Algonquin College of Applied Arts and Technology

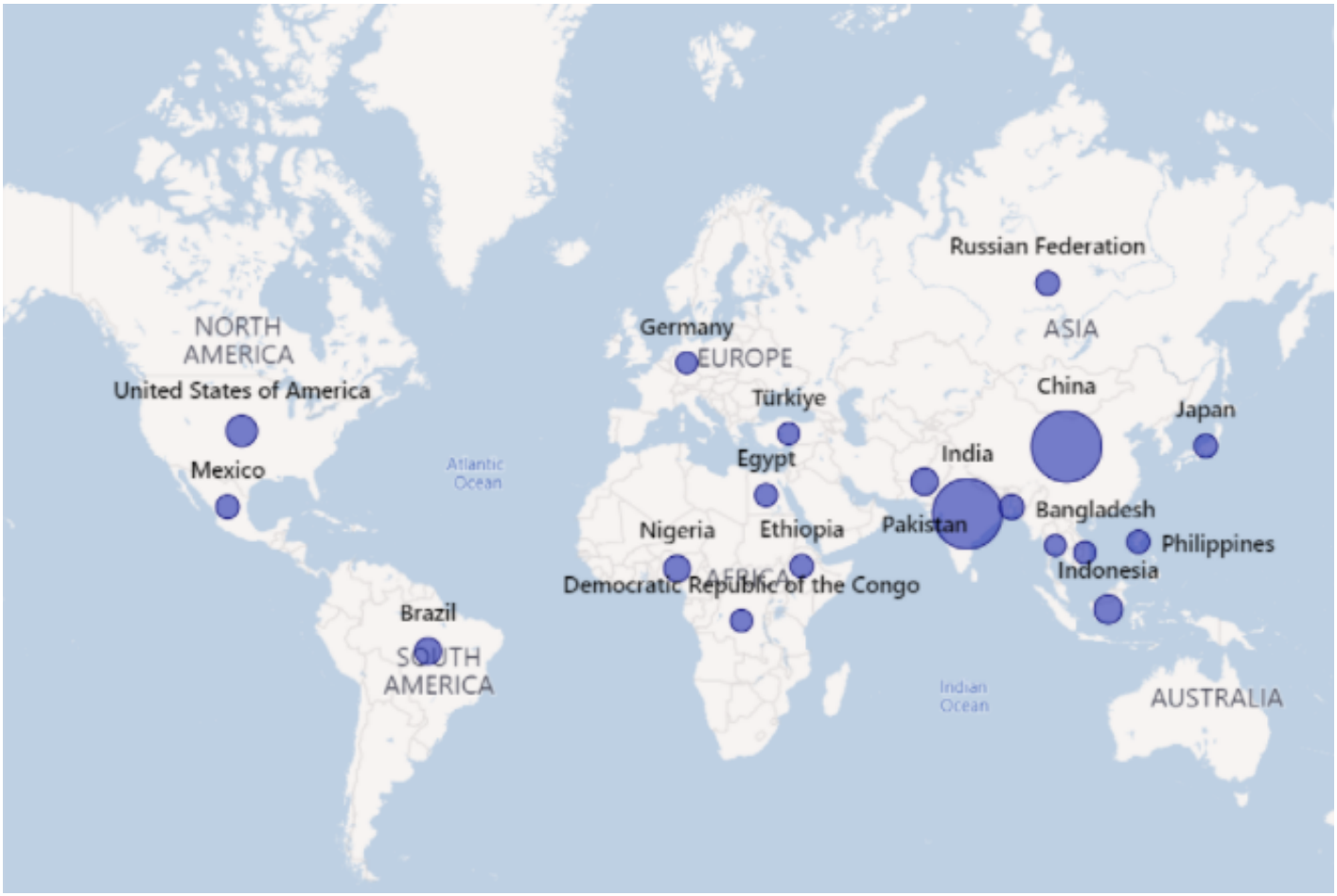
Business Intelligence System Infrastructure

22F_CST2106 - Data Visualization Topics

Final Project

on

Growth of World Population and Future Prediction



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1 EXECUTIVE SUMMARY

Group 10 is pleased to present a report on the Topic: *'Growth on World Population and Future Prediction'*. This work comes along with the data visualization file and a presentation prepared in a collaborative effort by Alin Mary Varghese, Ozal Ganatra, Omoloba Oluwatomiloba Sarah & Wali Hyder (Group 10) to the fulfill the requirement of the final project for the CST2106 - Data Visualization Topics course.

Through meticulous qualitative and quantitative analysis, efforts have been made to find interesting insights and an attempt to predict the future population. The problem statements put forward here and explicitly answered in the background & analysis sections of this document are:

1) "*What are the critical factors that are affecting the global population?*"
2) "*Determine the future prediction of the population for the years 2030, 2040 and 2050 based on current data.*"

Following a decade of rapid population growth, there has often been a concern that population growth is out-of-control, and an end to the growth is not in sight. However, with the help of this report we can quite confidently conclude that despite of the fact the Global population continues to grow, the pace or the growth rate is slowing down.

The interactive tool used for the dataset munging and preparation prior to analysis and final data visualizations is Microsoft PowerBI 2022 Desktop Version 2.111.590.0.

Key Conclusions

- Population growth is primarily caused by declining levels of mortality, increased levels of life expectancy at birth and in part by the increasing annual birth-rates.

- More than 70% of the world population live in the 20 most populous countries of the world.

- In November 2022, the global population exceeded the 8 billion mark and projections suggest that it could grow to around 8.5 billion in 2030 and 9.7 billion in 2050.

- The COVID-19 pandemic has impacted all components of population change, including fertility, mortality, and migration.

Recommendations

To meet the needs of the future generations, sustainable development goals vary from region to region, and their relationship between the population should be considered within the context of climate change and other global environmental challenges that have a direct impact. For example - countries where fertility levels remain high should prepare to meet the needs of growing numbers of children and young people. The

growth of the population solely may not be the direct cause of Environmental Damage, nevertheless it is intensifying the problem and accelerating the timing of emergence of a world-wide crisis.

Evidently all countries should proactively take actions to tackle climate change and protect the environment, with the most developed nations bearing the greatest responsibility of implementing and supporting strategies globally.

1.1 DATA SOURCE

The basis of this report and the dataset used is majorly from the United Nations Department of Economic and Social Affairs, Population Division - World Population Prospects 2022 Dataset (File GEN/01/REV1) [1]. See Appendix 1.0.0 to view the demographic indicators (fields) in the original dataset and also the ones edited.

1.2 SCOPE

The base year taken into consideration for this study and the visualizations is 1950 for a period ranging over 100 years. Hence The scope is from 1st January 1950 to 1st January 2021 and predictions have been done for 2030, 2040 until 2050.

For all analysis done in this paper, when depicting countries only twenty are shown for a couple of reasons, one of which is because presently around 70% of the world's population reside in the top twenty most populous countries. Another reason is that it is broad enough to convey the necessary information, while still apt for visualizations not being cluttered.

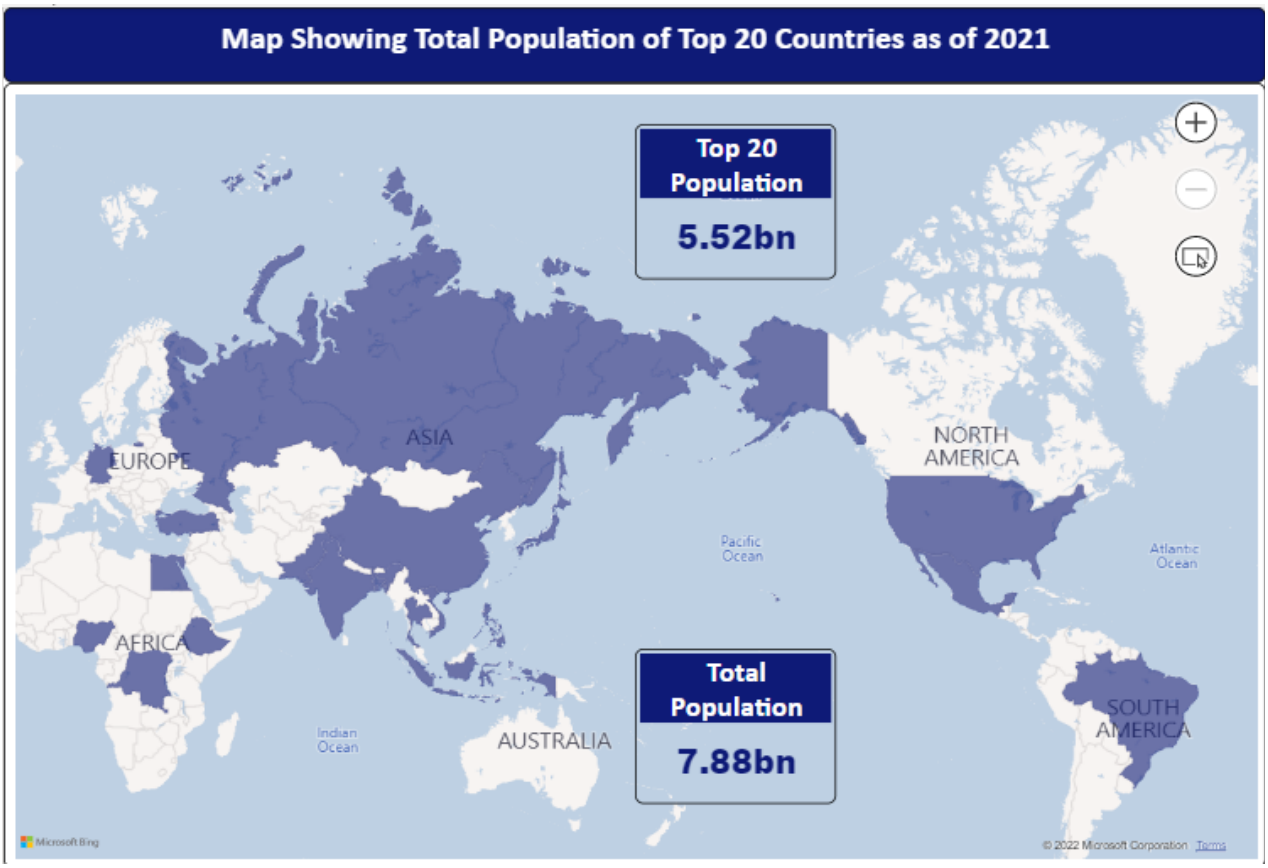
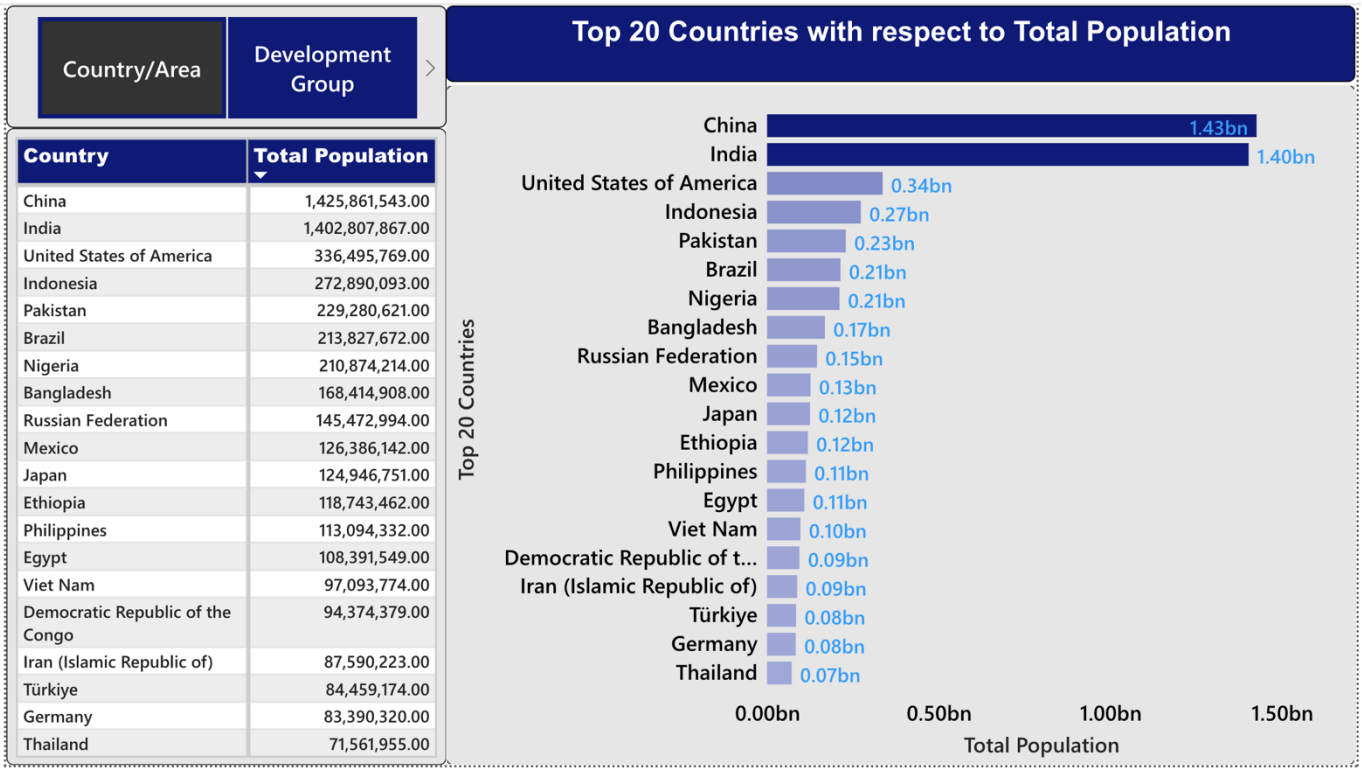


Figure 1:Map of the current top 20 most populated countries.

2 BACKGROUND

The deeper view and a better understanding of the global population has steered complete focus of this report on the demographic indicators and the parameters that have led to the increasing cumulative population growth rates.
Moreover, to cover a major quantity in the world total, the figures of the top 20 countries (≈70 % of the global population) were taken into further scrutiny and this approach was adopted to further expand on the analysis and visualizations.



Country	Total Population
China	1,425,861,543.00
India	1,402,807,867.00
United States of America	336,495,769.00
Indonesia	272,890,093.00
Pakistan	229,280,621.00
Brazil	213,827,672.00
Nigeria	210,874,214.00
Bangladesh	168,414,908.00
Russian Federation	145,472,994.00
Mexico	126,386,142.00
Japan	124,946,751.00
Ethiopia	118,743,462.00
Philippines	113,094,332.00
Egypt	108,391,549.00
Viet Nam	97,093,774.00
Democratic Republic of the Congo	94,374,379.00
Iran (Islamic Republic of)	87,590,223.00
Türkiye	84,459,174.00
Germany	83,390,320.00
Thailand	71,561,955.00

Figure 2:Top 20 most populous countries in 2021

To briefly list the key demographic indicators that have an impact on the population i.e.,

- Birthrates
- Deathrates
- Life Expectancy at birth
- Net Migration

In order to begin visualization, the team performed a series of data cleaning sessions with respect to the above-listed demographic indicators for the entire dataset.

The original dataset was divided into the following major regions based on the definition provided by the United Nations Statistics Division, the countries and areas grouped into eight Sustainable Development Goal (SDG) regions which were then further divided into 21 geographic subregions.

S.No.	Sustainable Development Goal (SDG) regions
1	Sub-Saharan Africa
2	Northern Africa and Western Asia
3	Central and Southern Asia
4	Eastern and South-Eastern Asia
5	Latin America and the Caribbean
6	Oceania
7	Europe and Northern America

Table 1: SDG regions

The dataset was then analyzed with the SDGs grouped into More, Less and Least Developed regions as seen in the table below. This was also factored into the visualization concerning the top 20 countries featured in the image below [1].

S.No.	Development Regions	Description
1	More Developed Regions	Europe, Northern America, Australia, New Zealand and Japan.
2	Less Developed Regions	all regions of Africa, Asia (except Japan), Latin America and the Caribbean plus Melanesia, Micronesia, and Polynesia.)
3	Least Developed Regions	includes 46 countries: 32 in Sub-Saharan Africa, 2 in Northern Africa and Western Asia, 4 in Central and Southern Asia, 4 in Eastern and South-Eastern Asia, 1 in Latin America and the Caribbean, 3 in Oceania

Table 2: Development Regions

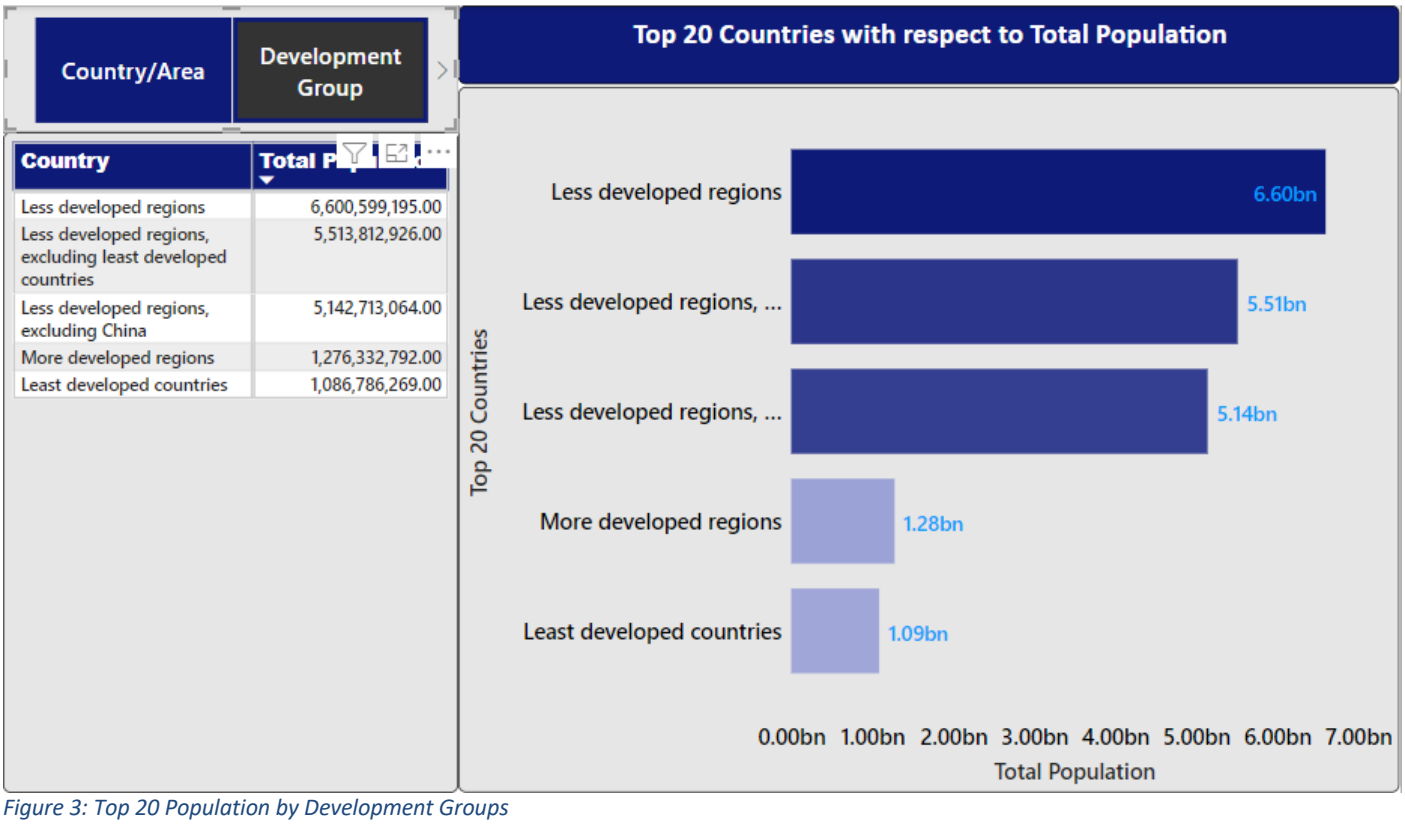


Figure 3: Top 20 Population by Development Groups

Both the more and less developed regions were given designations based on the statistical findings. No justification about the stage reached by a particular country or area in the development process was provided [1]. However, the dataset was analyzed for this project based on the subsets in the table below.

S/N	Project Subsets
1	Country Area
2	Income Group
3	Development Group
4	Region
5	SDG Region
6	Sub-Region
7	World
8	Special other

Table 3: Project subsets

2.1 DATA MUNGING & PREPARATION

2.1.1 SESSION 1

The dataset was uploaded onto the PowerBI to initiate the first round of cleansing which included looking for null values, error quantification and missing parameters. Keeping the primary indicators in mind, calculated formulas were added to omit duplicate values and overlapping fields. A cleaned version of the dataset was prepared by the end of the first round.

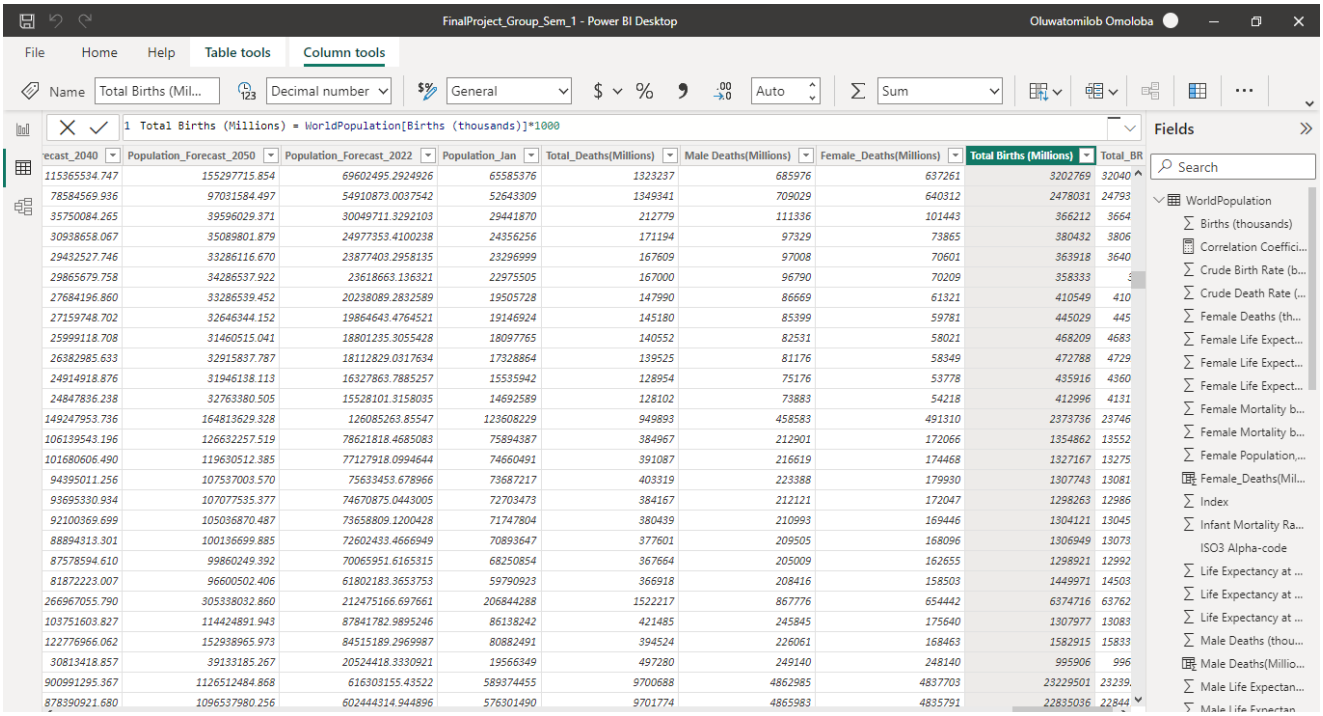


Figure 4 Data Cleaning Session 1

2.1.2 SESSION 2

The second round was focused on data transformation by pivoting and unpivoting columns to convert them into correct datatypes. This was done with the help Power Query Editor, by selecting pivot column in the Transform Tab, the datatype was changed by clicking on the left icon on each column header. All the columns that had to be in measures were in text, changes were made to have its datatype into decimal.the datatype was changed by clicking on the left icon on each column header. A Clear and valuable view of the dataset with rows being grouped by the years for a particular field was achieved in this round. Also, all fields with cumulative population (in thousands) were converted into billions for ease of scale.

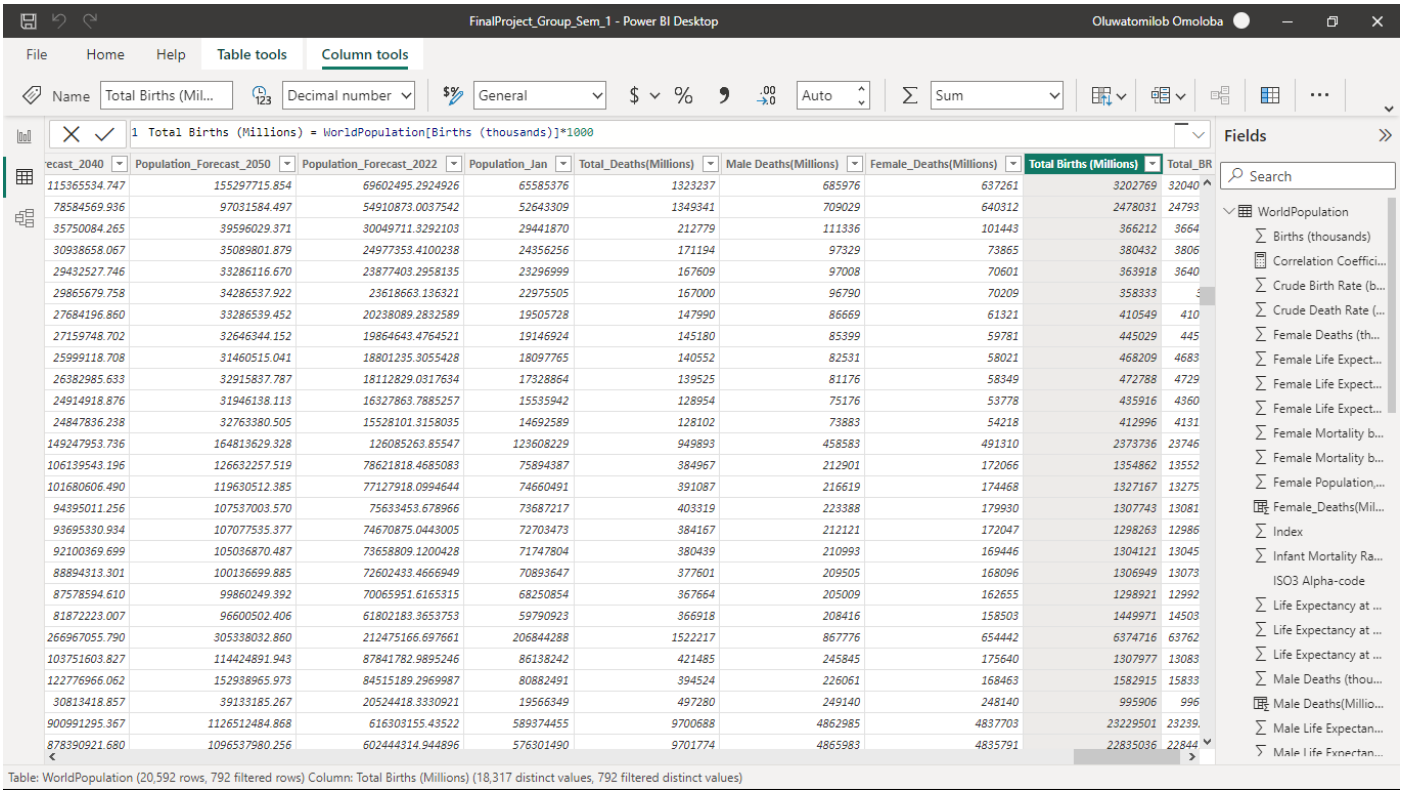


Figure 5 Data Cleaning Session 2

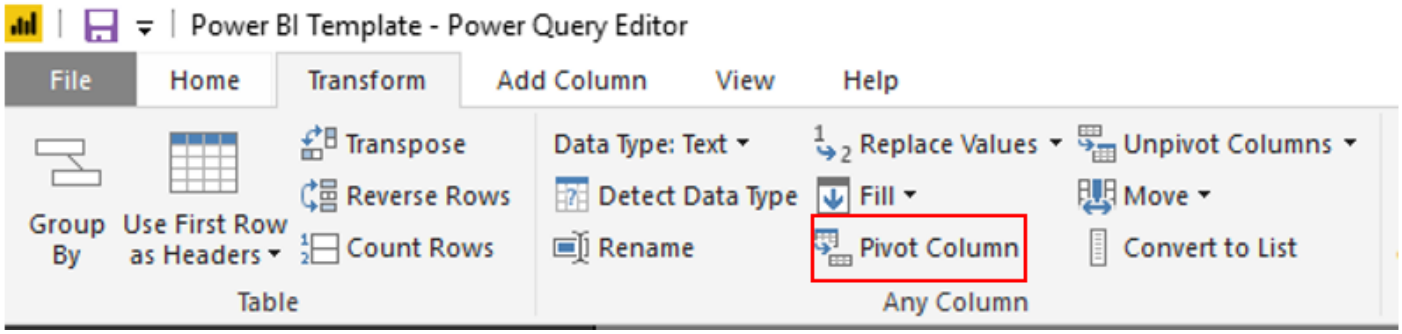


Figure 6 Pivoting and unpivoting columns in Power Query Editor

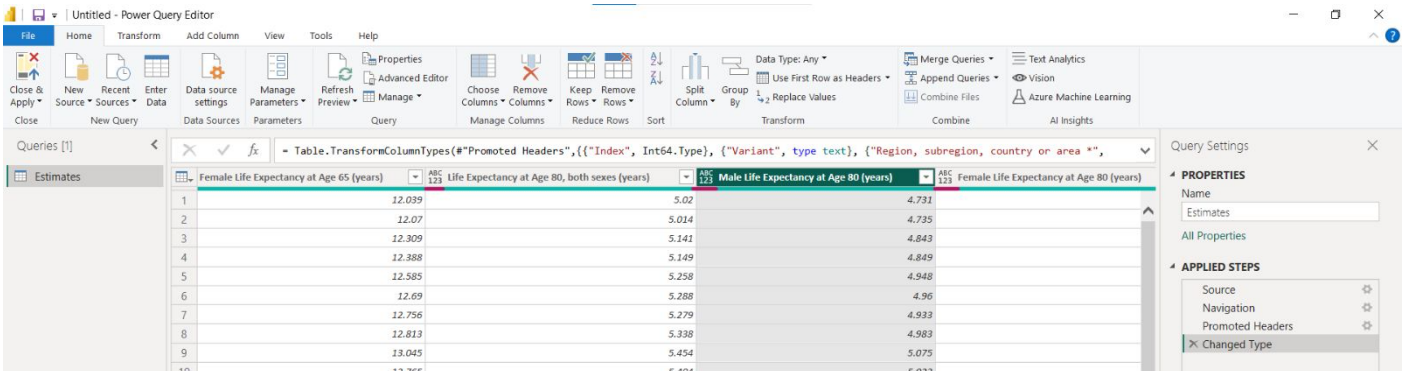


Figure 7 Changed Datatypes

2.1.3 SESSION 3

The last session of preparation included renaming of certain fields in a pre-defined naming convention labels for the ease of identification (See Appendix 1.0.0). This round also included segregation of the required fields from dataset, the rest were examined and hidden/omitted if for no-correlation was found.

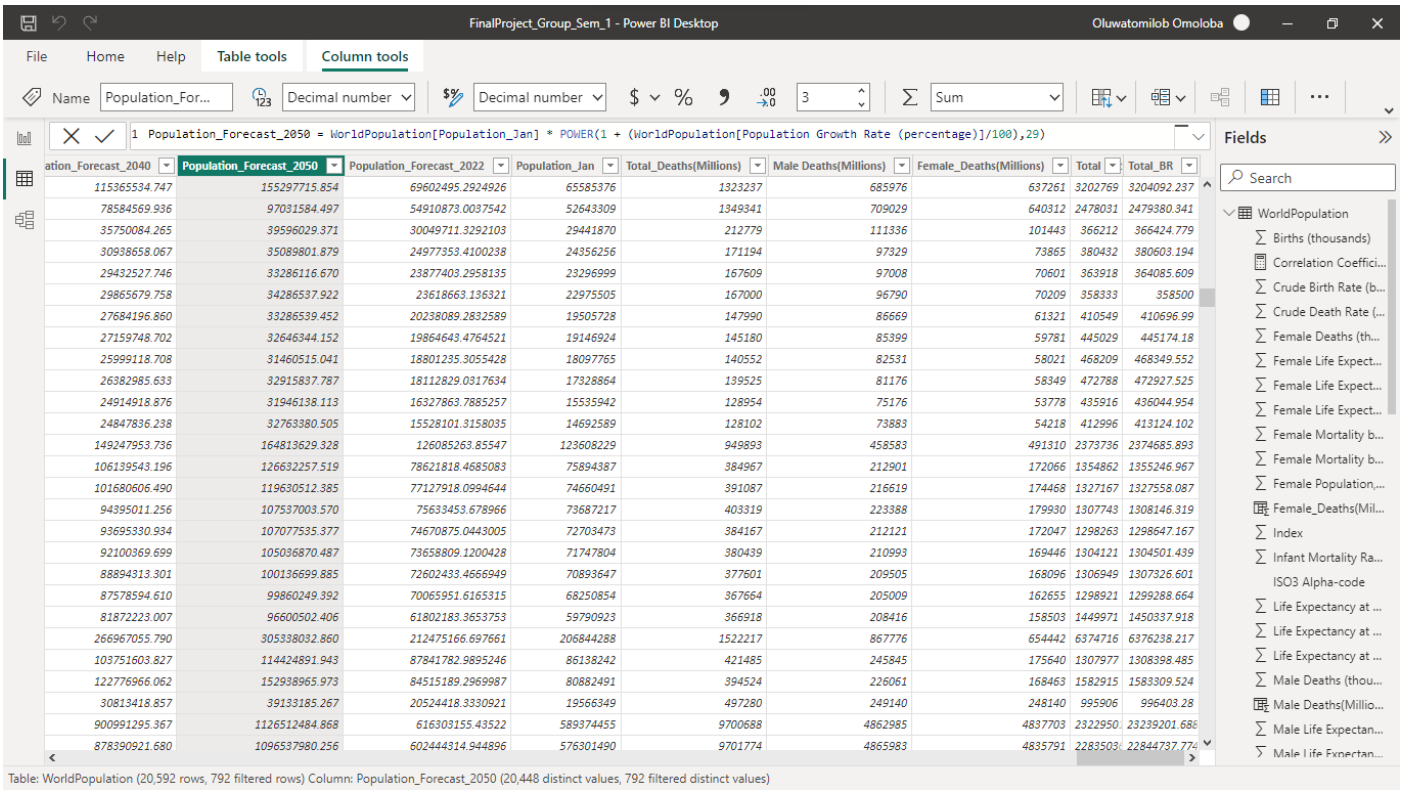


Figure 8 Data Cleaning Session 3

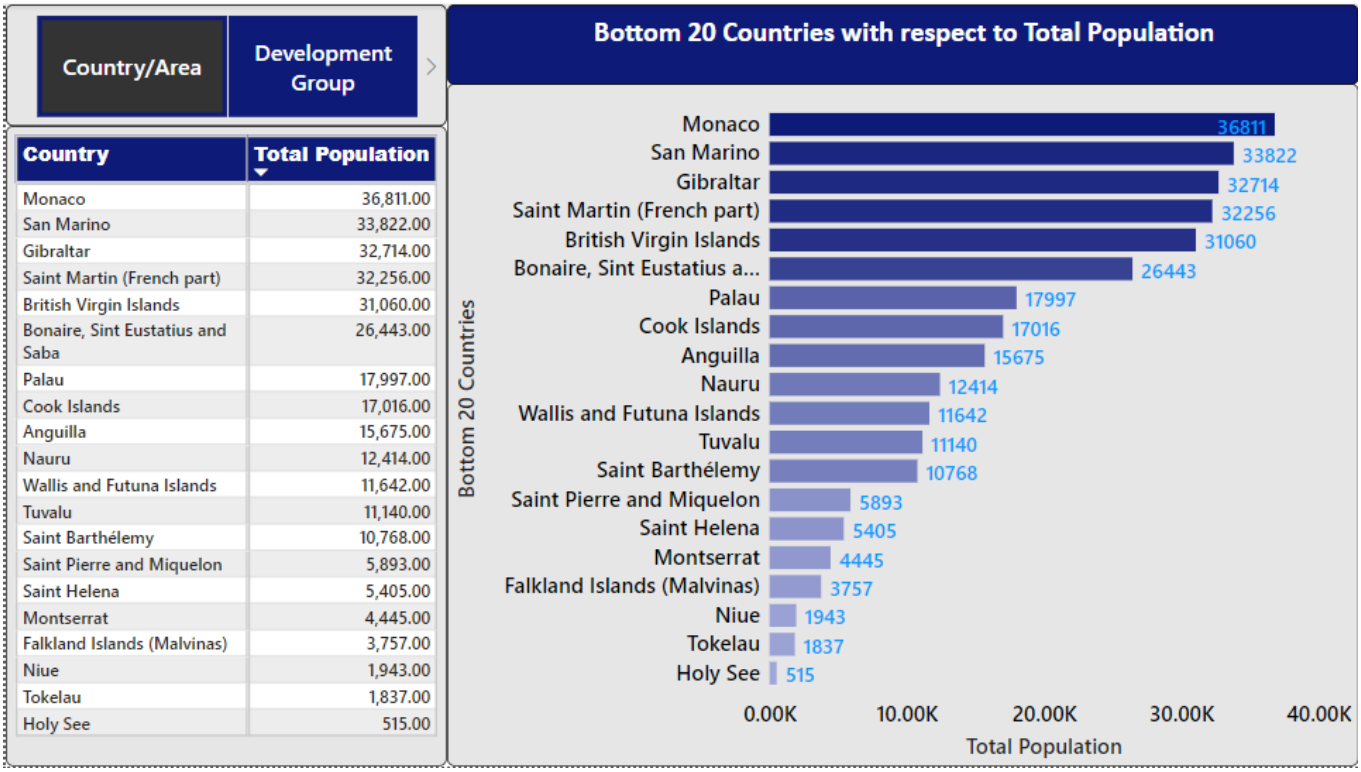
3 ANALYSIS

An analysis of our data will be carried out in line with the problem statements put forward. The following subsections will address the problem statements in detail by providing a supporting analysis from the visualizations performed.

3.1 PROBLEM STATEMENT 1

What are the main factors that are affecting population growth?

Before coming across the dataset, there was a long list of factors that were thought to influence population, some of which were proven to be true and those are the ones addressed in this paper.



Country	Total Population
Monaco	36,811.00
San Marino	33,822.00
Gibraltar	32,714.00
Saint Martin (French part)	32,256.00
British Virgin Islands	31,060.00
Bonaire, Sint Eustatius and Saba	26,443.00
Palau	17,997.00
Cook Islands	17,016.00
Anguilla	15,675.00
Nauru	12,414.00
Wallis and Futuna Islands	11,642.00
Tuvalu	11,140.00
Saint Barthélemy	10,768.00
Saint Pierre and Miquelon	5,893.00
Saint Helena	5,405.00
Montserrat	4,445.00
Falkland Islands (Malvinas)	3,757.00
Niue	1,943.00
Tokelau	1,837.00
Holy See	515.00

Figure 9: Bottom 20 populous Countries

3.1.1 Factors Affecting Population

As stated earlier this paper will only focus on a few aspects affecting population, majorly under birthrates, mortality, and migration.

3.1.1.1 Mortality

From the image below it can be seen that the overall death rate of people less than 60 years of age, has been on a decline from 1950 till date before spiking up in 2020 at the advent of the Covid-19 pandemic, with the male population having a higher mortality rate than their female counterpart.

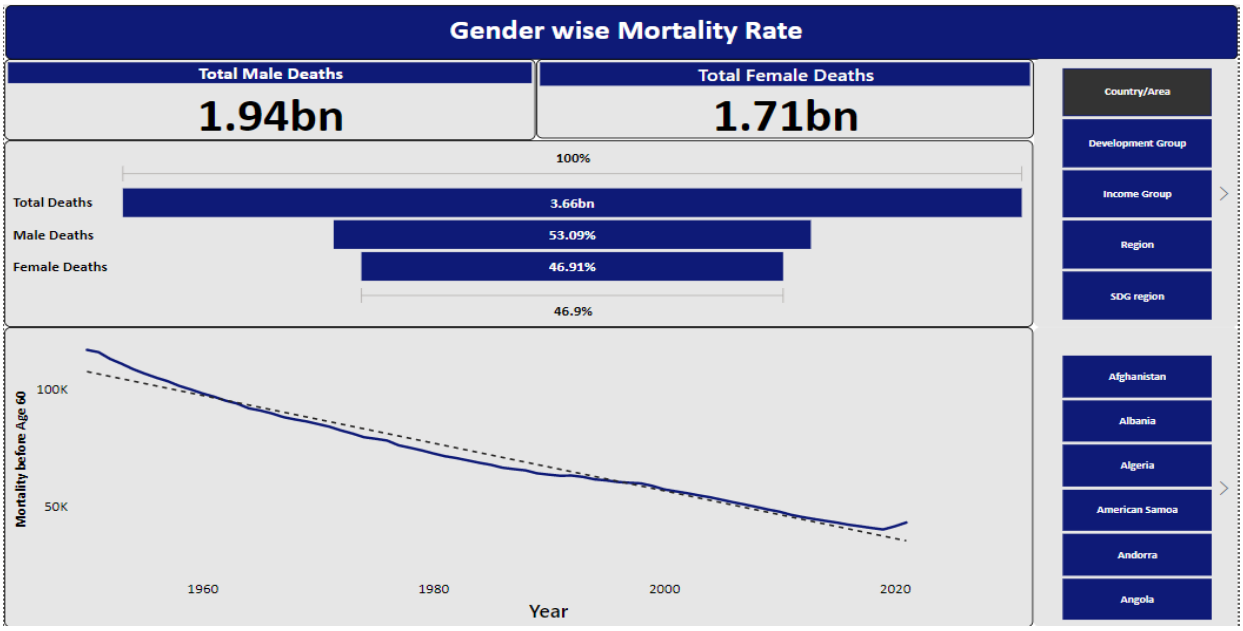


Figure 10: Mortality Rate

The trend from the graph below shows that the global population is seeing a decreased rate of births and an increase in the rate of deaths, implying that at some point not only will they intersect, but will each surpass the other.

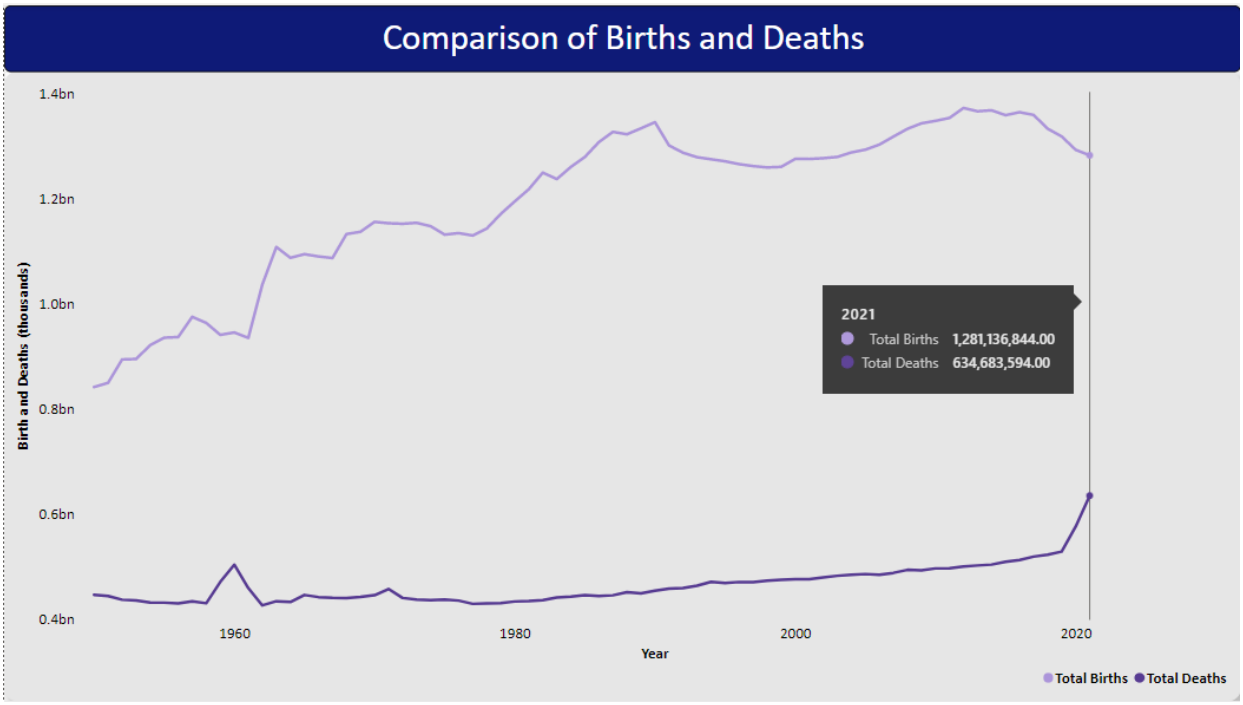


Figure 11: Comparison of Births and Deaths

Even though the birth rate is reducing, the actual number of births is still at an all-time high, “UN data released in 2018 states that around 250 babies are born every minute across the world” [2].

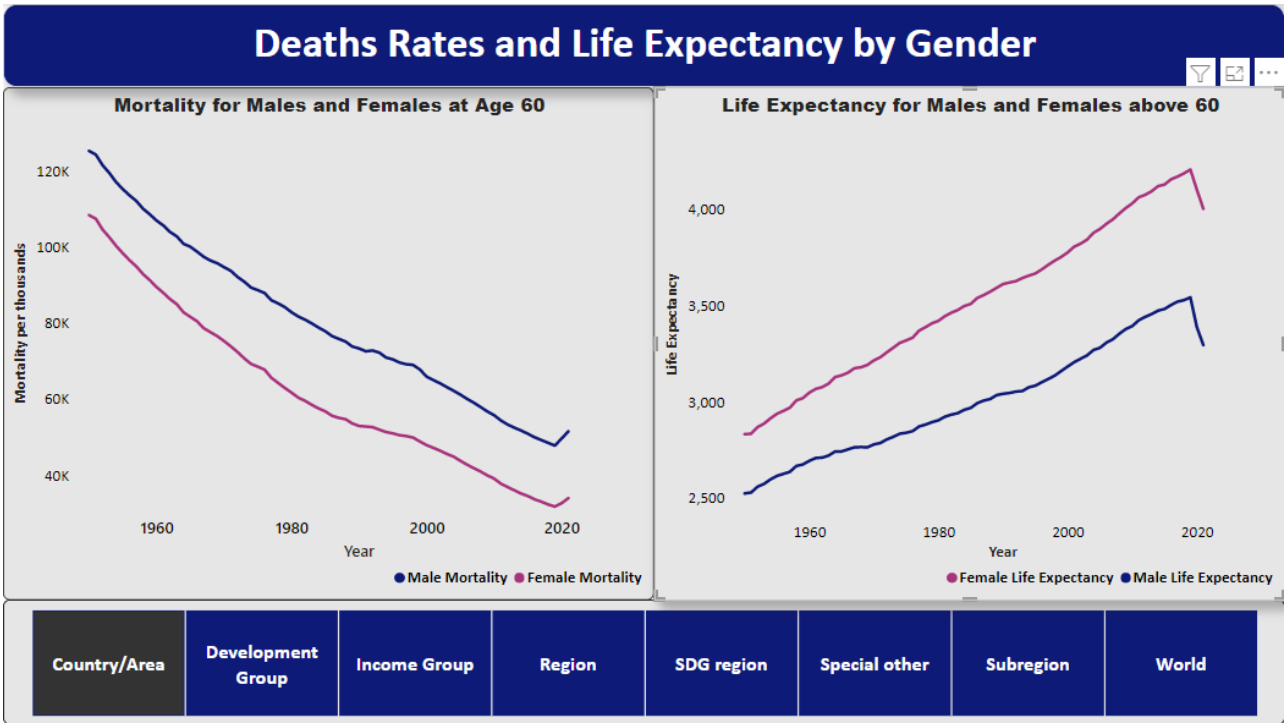


Figure 12:Death Rate and Life Expectancy by Gender

As mentioned above according to the data, males have a higher death rate and a lower life expectancy rate than women, which might contribute to a constant reduction in their numbers when considering the ratio between men and women. Regardless, the overall mortality rate is dropping and life expectancy rate increasing for the population, meaning that more people are living on this planet for longer now, in fact "Life expectancy is expected to rise to 77 years between 2045 and 2050" [2].

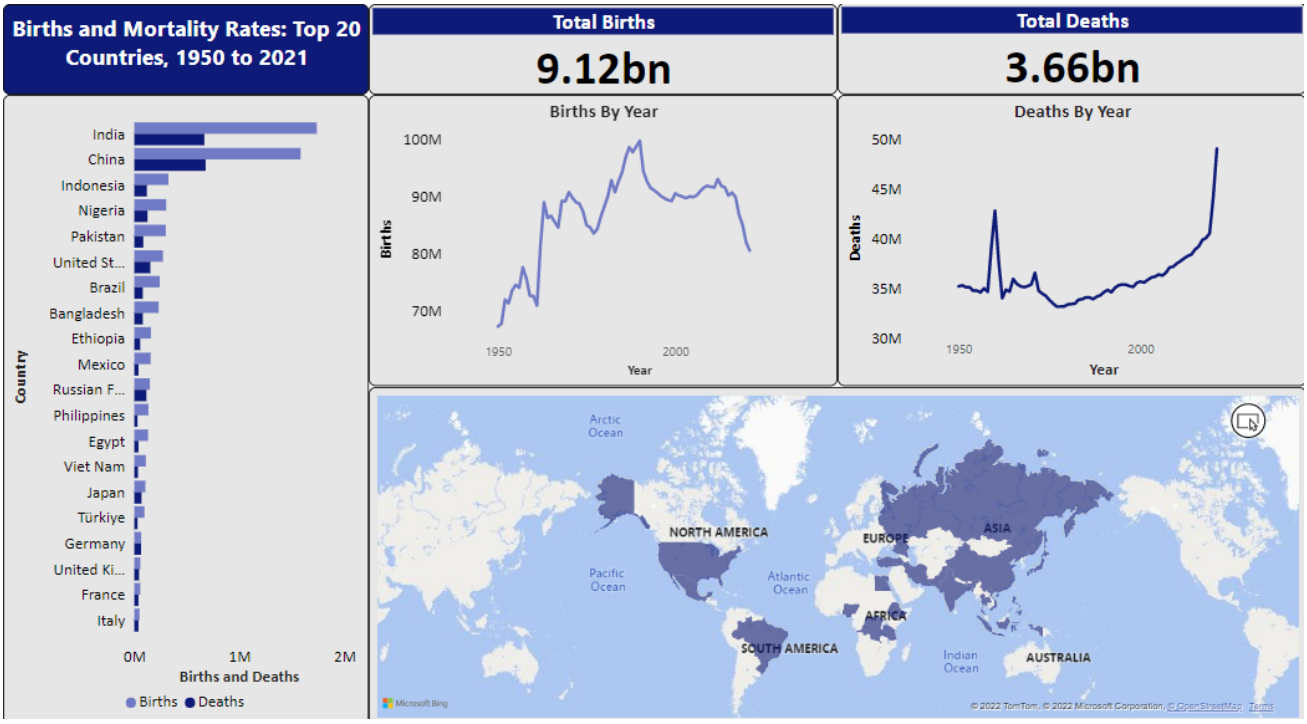


Figure 13: Top 20 countries in terms of birth and death rates dashboard

It has been estimated that anything from 90 billion to 110 billion people have been born from the dawn of humanity to now and considering that the world's current population is the highest it has ever been at any given time, the importance of mortality rate can be seen [3]. From 1950 till date countries in the top 20 range have seen their total birth rate drop and death rate rise, while it can be inferred that an intersecting point will be reached that does not fall within the scope of this paper.

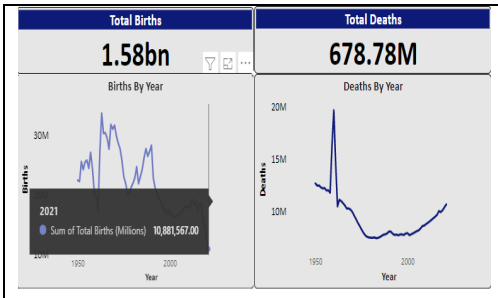
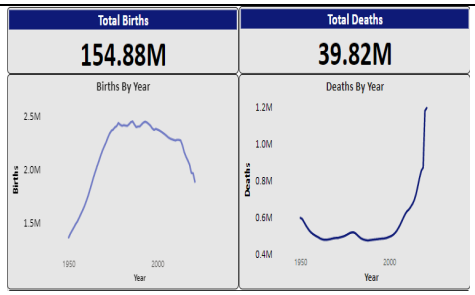
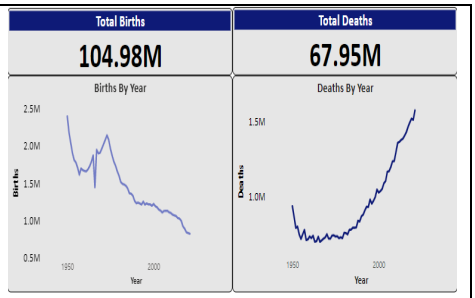
		
China	Mexico	Japan

Table 4: Birth rate against population down

China, Japan and Mexico have experienced this more than the others in the group with their birth rate steadily dropping and their death rate rising, which will result in them moving down the ranks as the years go by.

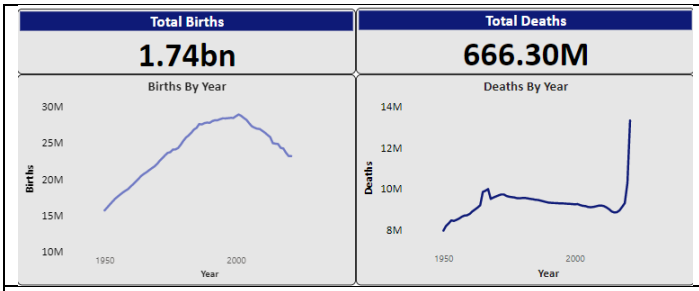
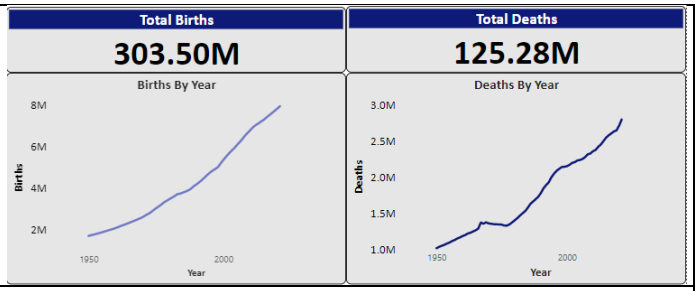
	
India	Nigeria

Table 5: Birth rate against population up

At the first glance, it looks like India is also following the trend of the previous countries, but it is to be noted that the birth rate is measured at about 23 million births per year as compared to about 13 million deaths per year, so it is still set to see a continuous increase in its growth rate. In the case of Nigeria's charts both the birth and death rates are increasing but at different rates, with the ratio being about 2.84 births to every death.

3.1.1.2 Net Migration

No country is an island, in the sense that there will always be people immigrating to and emigrating from their borders, some countries like Canada see as much as over 10 million immigrants more than their emigrants. Population is known as an important resource that any country wanting to go forward must manage, as too much will cause a strain on the other resources and too little will cause the economy to move slowly or even crash, hence why so many countries open their borders to immigrants.

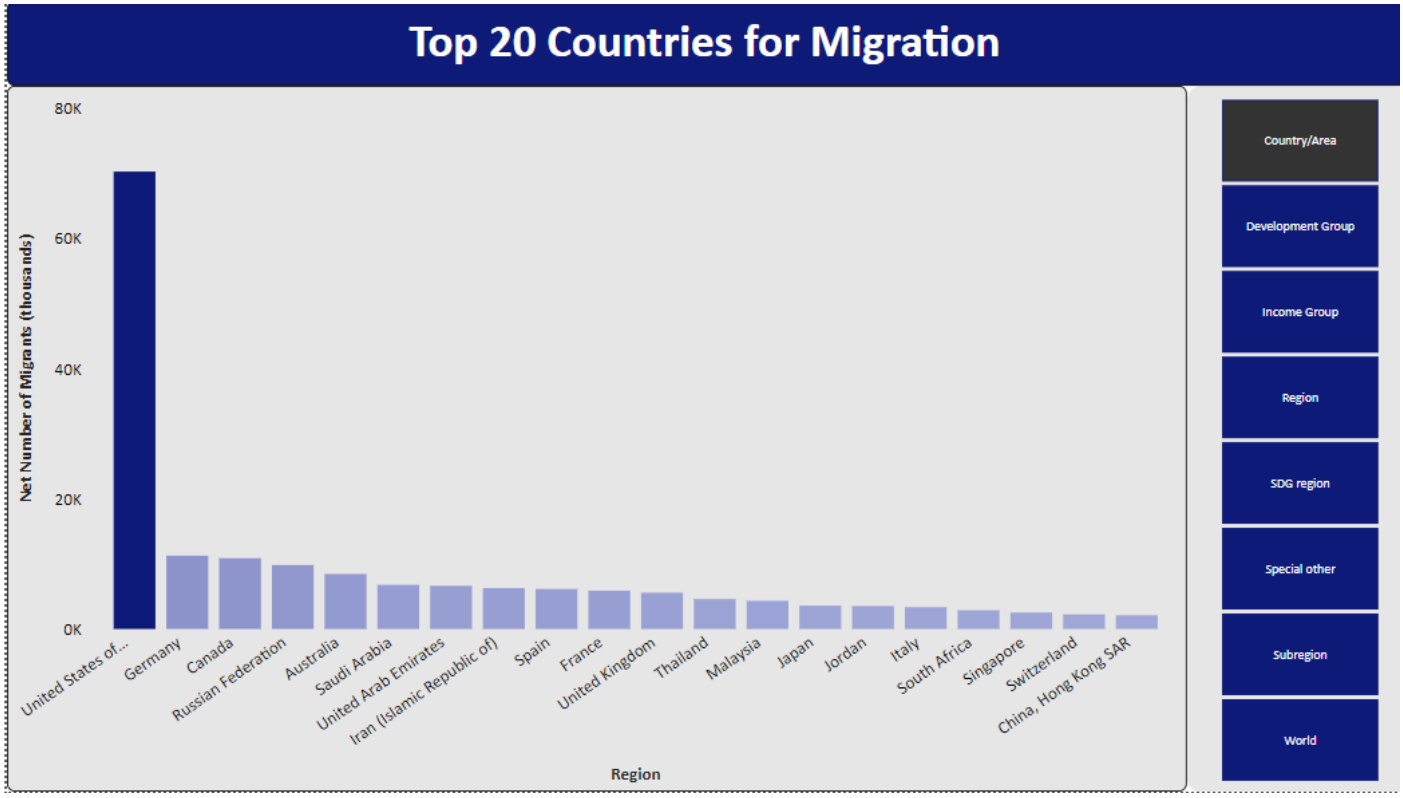


Figure 14: the Top 20 Countries for Migration

The values were recorded in positive numbers for immigration and negative numbers for emigration, although the values in the chart above don't look significant, the difference for every thousandth migrant is all that's displayed. The image below shows this more clearly, it shows migration by region and regardless of the number of both types of migrants North America, Europe and Oceania have more people migrating to them and the other regions having more people migrate from them.

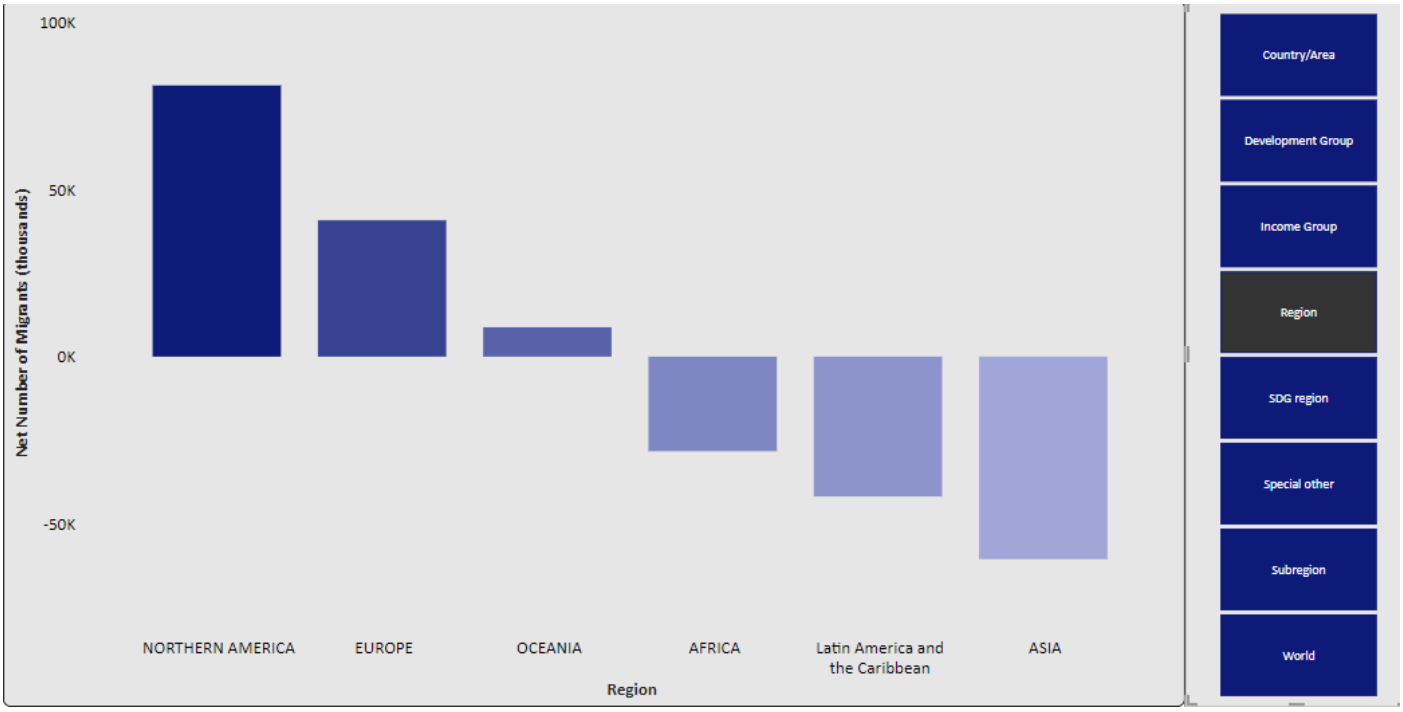


Figure 15: Migration by Region

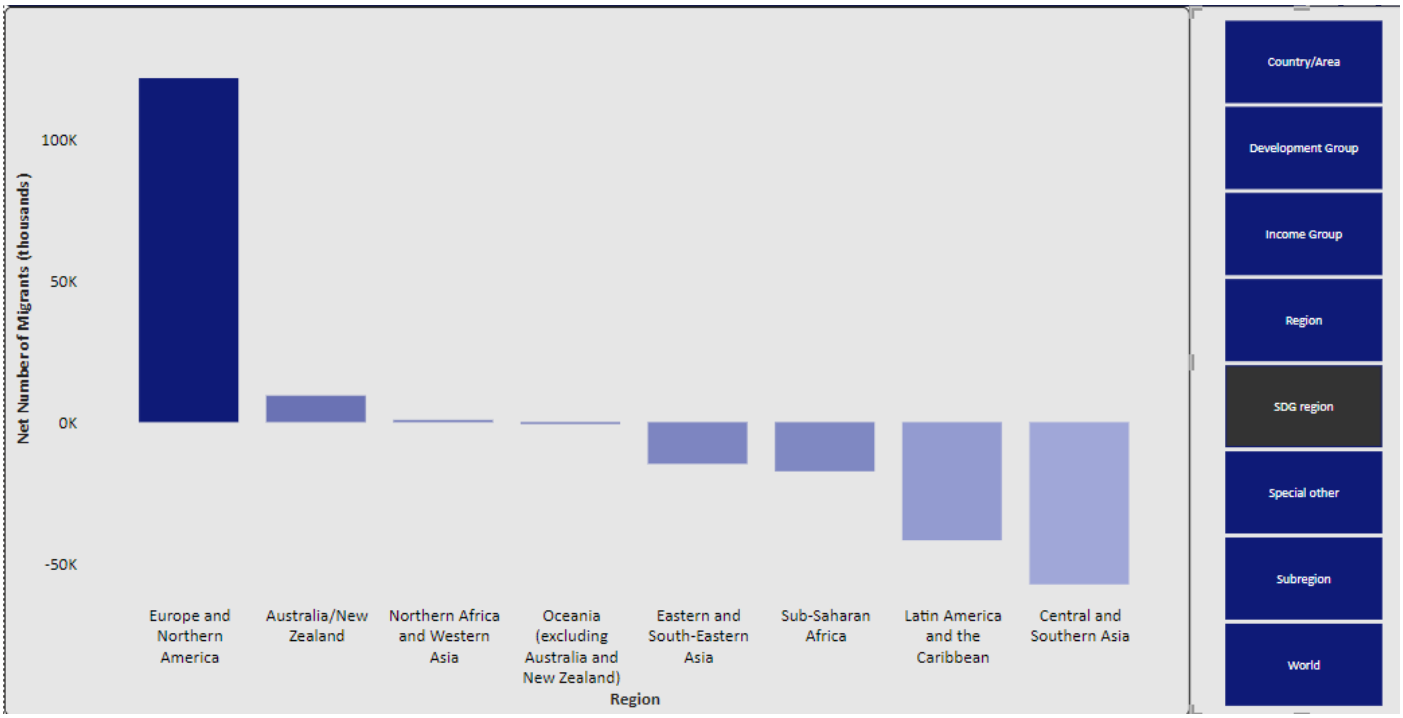


Figure 16: Migration by SDG regions

The chart above only serves to emphasize on the migration trend addressed above, and the one below shows the same information with more granularity, showing the sub regions with the most immigrants and the most emigrants.

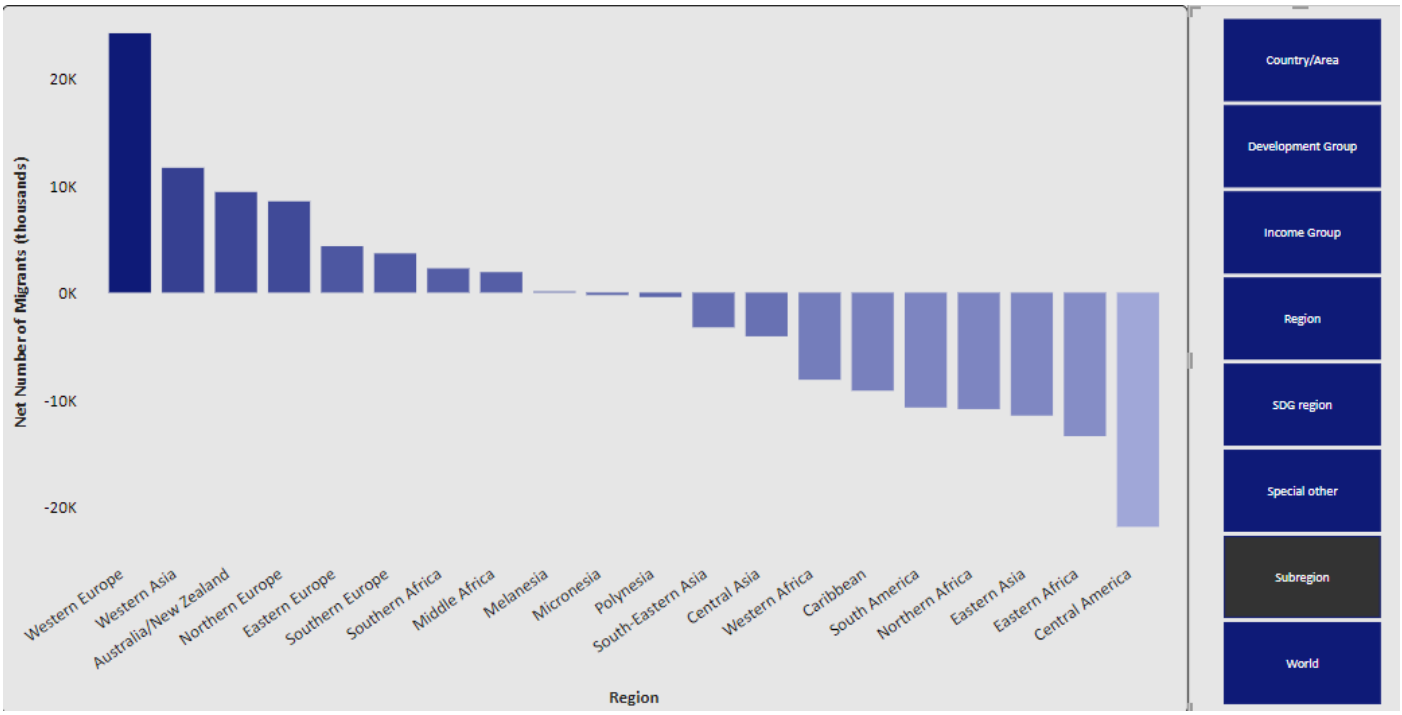


Figure 17: Migration by Subregions

3.2 PROBLEM STATEMENT 2

Determining the future prediction of the population for the years 2030, 2040 and 2050 based on the current data.

3.2.1 Population Prediction

Population prediction is something that has been done by different agencies and organizations for a myriad of reasons, the question lies on whether it is accurate. The graph below was gotten from Rosea and Rodes-Guirao's 2014 publication that was updated in 2019, on future predictions [4].

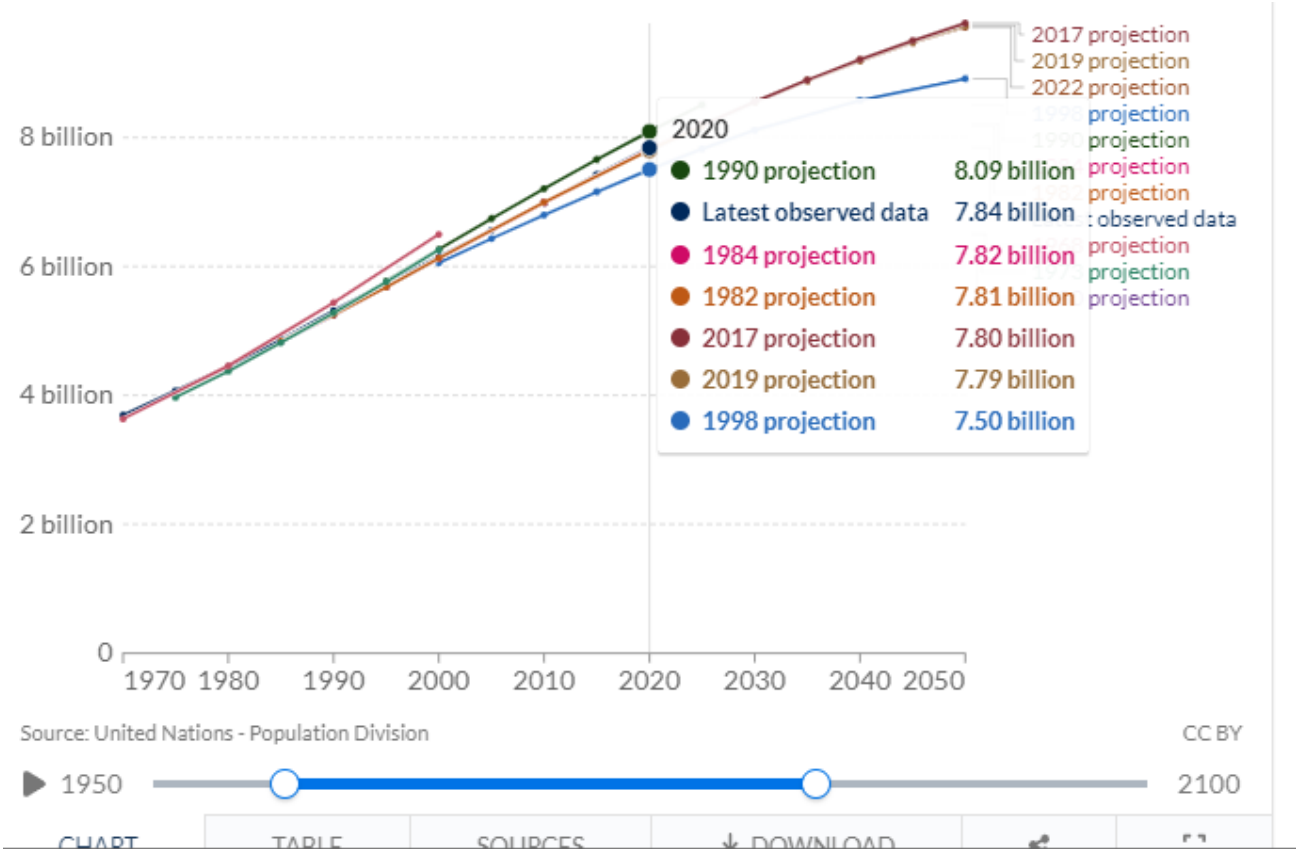


Figure 18: Past Predictions. Source (https://ourworldindata.org/future-population-growth)

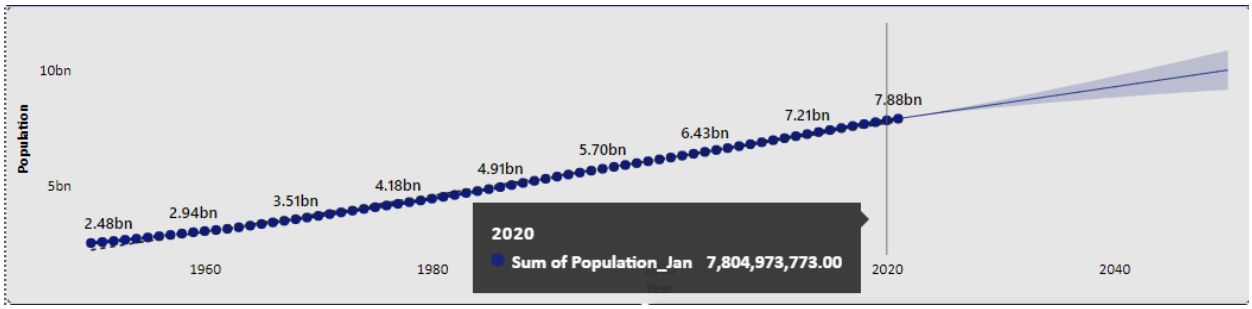


Figure 19: Total World Population

Comparing the first chart retrieved from Our World in Data [4] to the second one which was retrieved from the project' visualization, it can be seen that the 2020 prediction of the population from previous years factored in the growth rates of the countries, with the most recent one from 2019 predicting the population at 7.79 billion, even though Covid-19 caused a spike in the mortality rate as seen in an earlier chart, the results did not stray away from it with the population reaching 7.80 billion [4]. So, it can be inferred that the prediction is mostly reliable.

To tackle this and give our prediction we have used the below formulas for population projects and growth rate. The results of our predictions were compared with the forecast prediction capability of PowerBI, and we infer that the results are quite close to each other(Please see fig.19).

3.2.1.1 Formulas - Predictions

A. Population projections

$$P_t = P_0(1 + \frac{r}{100})^t$$

Equation 1:population projection. Source (https://www.kaggle.com/code/harits/world-population-past-present-and-future)

- **t**: Number of years
- **Pt**: Population after t years
- **P0**: Population at the start
- **r**: Growth annual rate (in %)

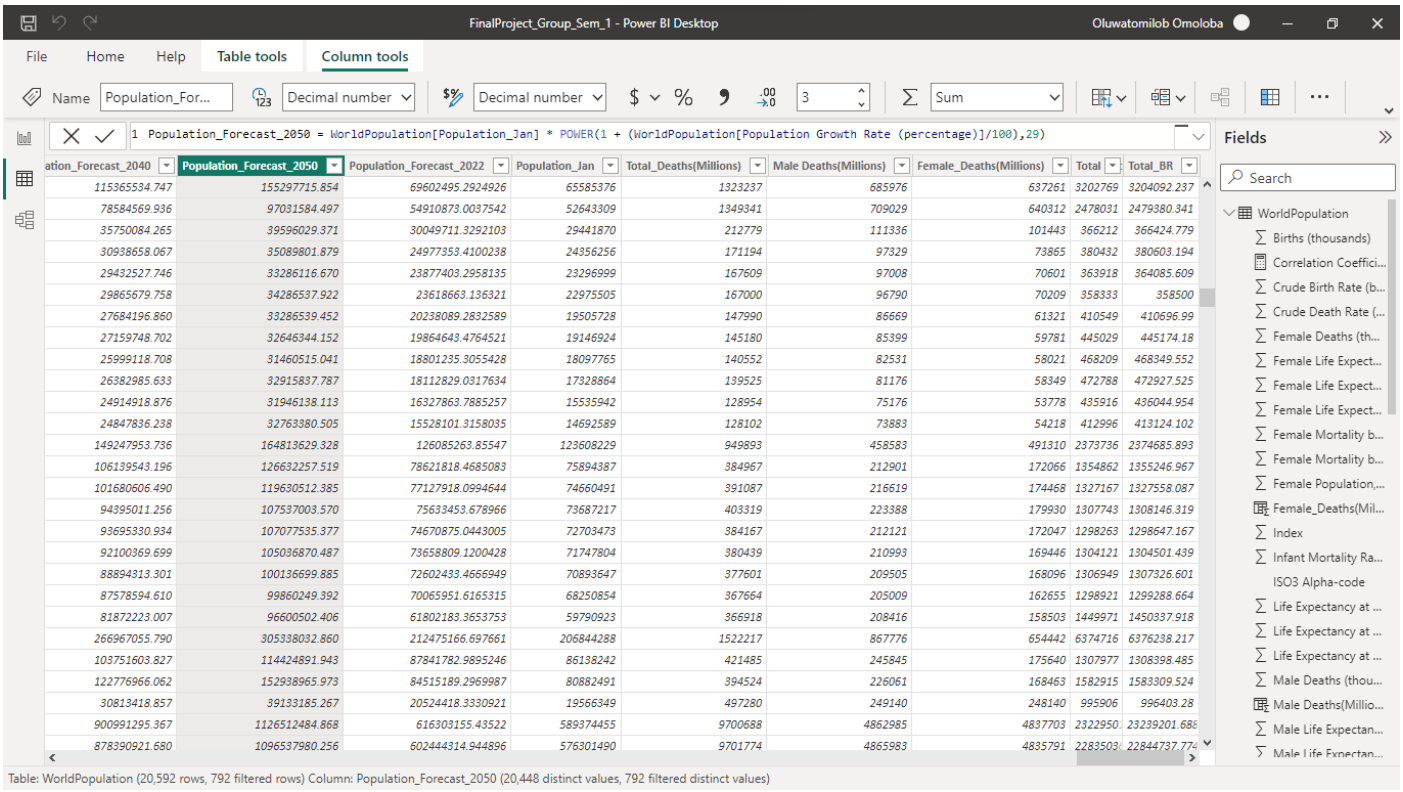
Growth Rate

$$r = ((\frac{P_2}{P_1})^{\frac{1}{t}} - 1)100$$

Equation 2: growth rate: Source (https://www.kaggle.com/code/harits/world-population-past-present-and-future)

- **t**: Number of years of period
- **P2**: Population at the end of the period
- **P1**: Population at the start of the period
- **r**: Growth annual rate (in %)

The above formulas were added in the form of DAX (Data Analysis Expressions) in the formula tab as a calculated fields for population prediction in for the years 2030,2040 & 2050 (please see fig.18)



ation_Forecast_2040	Population_Forecast_2050	Population_Forecast_2022	Population_Jan	Total_Deaths(Millions)	Male Deaths(Millions)	Female_Deaths(Millions)	Total	Total_BR
115365534.747	155297715.854	69602495.2924926	65585376	1323237	685976	637261	3202769	3204092.237
78584569.936	97031584.497	54910873.0037542	52643309	1349341	709029	640312	2478031	2479380.341
35750084.265	39596029.371	30049711.3292103	29441870	212779	111336	101443	366212	366424.779
30938658.067	35089801.879	24977353.4100238	24356256	171194	97329	73865	380432	380603.194
29432527.746	33286116.670	23877403.2958135	23296999	167609	97008	70601	363918	364085.609
29865679.758	34286537.922	23618663.136321	22975505	167000	96790	70209	358333	358500
27684196.860	33286539.452	20238089.2832589	19505728	147990	86669	61321	410549	410696.99
27159748.702	32646344.152	19864643.4764521	19146924	145180	85399	59781	445029	445174.18
25999118.708	31460515.041	18801235.3055428	18097765	140552	82531	58021	468209	468349.552
26382985.633	32915837.787	18112829.0317634	17328864	139525	81176	58349	472788	472927.525
24914918.876	31946138.113	16327863.7885257	15535942	128954	75176	53778	435916	436044.954
24847836.238	32763380.505	15528101.3158035	14692589	128102	73883	54218	412996	413124.102
149247953.736	164813629.328	126085263.85547	123608229	949893	458583	491310	2373736	2374685.893
106139543.196	126632257.519	78621818.4685083	75894387	384967	212901	172066	1354862	1355246.967
101680606.490	119630512.385	77127918.0994644	74660491	391087	216619	174468	1327167	1327558.087
94395011.256	107537003.570	75633453.678966	73687217	403319	223388	179930	1307743	1308146.319
93695330.934	107077535.377	74670875.0443005	72703473	384167	212121	172047	1298263	1298647.167
92100369.699	105036870.487	73658809.1200428	71747804	380439	210993	169446	1304121	1304501.439
88894313.301	100136699.885	72602433.4666949	70893647	377601	209505	168096	1306949	1307326.601
87578594.610	99860249.392	70065951.6165315	68250854	367664	205009	162655	1298921	1299288.664
81872223.007	96600502.406	61802183.3653753	59790923	366918	208416	158503	1449971	1450337.918
266967055.790	305338032.860	212475166.697661	206844288	1522217	867776	654442	6374716	6376238.217
103751603.827	114424891.943	87841782.9895246	86138242	421485	245845	175640	1307977	1308398.485
122776966.062	152938965.973	84515189.2969987	80882491	394524	226061	168463	1582915	1583309.524
30813418.857	39133185.267	20524418.3330921	19566349	497280	249140	248140	995906	996403.28
900991295.367	1126512484.868	616303155.43522	589374455	9700688	4862985	4837703	2322950	23239201.688
878390921.680	1096537980.256	602444314.944896	576301490	9701774	4865983	4835791	2283503	22844737.774

Figure 20 Prediction Formula added as DAX in calculated fields

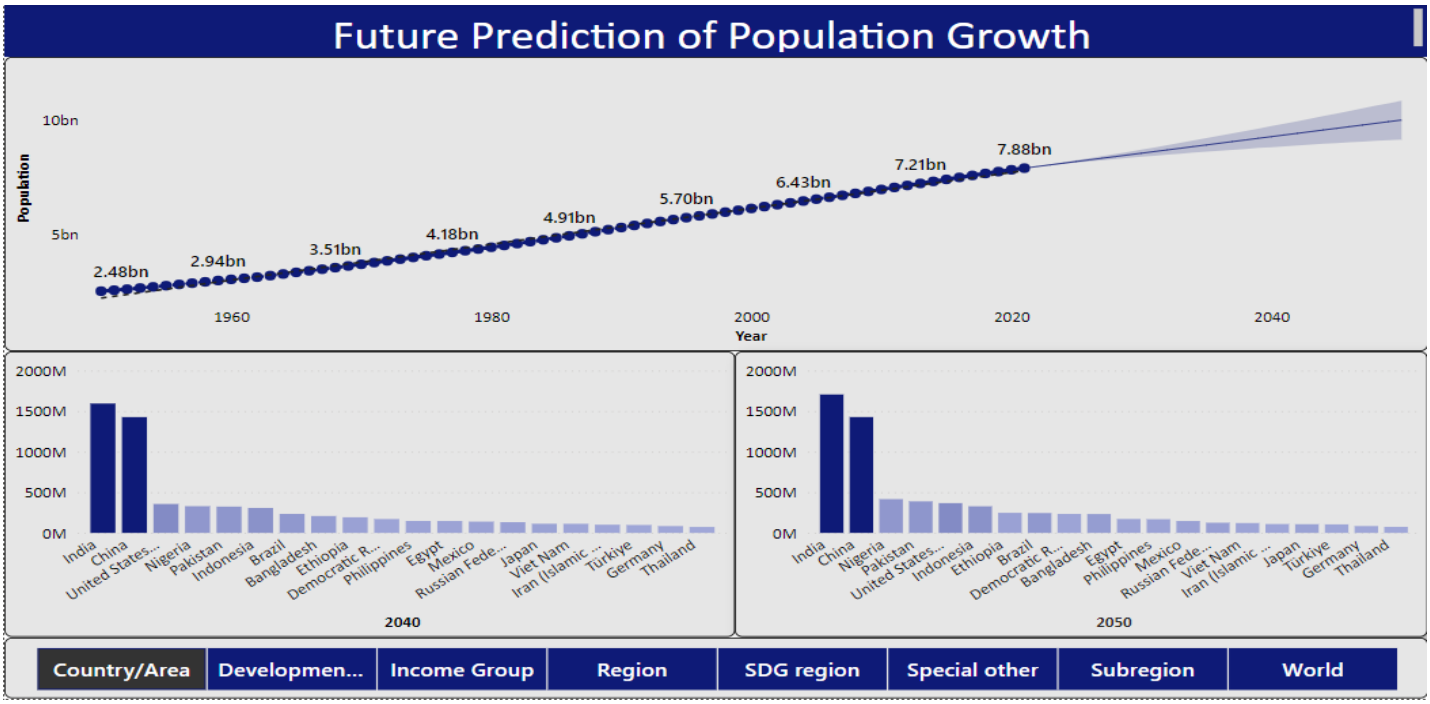


Figure 21:Future Prediction of Population Growth. The above line chart is from the PowerBI forecast and the bar charts are from the calculations done.

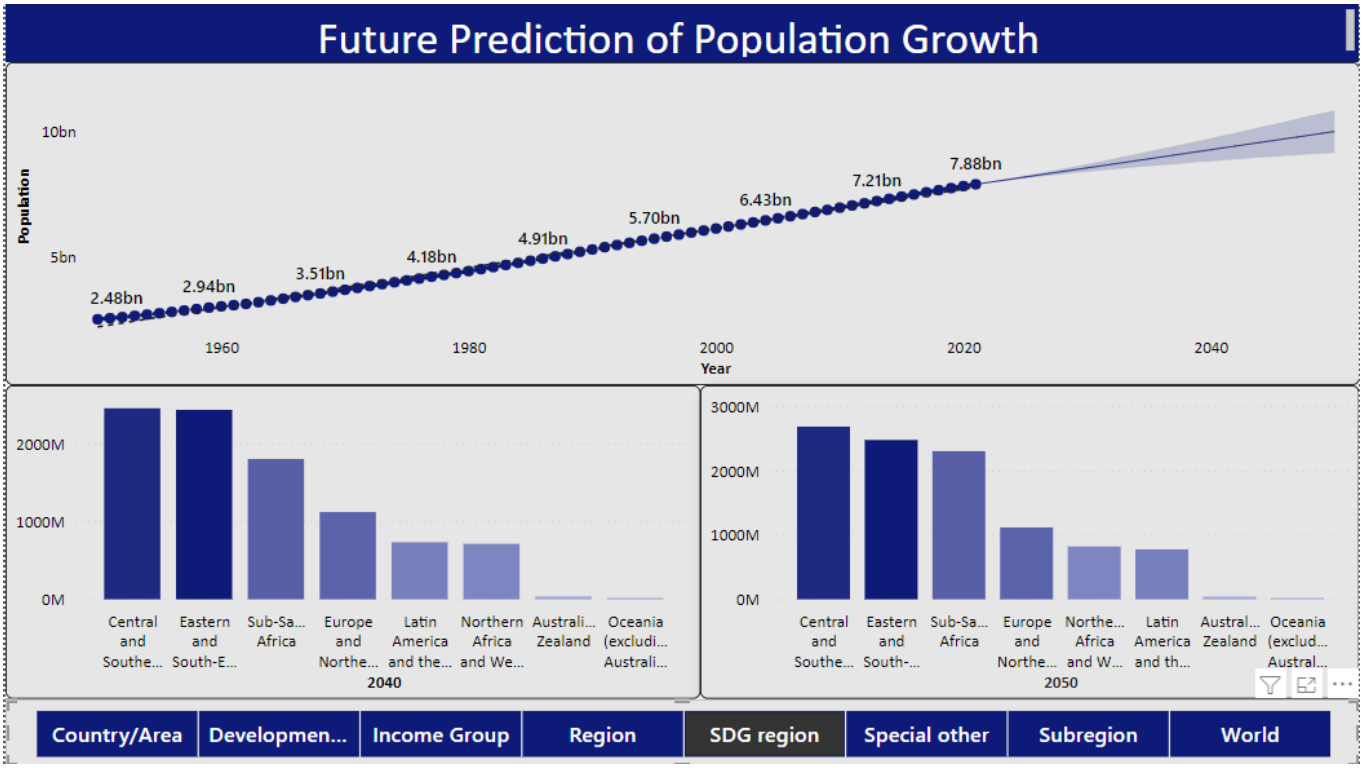


Figure 22: Prediction featuring SDG regions

The two previous charts show the forecast from 2022 – 2050 and from them a few things can be noticed like the growth trend between 2040 & 2050, one of which is that within 10 years Northern Africa will overtake Latin America.

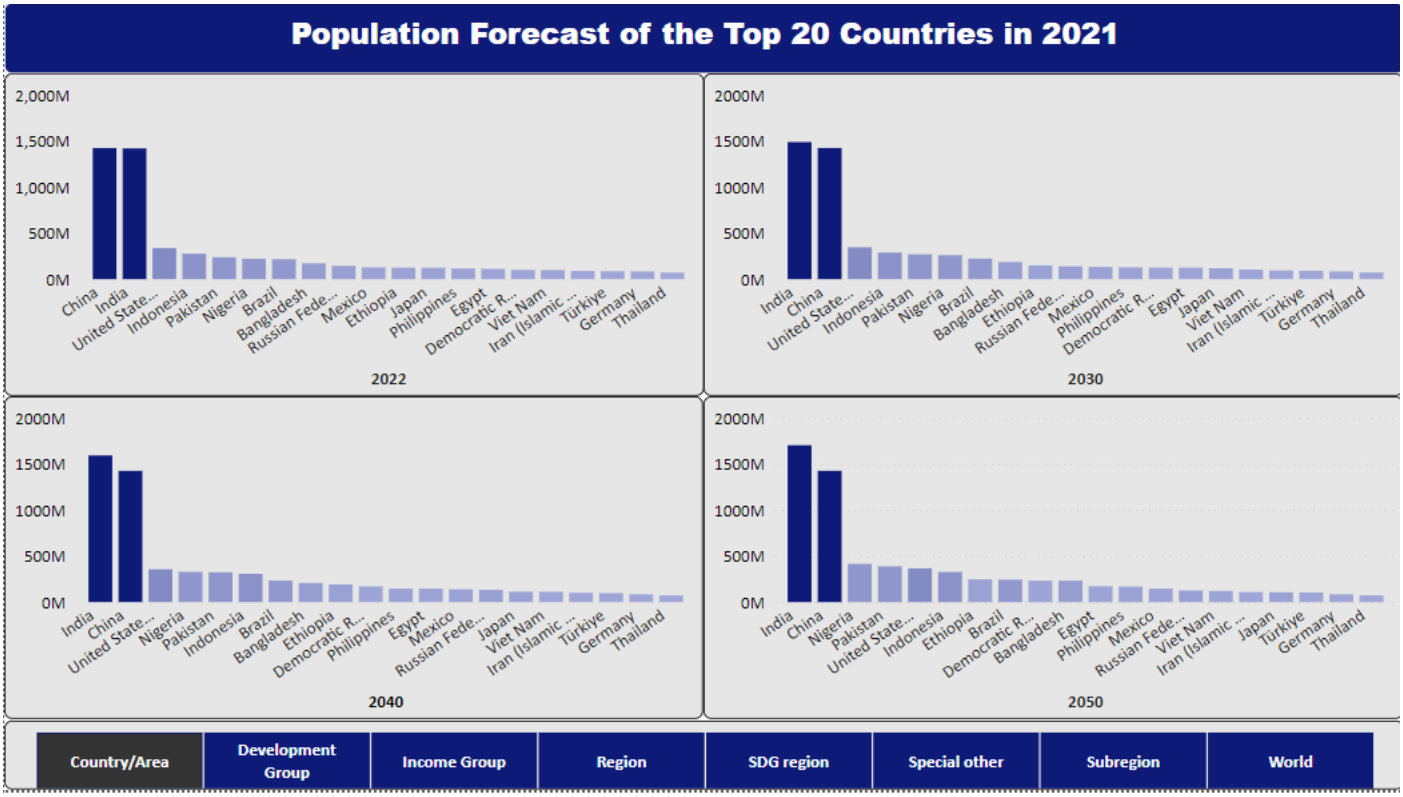


Figure 23: Population Forecast of the Top 20 Countries

The continents of South America and Africa have seen a constant increase in their growth rate and seeing as they house the top megacities of the future it is not surprising to see that they have the highest percent of countries moving into the top 20 most populated countries category. With countries in Middle Africa, Central America and West Africa seeing a considerable rise in their population in 30 years, while Eastern Europe will drop by a couple of places in that same timeframe.

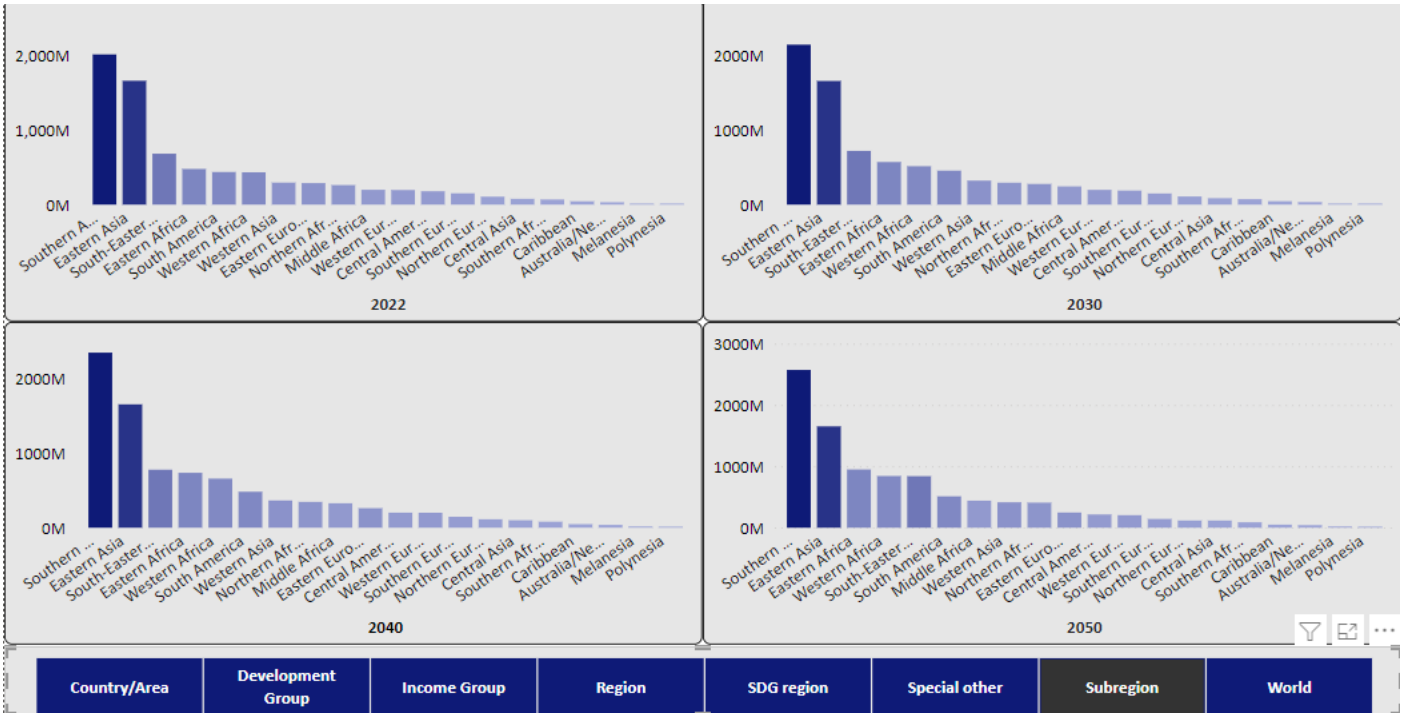


Figure 24:Population Forecast by Subregion

Whether it is presently or by 2050 Asia will remain as the region with the highest population rate, as it hosts China and India, the top two population power houses but further down the line it can be inferred from the growth rates of Africa and Latin America that perhaps the ones holding the top spot might be them a hundred years down the line.

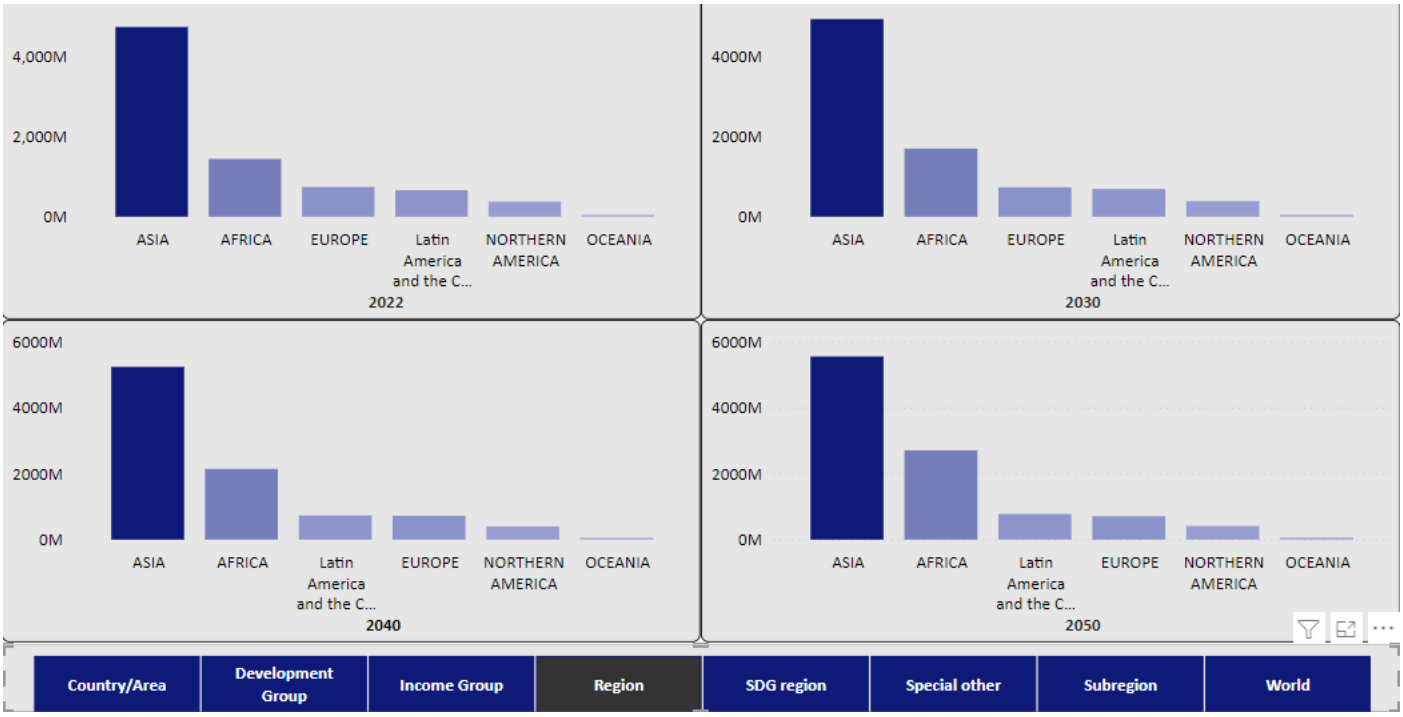


Figure 25: Population forecast by region

3.3 Conclusion & Recommendations

This section comprises of the conclusions that were made from the research done on global population backed by the analysis and visualization presented. The Following are the key conclusions and a few recommendations made:

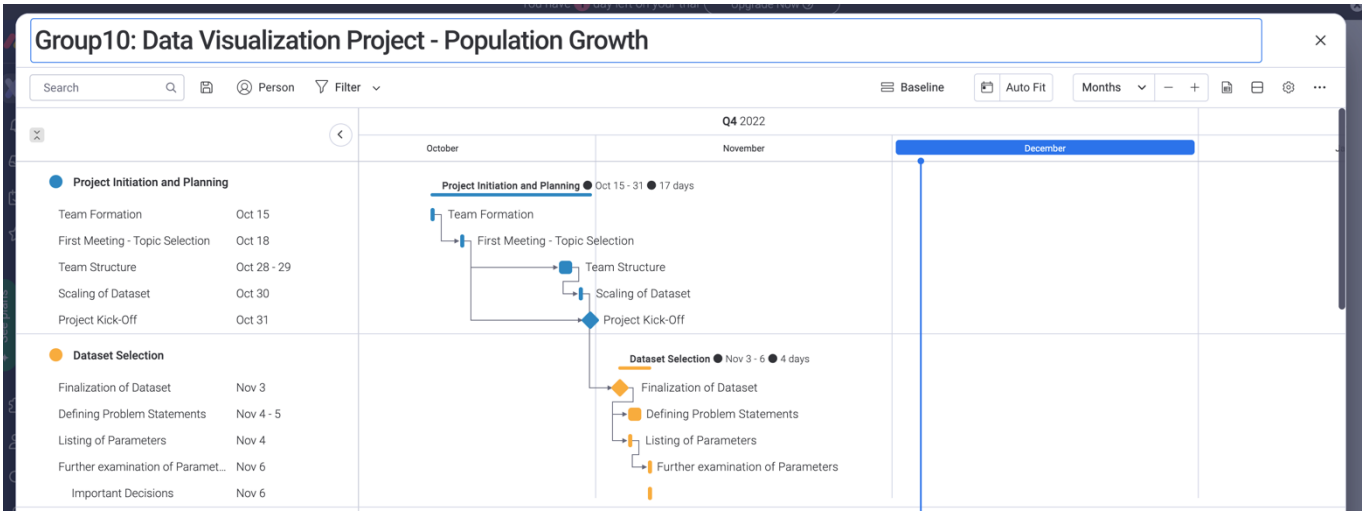
- India will overtake China to become the world's most populous country in 2023.
- Because of the advantage in life expectancy, females outnumber males. On a global scale women comprised about 55% of persons aged 60 and over in 2021.
- The populations of some of the top 20 countries are projected to decrease in between 2022 and 2050, owing to sustained lowering levels of births and, in some cases, elevated rates of emigration.
- COVID- 19 pandemic dropped the life expectancy from around 73 in 2019 to 71 in 2021, but it is set to rise to 77 years between 2045 and 2050.
- "In 2020, the global population growth rate fell under 1 per cent per year for the first time since 1950. The world's population is projected to reach a peak of around 10.4 billion people during the 2080s and to remain at that level until 2100" [1].

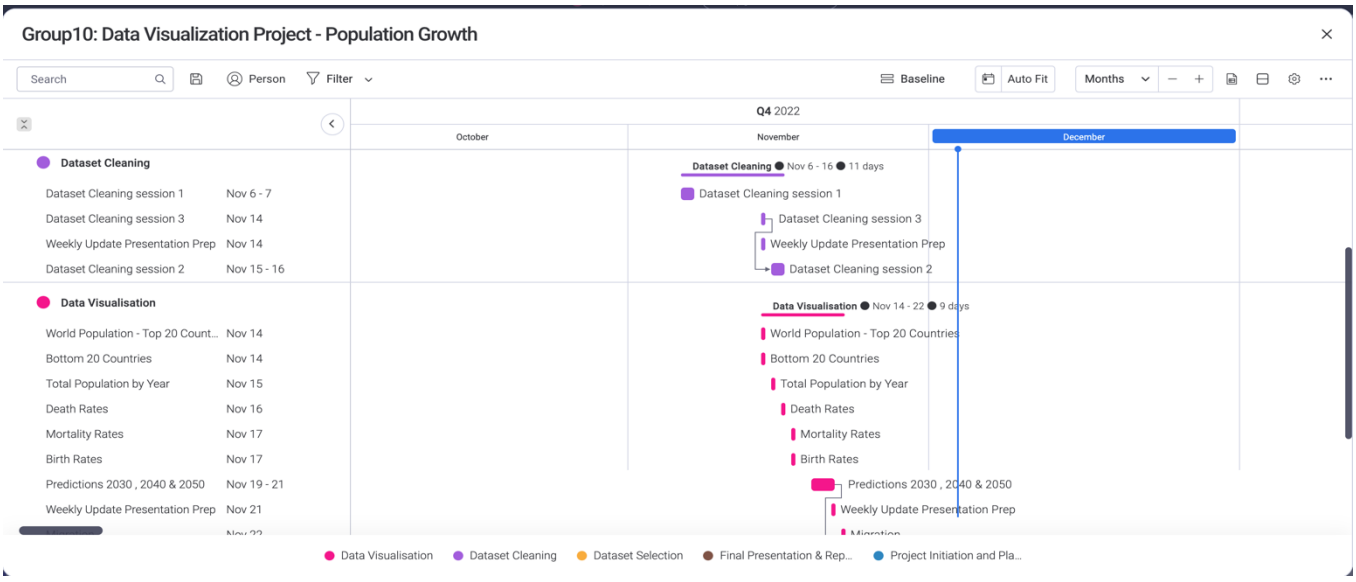
4 TEAM ASSESSMENT

This section of the report describes the ways of working followed by the team to make this report a success. Sophisticated project management tools and methodologies were implemented to achieve daily targets and exchange of information, data, and knowledge. The subsection depicts the project timeline and the deliverables clearly. This was a completely collaborative effort where in each member fulfilled their part in data gathering, cleaning, visualizations and final report writing with equal contribution. We worked as a team to deliver on-time a high-quality output.

4.1 PROJECT TIMELINE

The software used for project planning is 'Monday'. Please find below link to our project tracking dashboard and report. All deliverables were recorded with compliance to the scope and schedule. (https://algonquin-collegeinc.monday.com/boards/3552556764)





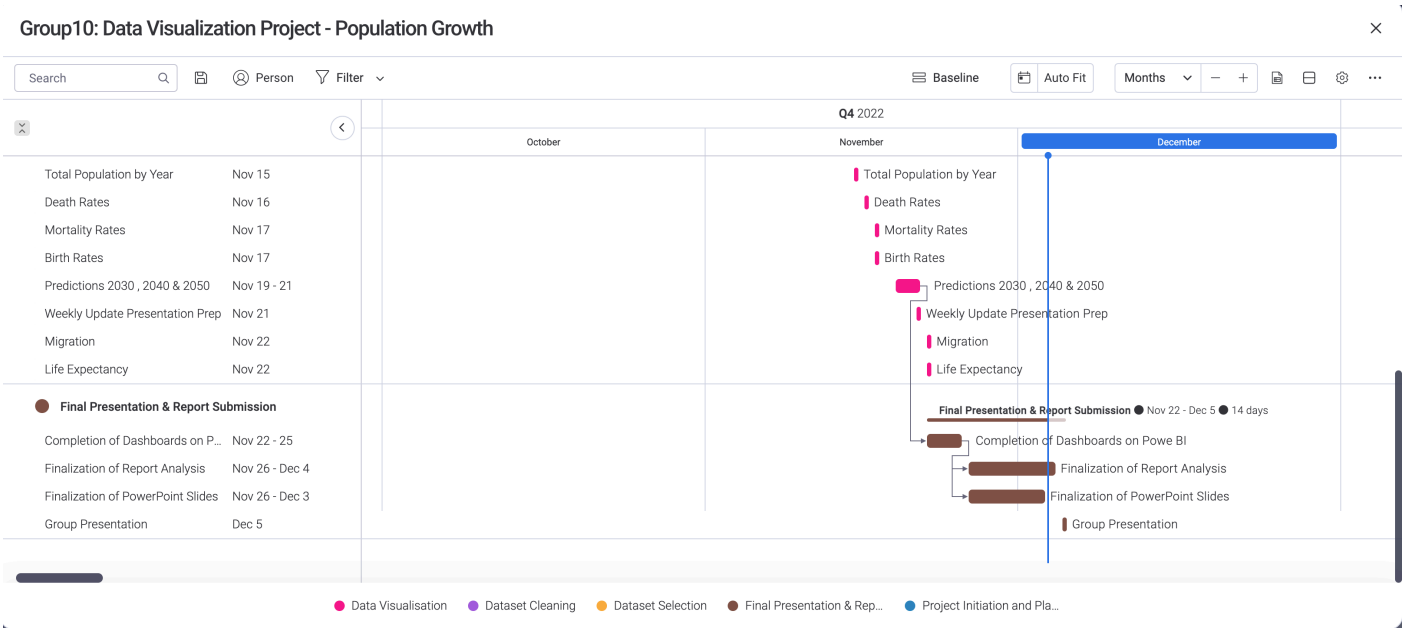


Figure 26: Project timeline Gantt Chart

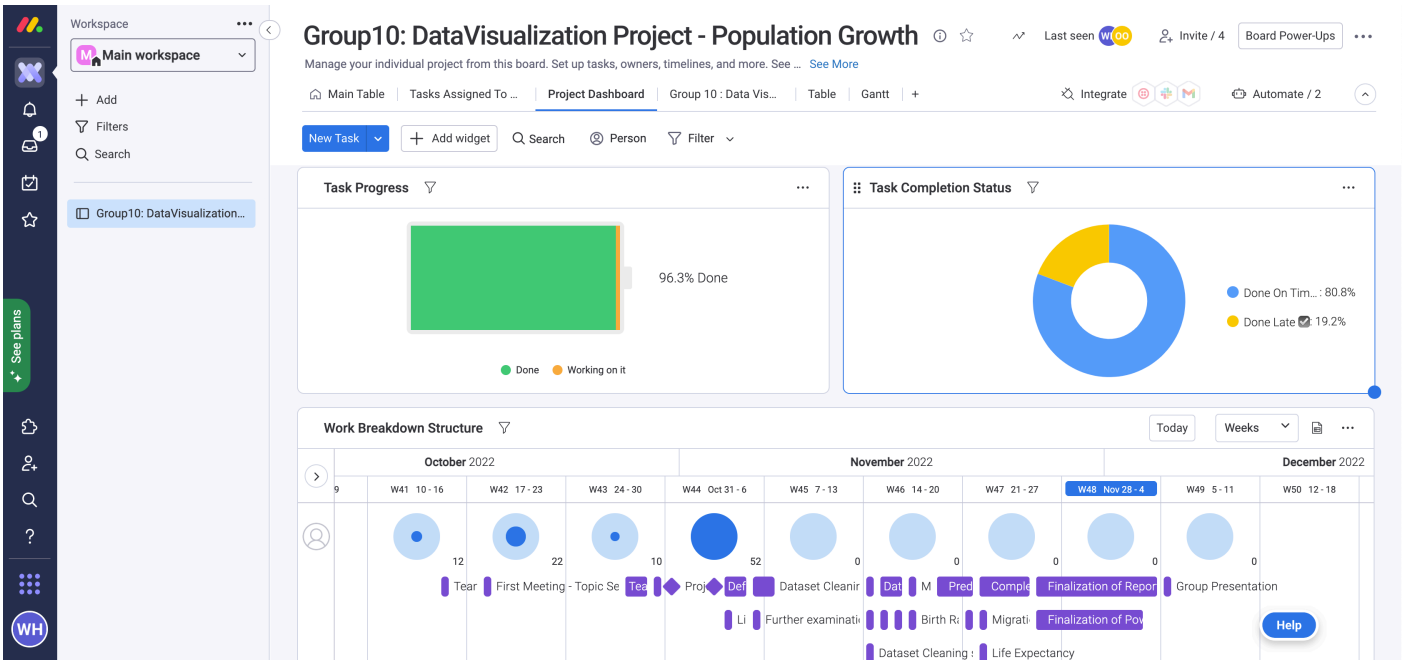


Figure 27: Project Management Dashboard

5 REFERENCE

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[2.] Prediction Formula for population and growth rate Available at: https://www.kaggle.com/code/harits/world-population-past-present-and-future.

[3.] The Economic Times (2022) World Population Day 2022: From China to Vatican City, significance of the day in numbers, The Economic Times. ET Magazine. Available at: https://economictimes.indiatimes.com/magazines/panache/world-population-day-2022-from-china-to-vatican-city-significance-of-the-day-in-numbers/articleshow/92799370.cms (Accessed: December 2, 2022).

[4.] Worldometer (2022) *Current world population*. Worldometer. Available at: https://www.worldometers.info/world-population/ (Accessed: November 16, 2022).

[5.] Roser, M. and Rodés-Guirao, L. (2014) *Future population growth*, *Our World in Data*. OurWorldinData.org. Available at: https://ourworldindata.org/future-population-growth (Accessed: December 2, 2022).

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[2.] Roser, M. and Rodés-Guirao, L. (2014) *Future population growth*, *Our World in Data*. OurWorldinData.org. Available at: https://ourworldindata.org/future-population-growth (Accessed: December 2, 2022).

[3.] The Economic Times (2022) *World Population Day 2022: From China to Vatican City, significance of the day in numbers*, *The Economic Times*. ET Magazine. Available at: https://economictimes.indiatimes.com/magazines/panache/world-population-day-2022-from-china-to-vatican-city-significance-of-the-day-in-numbers/articleshow/92799370.cms (Accessed: December 2, 2022).

[4.] United Nations Department of Economic and Social Affairs, Population Division (2022) World Population Prospects 2022, World population prospects - population division. United Nations. Available at: https://population.un.org/wpp/Download/Standard/MostUsed/ (Accessed: November 3, 2022).

[5.] Worldometer (2022) *Current world population* Available at: https://www.worldometers.info/world-population/ (Accessed: November 16, 2022).

[6.] World Population Review (ed.) (2022) *Total Population by Country 2022*, *Countries*. World Population Review. Available at: https://worldpopulationreview.com/countries (Accessed: December 2, 2022).

7 APPENDIX (1.0.0)

This section contains the list of all the demographic indicators or the “parameters” as we call them in the original dataset. The list is as follows:

- Total Population, as of 1 January (thousands)
- Total Population, as of 1 July (thousands)
- Male Population, as of 1 July (thousands)
- Female Population, as of 1 July (thousands)
- Population Density, as of 1 July (persons per square km) (UPDATED on 14 July 2022)
- Population Sex Ratio, as of 1 July (males per 100 females)
- Median Age, as of 1 July (years)
- Natural Change, Births minus Deaths (thousands)
- Rate of Natural Change (per 1,000 population)
- Population Change (thousands)
- Population Growth Rate (percentage)
- Population Annual Doubling Time (years)
- Births (thousands)
- Births by women aged 15 to 19 (thousands)
- Crude Birth Rate (births per 1,000 population)
- Total Fertility Rate (live births per woman)
- Net Reproduction Rate (surviving daughters per woman)
- Mean Age Childbearing (years)
- Sex Ratio at Birth (males per 100 female births)
- Total Deaths (thousands)
- Male Deaths (thousands)
- Female Deaths (thousands)
- Crude Death Rate (deaths per 1,000 population)
- Life Expectancy at Birth, both sexes (years)
- Male Life Expectancy at Birth (years)
- Female Life Expectancy at Birth (years)
- Life Expectancy at Age 15, both sexes (years)
- Male Life Expectancy at Age 15 (years)
- Female Life Expectancy at Age 15 (years)
- Life Expectancy at Age 65, both sexes (years)
- Male Life Expectancy at Age 65 (years)
- Female Life Expectancy at Age 65 (years)
- Life Expectancy at Age 80, both sexes (years)
- Male Life Expectancy at Age 80 (years)
- Female Life Expectancy at Age 80 (years)
- Infant Deaths, under age 1 (thousands)
- Infant Mortality Rate (infant deaths per 1,000 live births)
- Live Births Surviving to Age 1 (thousands)
- Under-Five Deaths, under age 5 (thousands)
- Under-Five Mortality (deaths under age 5 per 1,000 live births)
- Mortality before Age 40, both sexes (deaths under age 40 per 1,000 live births)
- Male Mortality before Age 40 (deaths under age 40 per 1,000 male live births)

- Female Mortality before Age 40 (deaths under age 40 per 1,000 female live births)
- Mortality before Age 60, both sexes (deaths under age 60 per 1,000 live births)
- Male Mortality before Age 60 (deaths under age 60 per 1,000 male live births)
- Female Mortality before Age 60 (deaths under age 60 per 1,000 female live births)
- Mortality between Age 15 and 50, both sexes (deaths under age 50 per 1,000 alive at age 15)
- Male Mortality between Age 15 and 50 (deaths under age 50 per 1,000 males alive at age 15)
- Female Mortality between Age 15 and 50 (deaths under age 50 per 1,000 females alive at age 15)
- Mortality between Age 15 and 60, both sexes (deaths under age 60 per 1,000 alive at age 15)
- Male Mortality between Age 15 and 60 (deaths under age 60 per 1,000 males alive at age 15)
- Female Mortality between Age 15 and 60 (deaths under age 60 per 1,000 females alive at age 15)
- Net Number of Migrants (thousands)
- Net Migration Rate (per 1,000 population)

Omitted columns:

- Note
- SDMX
- ISO2 alpha code
- Variant
- Net Reproduction Rate (surviving daughters per woman)
- Male Life Expectancy at Age 15 (years)
- Female Life Expectancy at Age 15 (years)
- Life Expectancy at Age 80, both sexes (years)
- Male Life Expectancy at Age 80 (years)
- Female Life Expectancy at Age 80 (years)

Renamed columns:

- 'Region, subregion, country or area to “Region”
- Total population as of 1st Jan to TOT_POP_1_Jan (1000s)
- Total population as of 1st Jul to TOT_POP_1_Jul (1000s)
- Male population as of 1st Jul to M_POP_1_Jul (1000s)
- Female population as of 1st Jul to F_POP_1_Jul (1000s)
- Population density as of 1st Jul (persons per sq. km) to POP_Density_1_Jul (persons\ km^2)
- 'Population Sex Ratio, as of 1 July (males per 100 females) to Pop_Sex_Ratio_1_Jul (M/100 F)
- Median Age, as of 1 July (years) to Median_Age_1_Jul (years)
- Natural Change, Births minus Deaths (thousands) to Natural Change (1000s) (means birth- deaths)
- Rate of Natural Change (per 1,000 population) to Natural_Change_Rate (/1,000 pop)
- Population Change (thousands) to Pop_Change (1000s)
- Population Growth Rate (percentage) to Pop_Growth_Rate (%)
- Population Annual Doubling Time (years) to Pop_Annual_Double_Time (years)
- Births (thousands) to Births (1000s)
- Births by women aged 15 to 19 (thousands) to Births_by_W(aged 15 to 19 -1000s)
- Crude Birth Rate (births per 1,000 population) to Crude_BR (births/1,000 pop)
- Total Fertility Rate (live births per woman) to Tot_FR (live births/W)
- Mean Age Childbearing (years) to Mean_Age_CB (years)
- Sex Ratio at Birth (males per 100 female births) to Sex_Ratio_Birth (M/100 F)

- Total Deaths (thousands) to Tot_Deaths (1000s)
- Male Deaths (thousands) to M_Deaths (1000s)
- Female Deaths (thousands) to F_Deaths (1000s)
- Crude Death Rate (deaths per 1,000 population) to Crude_DR (births/1,000 pop)
- Life Expectancy at Birth, both sexes (years) to Life_Expctncy_at_Birth-M+F (years)
- Male Life Expectancy at Birth (years) to M_Expctncy_at_Birth (years)
- Female Life Expectancy at Birth (years) to F_Expctncy_at_Birth (years) Life Expectancy at Age 65, both sexes (years) to Life Expectancy_65, M+F (years)
- Male Life Expectancy at Age 65 (years) to M_Life Expectancy_65 (years)
- Female Life Expectancy at Age 65 (years) F_Life Expectancy_65 (years)
- Infant Deaths, under age 1 (thousands)
- Infant Mortality Rate (infant deaths per 1,000 live births)
- Mortality before Age 60, both sexes (deaths under age 60 per 1,000 live births)
- Male Mortality before Age 60 (deaths under age 60 per 1,000 male live births)
- Female Mortality before Age 60 (deaths under age 60 per 1,000 female live births)
- Net Number of Migrants (thousands)
- Net Migration Rate (per 1,000 population)

Changed datatype (changed datatype text to decimal/number):

- Total population as of 1st Jan to TOT_POP_1_Jan (1000s)
- Total population as of 1st Jul to TOT_POP_1_Jul (1000s)
- Male population as of 1st Jul to M_POP_1_Jul (1000s)
- Female population as of 1st Jul to F_POP_1_Jul (1000s)
- Population density as of 1st Jul (persons per sq. km) to POP_Density_1_Jul (persons\ km^2)
- Total Deaths (thousands) to Tot_Deaths (1000s)
- Male Deaths (thousands) to M_Deaths (1000s)
- Female Deaths (thousands) to F_Deaths (1000s)
- Crude Death Rate (deaths per 1,000 population) to Crude_DR (births/1,000 pop)
- Life Expectancy at Birth, both sexes (years) to Life_Expctncy_at_Birth-M+F (years)
- Male Life Expectancy at Birth (years) to M_Expctncy_at_Birth (years)
- Male Mortality before Age 60 (deaths under age 60 per 1,000 male live births)
- Female Mortality before Age 60 (deaths under age 60 per 1,000 female live births)
- Net Number of Migrants (thousands)
- Net Migration Rate (per 1,000 population)

Created Columns using DAX:

- Total population (combining 1st of January and 1st of July)
- Total Births (in Millions)
- Total Deaths (In Millions)
- Population forcast_2022
- Population forecast_2030
- Population forecast_2040
- Population forecast_2050
- Male deaths (Millions)
- Female deaths (Millions)