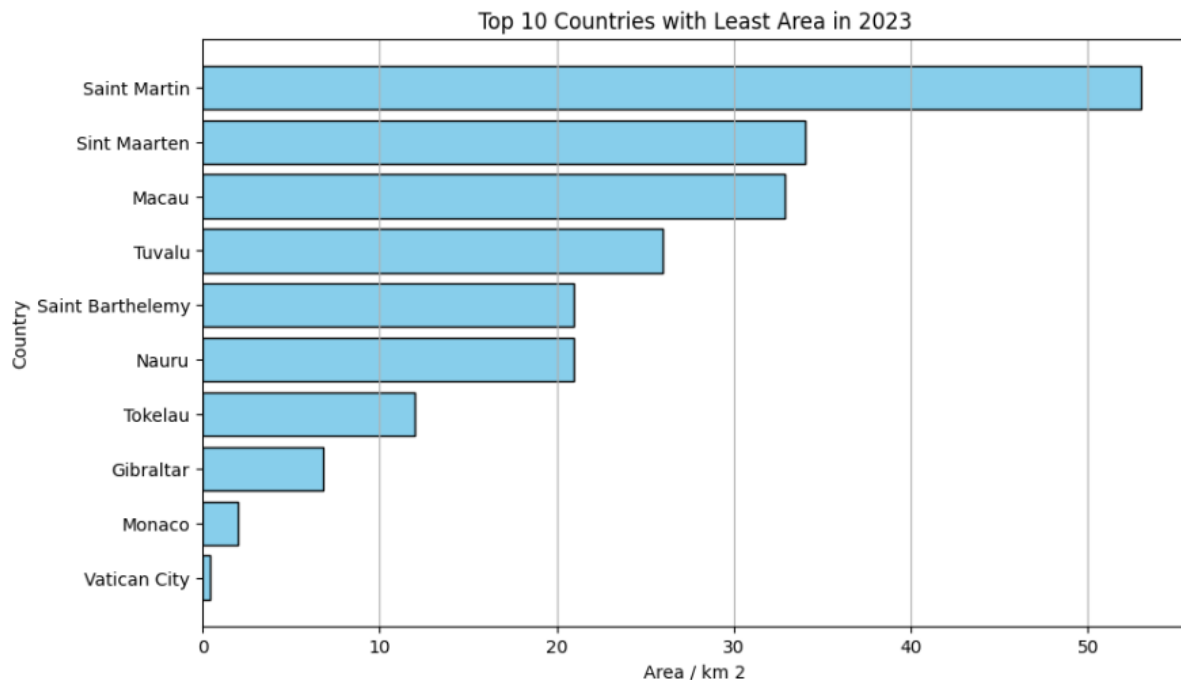


Figure 23 Top 10 countries occupying the smallest area per km²

Vatican City, the world's tiniest independent state, spans merely 44 hectares and serves as a spiritual hub for the Catholic Church. Monaco, nestled along the French Riviera, covers around 2.02 square kilometres and is synonymous with luxury and prestigious events. Nauru, a Pacific Island nation, occupies approximately 21 square kilometres and is notable for its phosphate mining heritage. Tuvalu, comprised of atolls and islands in the Pacific Ocean, spans about 26 square kilometres. San Marino, a historic enclave surrounded by Italy, encompasses roughly 61 square kilometres. Liechtenstein, nestled between Switzerland and Austria, stretches across 160 square kilometres of alpine landscapes. Lastly, the Marshall Islands, known for their atolls and islands in the central Pacific, cover about 181 square kilometres. These countries, despite their limited land areas, each possess unique cultural identities and histories that set them apart on the global stage. (Wereldreizigers, 2023)

Density

Population density is a measure of the number of people living in a particular area, usually expressed as the number of people per unit of land area. It is an important indicator of the spatial distribution of population and reflects the level of human concentration in each area.

Population density can have several impacts on society and the environment. In densely populated areas, there may be greater demand for resources such as food, water, and energy, which can lead to increased competition, price volatility, and potential conflicts. High population density can also put pressure on infrastructure systems, such as transportation, housing, and health care, leading to overcrowding, congestion, and reduced access to services. Additionally, high population density can increase the risk of disease transmission, as well as environmental degradation and pollution, due to the concentration of human activities in a small area. (Pettinger & Adamu, 2019)

In contrast, low population density can have its own set of challenges and opportunities. While sparsely populated areas may offer more room to move and greater access to natural resources, they may also be more vulnerable to environmental disasters, such as droughts, floods, and wildfires, which can have devastating impacts on small populations. Additionally, low population density can pose challenges for service delivery and infrastructure development, as it may be more difficult and costly to provide services to remote areas with small populations. (Pettinger & Adamu, 2019)

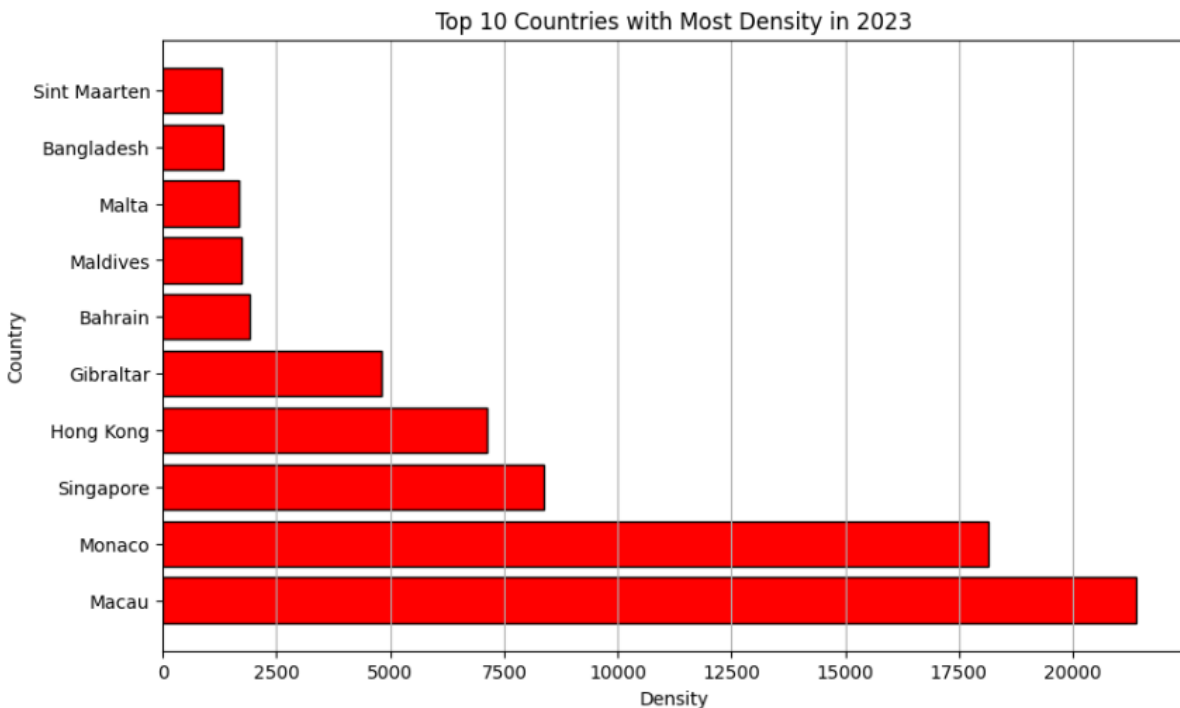
Below is a Density tree map to find out countries with the most density below in each continent.

Density Treemap



Figure 24 Tree map showing the densest countries in each continent

According to our data, the most densely populated country in the world is Macau, with a population density of approximately 21,402 people per square km. Other densely populated countries include Monaco, Singapore, Gibraltar, Honk Kong, Bahrain, and Malta.



The world's most densely populated countries are characterized by their remarkable ability to accommodate large populations within relatively limited geographic areas. These nations exhibit a high population density, which is often a result of factors such as urbanization, economic opportunities, and cultural dynamics. Countries like Macau, Monaco, Singapore, and Bangladesh stand out as some of the most densely populated nations on the planet.

These densely populated countries highlight the intricate balance between economic opportunities, urban planning, and environmental sustainability. They underscore the importance of innovative policies and technologies to manage resources and ensure that a high population density doesn't lead to adverse social or ecological consequences.

In contrast, some of the least densely populated countries in the world include Mongolia, Greenland, Falkland Islands, Mongolia, and Australia, which have vast expanses of land but relatively small populations. They are seen below in a horizontal bar graph below.

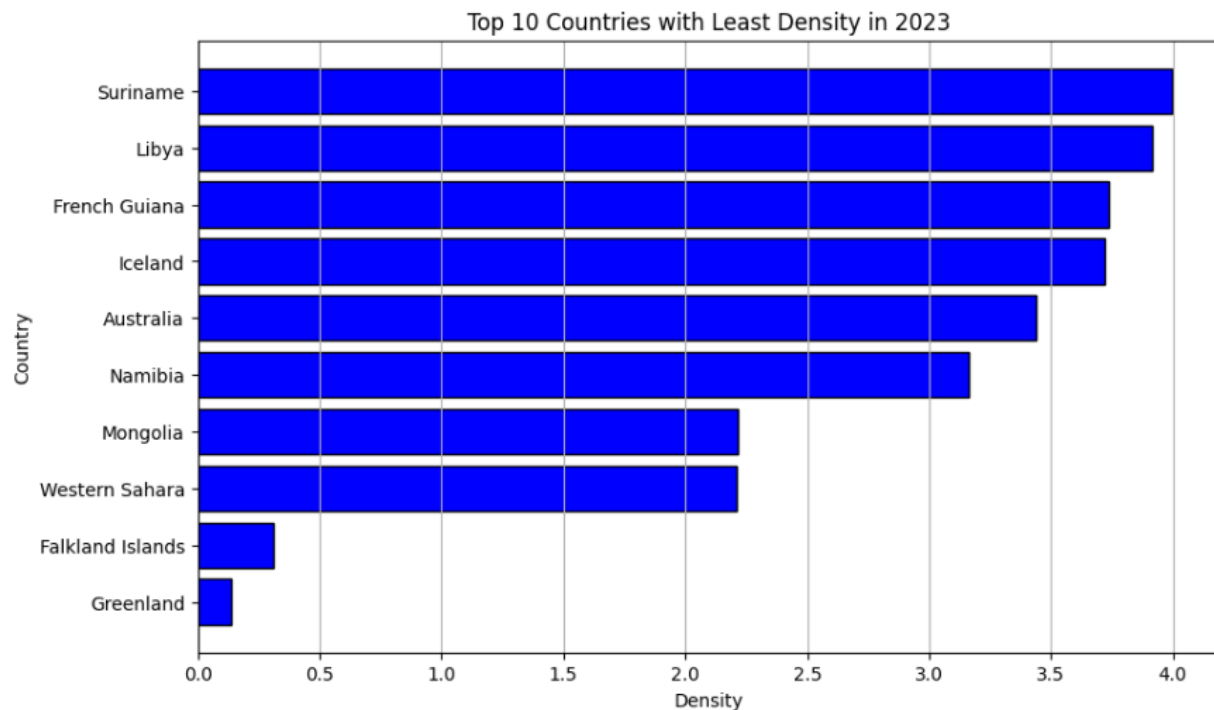


Figure 25 Top 10 countries least densest countries

The least densely populated countries in the world possess vast expanses of land that are sparsely inhabited, often characterized by rugged landscapes, remote regions, and a lower concentration of human settlements. Nations such as Greenland, Mongolia, and Namibia exemplify this demographic trend.

These least densely populated countries highlight the coexistence of sparse human settlements and natural beauty. They underscore the challenges of development and resource management in remote and less accessible areas, emphasizing the need for balanced policies that respect both the environment and the cultural heritage of these nations.

Population density influences migration patterns, as people often seek regions with optimal balance in density that aligns with their preferences and needs. Policies addressing population density involve urban planning strategies, zoning regulations, and sustainable development practices aimed at managing growth and ensuring a high quality of life.

Next, we look the most and least dense continents. The figure below gives us an idea on density per km² of each continent.

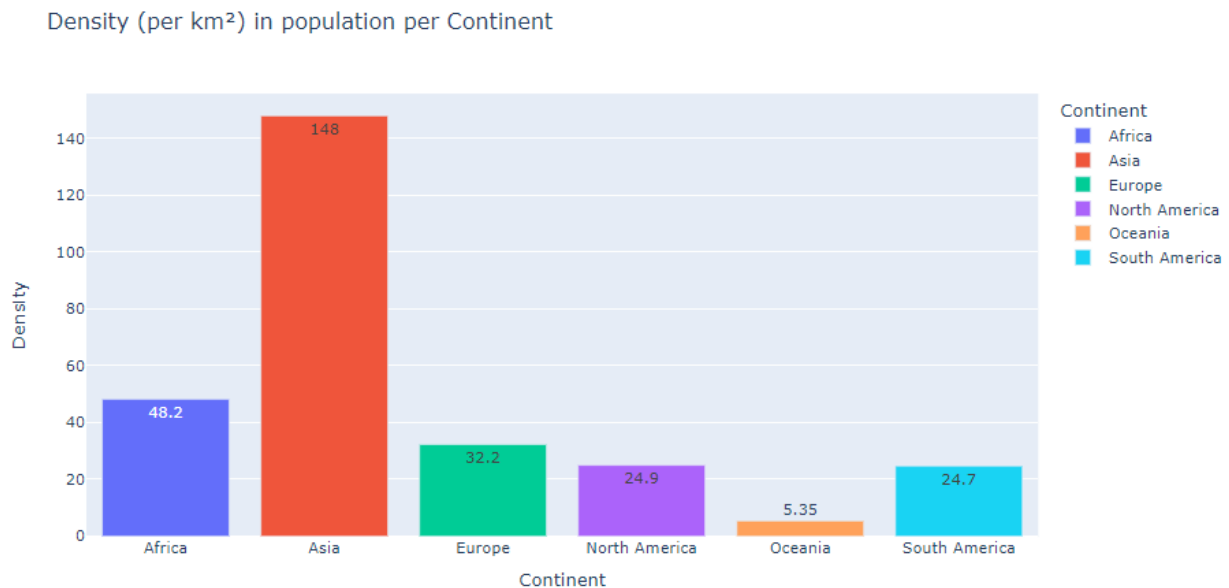


Figure 26 Density (km2) in population per continent

As of the present, the continents with the highest population density stand out as centres of remarkable human concentration. Asia, often recognized as the world's most populous continent, also exhibits the greatest population density due to its vast population and relatively smaller land area. Within Asia, regions like South Asia and East Asia, including countries like India, China, and Bangladesh, showcase some of the highest population densities globally. Furthermore, Europe, with its numerous urban centres and advanced economies, ranks among the densely populated continents. Countries like Monaco, the Netherlands, and Belgium contribute to Europe's elevated population density. These densely populated continents grapple with intricate challenges related to urbanization, resource management, and infrastructure development to accommodate their substantial populations. (United Nations, 2019)

Understanding population density is integral for policymakers, urban planners, and researchers to make informed decisions regarding land use, infrastructure development, and resource allocation. It underscores the delicate balance between accommodating growing populations and preserving the environment while striving for optimal living conditions for all.

Growth Rate

Population growth rate is a critical factor that profoundly shapes the size, composition, and demographic trajectory of a population. It represents the rate at which a population increases or decreases over a specific period, often expressed as a percentage. This growth rate is influenced by birth rates, death rates, immigration, and emigration, reflecting the complex interplay of biological, social, economic, and environmental factors.

According to World Bank, the global population growth rate was estimated to be 2% in 1972. It was 1.05% in 2020. (World Bank, 2022)

From our data for 2023, The current population growth rate is 0.97%. Here is how it was calculated.

```
In [137]: # average population growth rate
          df['GrowthRate'].mean()

Out[137]: 0.009736752136752137
```

Figure 27 Current growth rate calculation

Population growth rate declining can be attributed to various factors, including changes in birth rates, death rates, fertility rates, economic development, and social dynamics. Here are some key reasons for declining population growth rates.

- **Fertility Decline:** Improved access to education, particularly for women, has been linked to declining fertility rates. As education levels rise, women often delay childbearing and choose to have fewer children.
- **Urbanization and Industrialization:** As societies urbanize and industrialize, people tend to have fewer children due to changes in lifestyle, family structure, and economic conditions. Urban areas often offer better access to family planning and healthcare services.
- **Family Planning and Contraception:** Widespread availability and use of contraception methods have allowed individuals to control their family size, leading to decreased birth rates. (Bongaarts, 2008)
- **Economic Development:** Economic growth and increased prosperity often correlate with declining birth rates. As economies develop, families may choose to have fewer children to ensure better living standards for each child.

- **Gender Equality:** Empowerment of women and increased gender equality lead to delayed marriages and childbearing, as well as increased participation in the workforce. (Caldwell, 1982)
- **Government Policies:** Government policies promoting family planning and providing incentives for smaller families can contribute to declining population growth rates.

Population growth rates vary widely by region and country. For example, Africa has the highest population growth rate, while Europe has the lowest population growth rate as can be seen in the figure below.

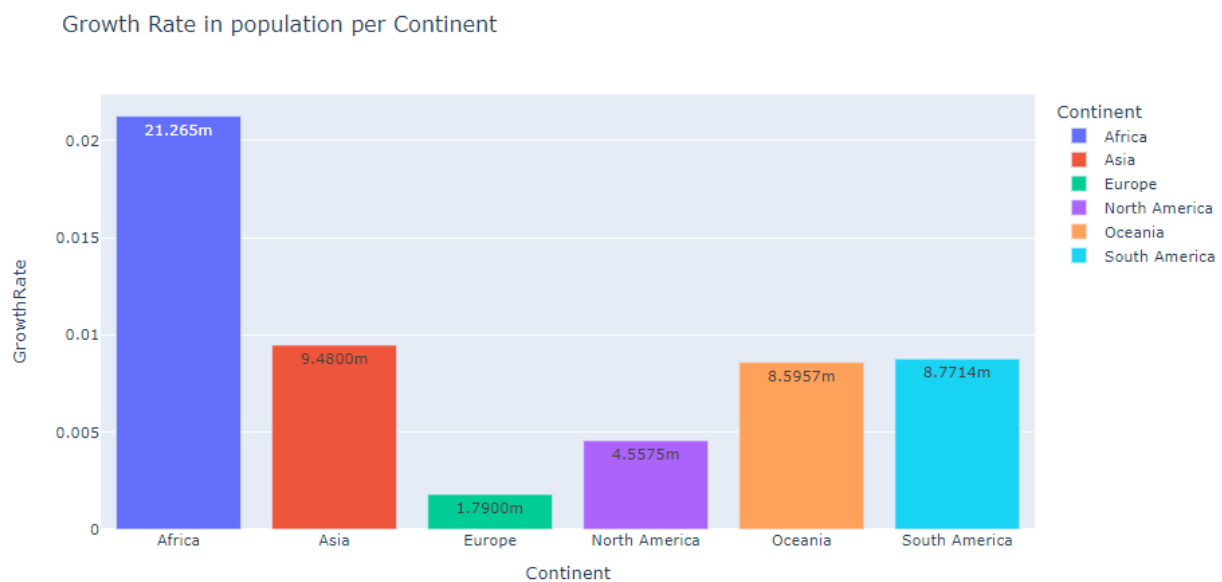


Figure 28 Population growth rate per continents

Africa is considered the fastest growing continent and the data back it up. Over half of the global population surge anticipated until 2050 is predicted to transpire in Africa. The population of sub-Saharan Africa is forecasted to double by 2050. Even with a significant decrease in fertility rates in the foreseeable future, a swift population escalation in Africa is expected. Despite the uncertain prospects of fertility trends in Africa, the substantial youth populace on the continent is poised to mature in the next years and eventually become parents themselves. This ensures that the region will have a pivotal role in shaping the worldwide population size and distribution in the forthcoming decades. (United Nations, 2022)

In stark contrast, the populations of 61 nations or regions across the globe are projected to diminish by 2050, with 26 of them potentially experiencing a decrease of at least ten percent. Several

countries could witness a population decline exceeding 15 percent by 2050. This group includes Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Japan, Latvia, Lithuania, Republic of Moldova, Romania, Serbia, and Ukraine. Fertility rates in all European countries currently fall below the threshold required for the sustainable replacement of the population in the long term (approximately 2.1 children per woman). In most instances, fertility has remained beneath this replacement level for multiple decades. (United Nations, 2022)

Syria has seen the highest Growth Rate in terms of countries. The rapid population growth in Syria can be attributed to the under-five mortality rate, which is 22.3 per 1,000 births, while the global average is 38 deaths per 1,000 live births, as per UNICEF. A lower under-five mortality rate implies an increased number of children surviving into adolescence and reaching their reproductive ages. (Ijaz, 2023)

Below is a bar chart that illustrates countries with the highest growth rate in 2023 so far. Syria and Moldova are the top nations in this regard.

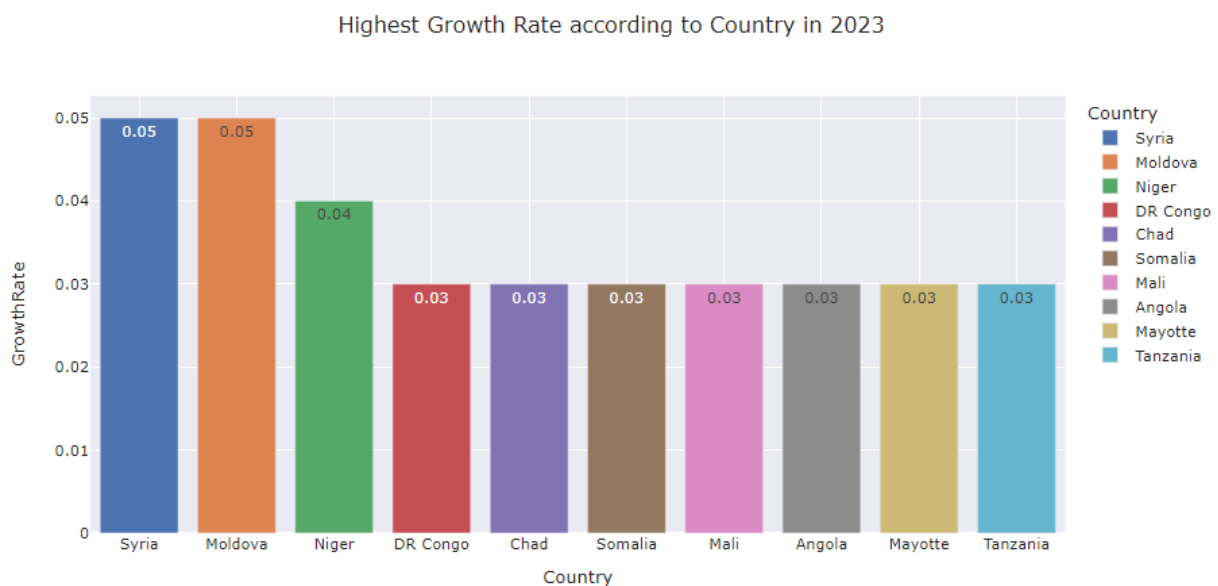


Figure 29 Countries with highest growth rate

These countries are driven by a high birth rate and low death rate and elevated growth rates often face challenges related to providing essential services, infrastructure, and employment opportunities for their growing populations.

If we look at the Growth Rates of these nations having the highest growth rate in 2023 and compare them with their growth rate in 1970 it makes for an interesting reading.

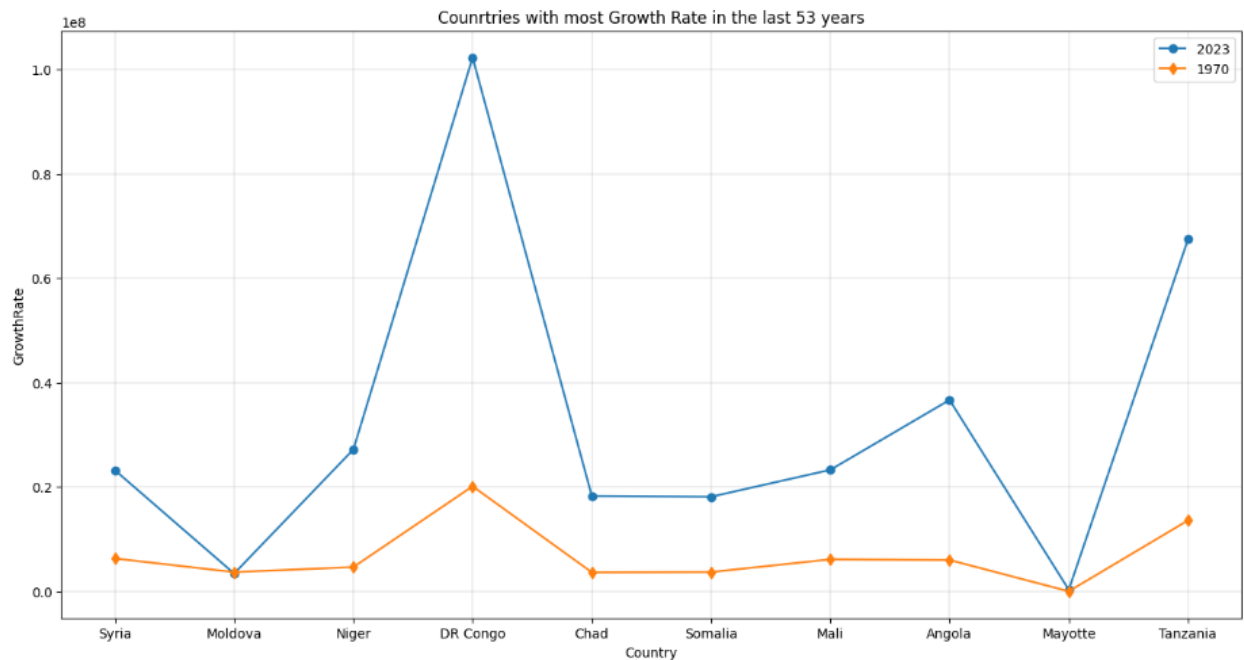


Figure 30 Growth rate comparisons before and now

We can observe, DR Congo, Tanzania are the countries that have seen the biggest growth in this 50 odd year time span. Countries like Somalia, Mali, Angola, Niger, Chad, and Syria has also seen a fair rise. While Moldova and Mayotte do see much change if at all between these two time periods.

Next, we look at the countries with negative growth rate or declining population.

Country	GrowthRate
Ukraine	-0.07
Lebanon	-0.02
Bulgaria	-0.01
Lithuania	-0.01
Latvia	-0.01
Serbia	-0.01
American Samoa	-0.01
United States Virgin Islands	-0.01
Bosnia and Herzegovina	-0.01
Wallis and Futuna	-0.01

Figure 31 Countries with declining population

A very low or negative growth rate, resulting from low birth rates and higher death rates, can lead to population aging and potential workforce shortages. Unsurprisingly most of these nations are in Europe as they are the continent with the lowest growth rate.

The declining population in Europe can be attributed to several interconnected factors. These include consistently low fertility rates, delayed family formation, increased life expectancy, and migration patterns. Fertility rates in most European countries have remained below the replacement level of around 2.1 children per woman for a significant period, resulting in fewer births than necessary to maintain the population size. Additionally, as people delay having children and prioritize career and education, family formation is postponed, leading to a smaller number of births. Moreover, the region's increasing life expectancy contributes to an aging population, with a higher proportion of elderly individuals compared to younger ones. This demographic shift places strain on healthcare systems, social support structures, and pension systems. Lastly, migration patterns also play a role, with some European countries experiencing net outflows of people due to economic opportunities and political stability elsewhere. (Eurostat, 2021)

These growth rates are for the year 2023 which we are halfway through that's why we are seeing relatively low numbers. If we look at the growth rate through the previous 52 years of the top 10 biggest countries it, we get a better understanding of the growth levels in countries.

Below is an illustration of the line chart that encompasses that.

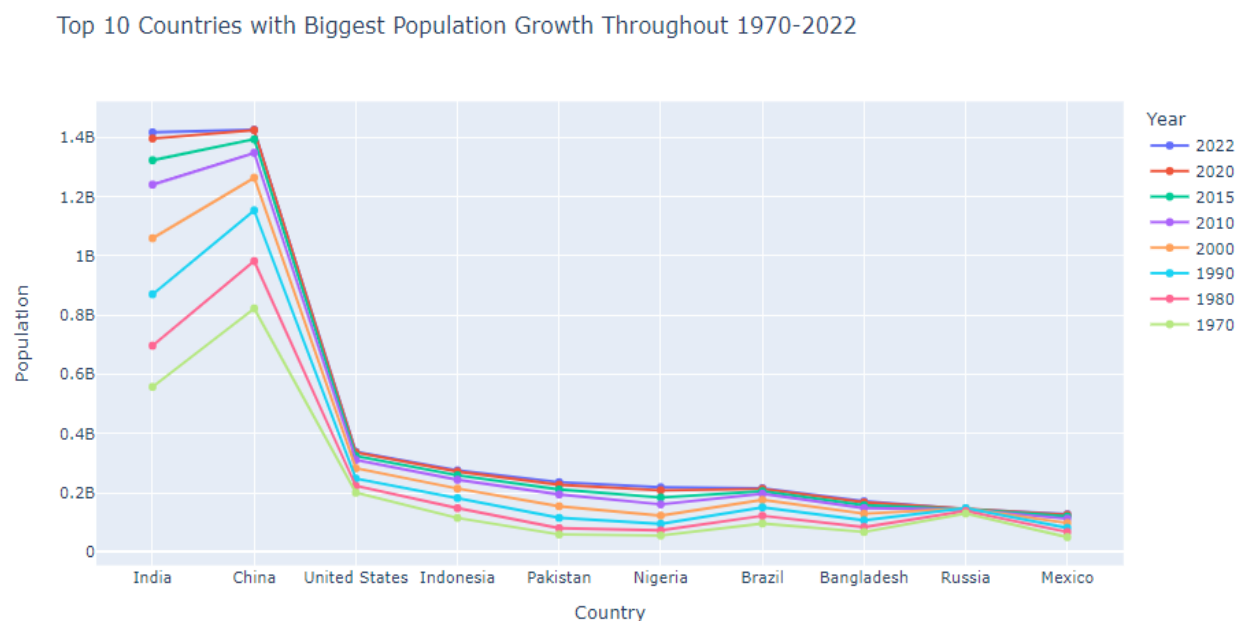


Figure 32 Growth rates of the biggest countries overtime

We can make a few interesting insights from this data. Most glaring one is the constant huge growth India has and continues to make. China's data suggest it has its level of growth is going down in recent years than it did before. The rest of the countries on here have seen minimal growth nothing drastic like India or China over the years. Interestingly, Russia population numbers has not seen much growth at all.

Understanding population growth rates is essential for governments, organizations, and communities to plan, allocate resources effectively, and ensure a balance between population needs and available resources. It informs decisions on healthcare, education, urban development, and sustainable practices, ultimately shaping the well-being and resilience of societies.

Population growth rates in the future involves considering a wide range of factors, including fertility trends, mortality rates, economic development, technological advancements, and social changes. Several factors affect what future growth may look like. We can say it population growth is trending to be relatively low due to these following factors.

- **Population Aging:** With increased life expectancy and lower birth rates, many countries are facing an aging population. This can lead to a lower overall population growth rate. (Bloom, 2010)
- **Global Decline in Fertility:** Many countries are experiencing declining fertility rates, leading to slower population growth. As education and economic opportunities increase, couples tend to have fewer children. (United Nations, 2019)
- **Urbanization:** As urban areas continue to expand, rural-to-urban migration can affect population growth rates. Urbanization tends to correlate with lower fertility rates. (Cohen, 2006)
- **Technological Advancements:** Advances in healthcare and medical technology can impact mortality rates, potentially leading to longer life expectancy and slower population growth. (Oeppen, 2002)
- **Family Planning and Education:** Access to family planning services and education can influence fertility rates, contributing to lower population growth. (Gribble & Bremner, 2012)
- **Policy Interventions:** Government policies promoting family planning and gender equality can have significant impacts on population growth rates. (Cleland, J & Shah, I. H. 2016)