Interactive Dashboard Design Report

1. Scenario Summary

The NGO I am working with is interested in understanding long-term global population dynamics to better inform policy decisions and public awareness. I have been provided with a comprehensive demographic dataset containing historical estimates from 1960 to 2022 and forward projections from 2023 to 2050. As a data analyst, my task is to explore this dataset, identify meaningful patterns, and develop a single-screen interactive Power BI dashboard that presents aggregated, group-level insights based on regional and/or income classifications.

The dashboard is intended for policymakers and the general public, so it must communicate population trends in a clear, intuitive, and accessible way. Although the dataset covers multiple demographic indicators, I have the flexibility to focus the dashboard on the aspects of population change that are most relevant or insightful. Therefore, part of my responsibility is to conduct exploratory data analysis, refine the scope, and define specific objectives that align with the NGO's overall interest in global population trends.

2. Data Exploration

Initial exploration of the demographic dataset revealed clear variations in population growth and urbanization patterns across global regions. Regions such as the Middle East & North Africa and Sub-Saharan Africa showed consistently higher average population growth rates, while regions like Europe & Central Asia and North America recorded significantly lower growth. Urbanization levels also varied widely, with North America and Latin America & the Caribbean being the most urbanized, compared to South Asia and Sub-Saharan Africa, which had lower urbanization rates

despite their faster population growth. Trend analysis from 1960 to 2022 further indicated that some regions experienced fluctuations in growth over time, while others maintained relatively stable trajectories.

Based on these insights, I refined the dashboard objectives to focus specifically on comparing population growth and urbanization dynamics across regions, and understanding how these patterns evolve over time. The dashboard therefore aims to help policymakers identify high-growth regions, assess the relationship between population expansion and urbanization, and observe long-term demographic shifts using interactive filters for year and income level. This narrowed focus remains aligned with the overall scenario by providing an accessible, data-driven overview of global population trends for strategic planning and public communication.

3. Visualization

The visualization choices in the dashboard were guided by established principles in data-visualization theory, including effectiveness, clarity, cognitive load reduction, and suitability for comparative analysis. According to Cleveland & McGill's hierarchy of graphical perception, visualizations that rely on position and length, such as bar charts and line charts, provide the highest accuracy for interpreting quantitative values. This makes them well suited for demographic indicators that need to be compared across regions and over time.

The column charts used for Average Population Growth by Region and Urbanization Rate by Region were chosen because bar/column charts are ideal for comparing discrete categories. Regions are mutually exclusive groups, and column charts allow viewers to quickly identify which

regions have the highest or lowest values. This supports one of the dashboard's core objectives: enabling policymakers to identify regional disparities in growth and urbanization rates at a glance.

The line chart displaying Average Population Growth by Time and Region aligns with best practices for showing trends over time. Line charts emphasize temporal continuity and are recommended for detecting long-term patterns, fluctuations, and intersection points between groups. This visualization helps users explore how population growth has evolved from 1960 to 2022, fulfilling the objective of understanding historical demographic shifts and long-term trajectories.

The summary cards were included to provide high-level key performance indicators (KPIs). Research in dashboard design suggests that summary metrics reduce cognitive effort by bringing the most important figures to the forefront before users engage with more complex visuals. Displaying the overall Average Population Growth and Urbanization Rate enhances interpretability and provides immediate context for the more detailed charts.

Finally, the slicers for income level and year range support the principle of interactivity, enabling users to personalize their exploration of the data. This aligns with Stephen Few's recommendation that dashboards should "facilitate comparison, exploration, and pattern detection" rather than simply display static information. By allowing users to segment the data by income category and timeframe, the dashboard becomes flexible and relevant to diverse policy questions.

4. **Explanation and Justification of the Dashboard Layout, Formatting, and Composition**

The layout and formatting of the dashboard were intentionally designed to support clear communication of key demographic patterns and allow policymakers to understand global population and urbanization trends at a glance.

4.1.Single-Screen, Non-Scrolling Layout

The dashboard adheres to the requirement of a single-screen interface, allowing all information to be viewed without scrolling. As Few (2013) notes, an effective dashboard should present critical insights at a glance. Presenting the summary cards, charts, and slicers on one canvas reduces cognitive friction and ensures immediate comprehension.

4.2.Logical Information Flow

The layout follows a top-down, left-to-right viewing pattern consistent with natural scanning behaviour (Ware, 2012).

- The title is positioned at the top to frame user expectation.
- KPI cards follow directly below, presenting headline metrics before more detailed visuals, which aligns with Few's (2006) principle of overview-first design.

This structure ensures a smooth narrative flow from high-level insights to deeper analysis.

4.3. Colour Choices and Consistency

A limited, harmonized colour palette was used to maintain clarity and reduce distraction, reflecting Ware's (2012) guidance on purposeful colour usage. Colours were applied consistently to

represent regions across visuals, supporting memorability and reducing the mental load on the viewer. Non-saturated tones also enhance accessibility, including for colour-blind users.

4.4.Clean Formatting and Use of Space

The layout avoids clutter through the use of adequate white space, simplified axis labels, and the removal of unnecessary gridlines, following Tufte's (2001) principle of reducing "chart junk." This enhances readability and ensures that the viewer's attention remains on the data rather than decorative elements.

4.5.Typography and Labelling

Consistent font sizes and a clear hierarchy (title - chart titles - labels) support quick interpretation. Knaflic (2015) emphasizes that typographic hierarchy is essential for guiding visual attention and eliminating ambiguity.

4.6.Alignment with Objectives and Gestalt Principles

The combination of KPIs, comparison charts, and trend visuals supports the dashboard's objective of explaining regional population growth patterns and urbanization dynamics. Gestalt principles of proximity**,** similarity, and continuity are reflected in the grouping of similar visuals and consistent design choices, enabling viewers to form meaningful connections across the data.

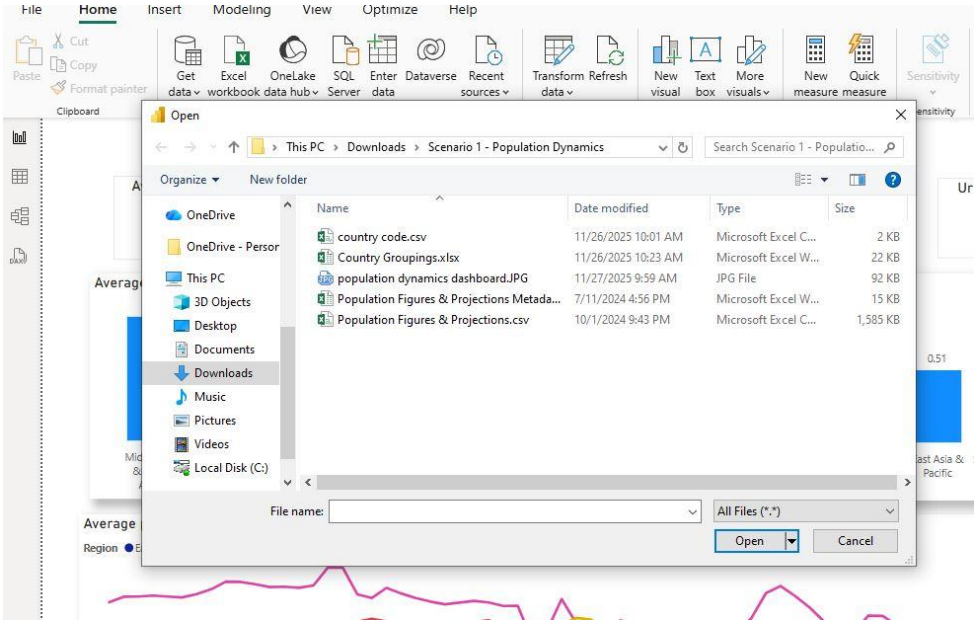
5. Step by step Overview of Building the Dashboard

5.1. Data loading

Steps performed

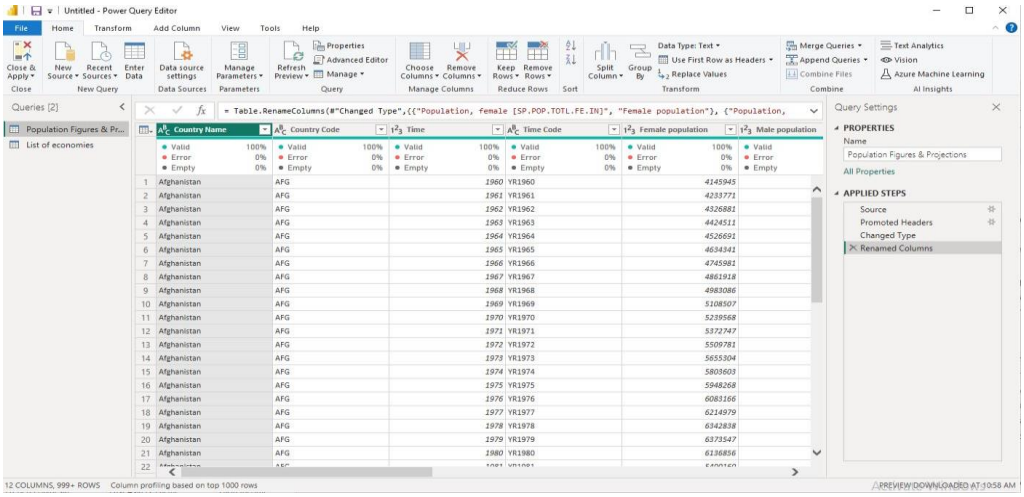
1. **Load the files**

- Home - Get data - Text/CSV - select the population data CSV (fact table).
- Home - Get data - Excel - select the list of economies data Excel (dimension table)

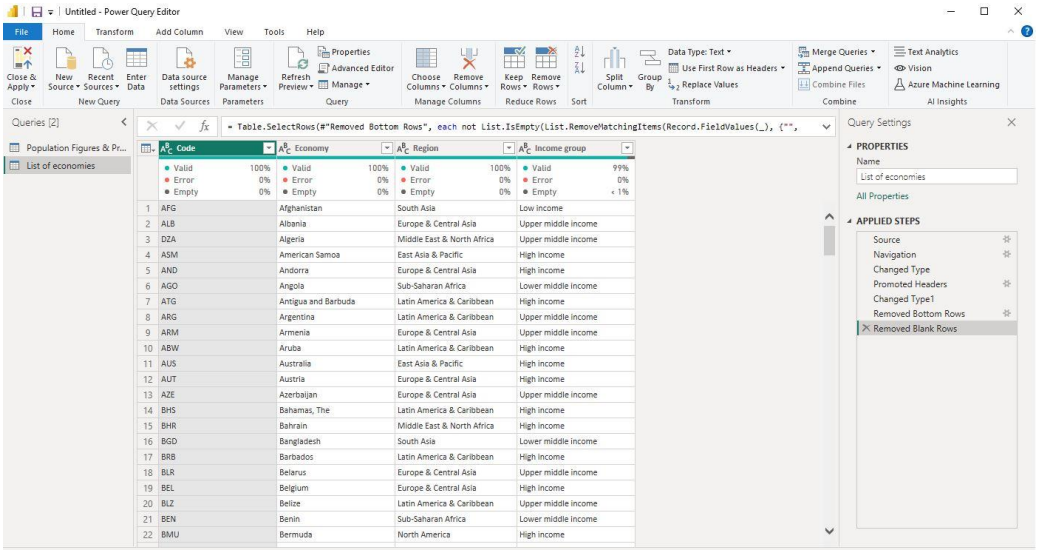


5.2.Power Query Editor I perform basic data cleaning here:

For the population dataset, I promoted header and renamed columns:



For the list of economies (country) data, I promoted header, removed bottom rows and blank rows



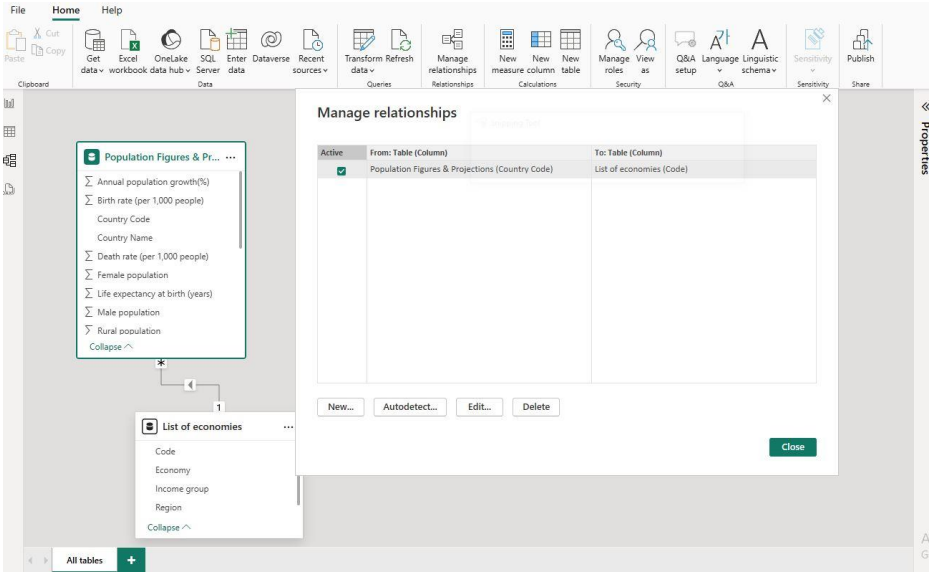
5.3. Data modelling

The country code in the population data (fact table) matches the code in the list of economies (country) data. So I created a one: many relationship with these variables between the two tables

Steps performed

1. Opened Model view.

2. Drag code from list of economies table to country code in population data table to create a one: many relationship. Cross filter direction: Single (Dim - Fact).



5.4. DAX measures (calculated measures used in cards & visuals) – I created the following measures during data exploration however only the first three were used in the report (dashboard).

- Total population (sum of male and female population)

- Urbanization rate (proportion of people living in urban areas)

- Average population growth (yearly growth rate averaged across rows)

- Average life expectancy

- Average Birth rate

- Average Death rate

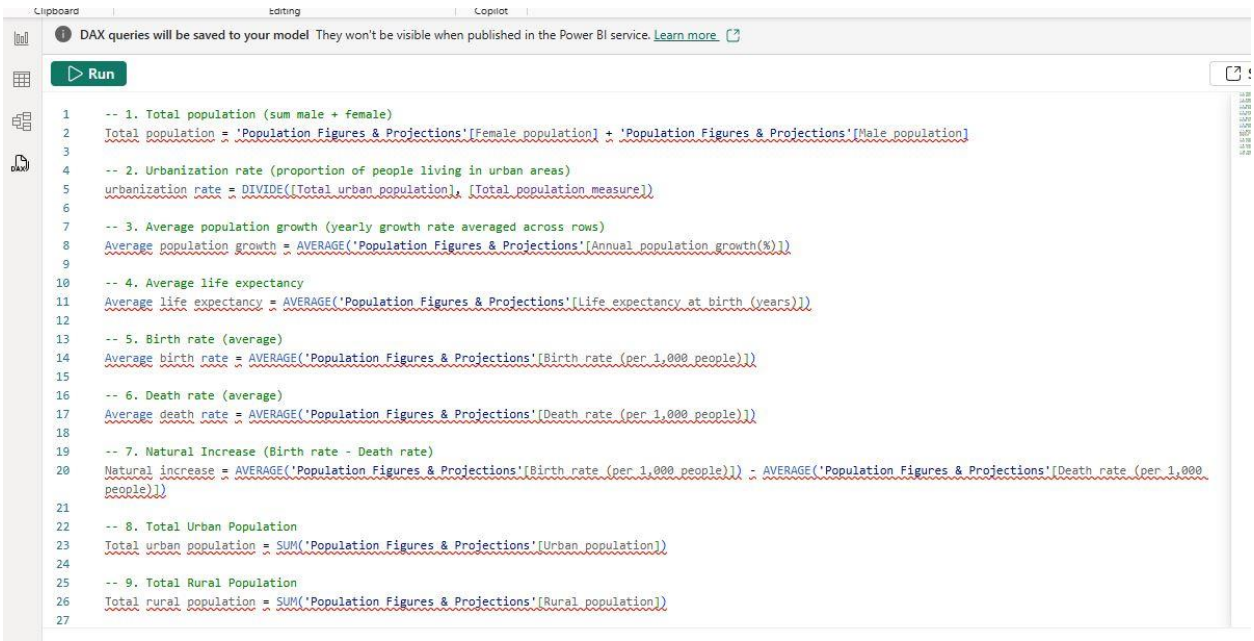
- Natural increase (Birth rate – Death rate)

- Total urban population

- Total rural population

- Sum total population

Step: Modeling pane - New Measure – DAX formula for creating measure



5.5. Building the report canvas (report view) — placing visuals

Layout (single screen)

1. **Title** (top center): *Population Growth and Urbanization Rate by Region Overview*

   - Text box - bold centered text.

2. **Top KPI cards** (left and right):

    - Card visual one - Average Population Growth measure
    - Card visual two - Urbanization Rate measure
    - Format: remove category label, set font size, background, shadow.

3. **Slicers**

    - Slicer 1: list of economies [IncomeGroup] (dropdown slicer)
    - Slicer 2: Year (between slider for 1960–2050)

4. **Column chart one - Average population growth by Region**

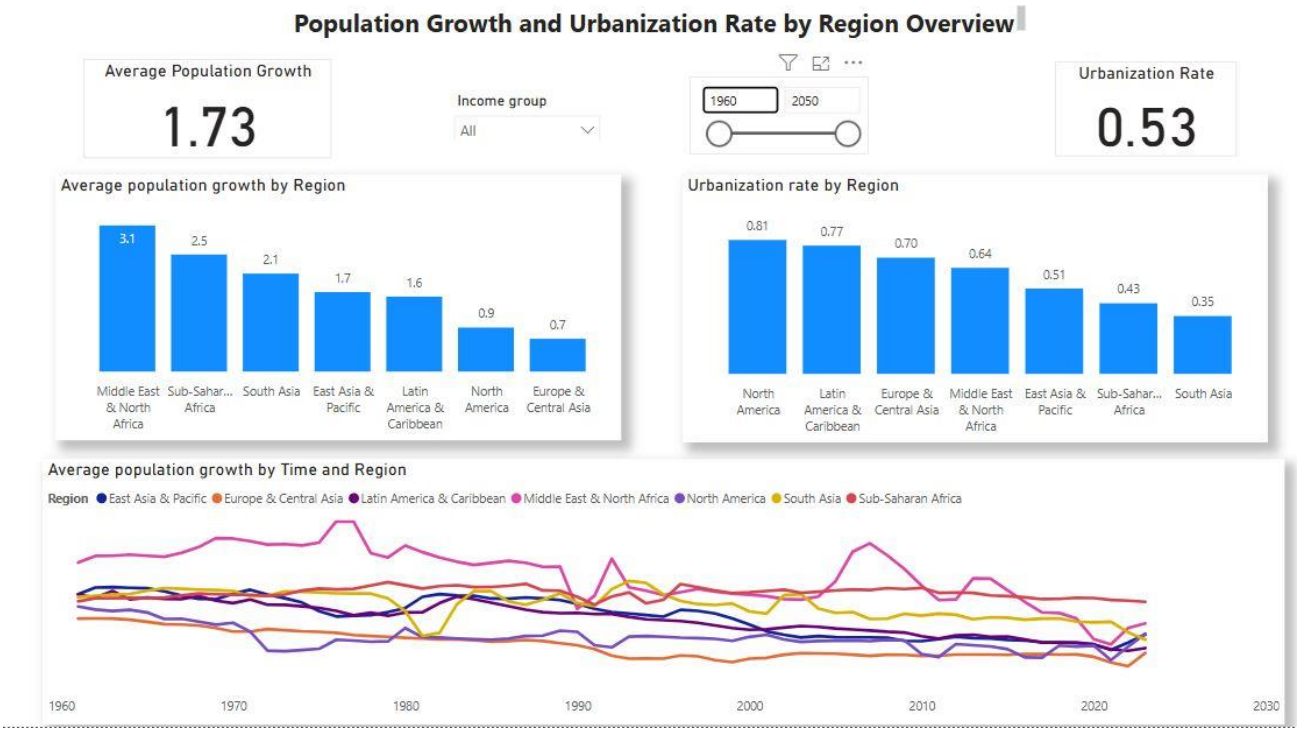
    - Visual: Clustered column chart
    - Axis: List of economies [Region]
    - Value: Average Population
    - Sort by value descending.
    - Add data labels (value above bars).

5. **Column chart two - Urbanization rate by Region**

    - Visual: Clustered column chart
    - Axis: list of economies [Region]
    - Value: Urbanization Rate
    - Format as percentage with 2 decimal places.
    - Add data labels.

6. **Line chart three - Average population growth by Year and Region**

- Visual: Line chart
- Axis: population data [Year]
- Legend: list of economies [Region]
- Value: Average Population Growth



6. **Critical Evaluation of the Dashboard Solution**

The developed dashboard offers an accessible and interactive overview of global population growth and urbanisation trends, providing policymakers and the general public with a clear

understanding of long-term demographic patterns from 1960 to 2050. This evaluation considers the strengths, alignment with project objectives, and limitations of the solution.

6.1.Strengths and Successful Elements

A key strength of the dashboard is its focused analytical scope. Given the breadth of demographic indicators available, narrowing the dashboard to concentrate on population growth and urbanization enables a coherent, single-screen design that remains understandable to non-technical users. These indicators are among the most policy-relevant in the dataset: population growth influences resource demand, social services and economic planning, while urbanization directly affects infrastructure development, housing needs and urban policy design. By presenting these metrics at a regional level, the dashboard aligns closely with the NGO's goal of offering aggregated insights that support high-level decision-making.

The choice of visualizations further reinforces the dashboard's clarity. Two column charts compare average population growth and urbanization levels across regions, making use of length-based comparisons that are quickly interpreted by viewers. The line chart showing population growth trends over time effectively captures temporal variation, enabling users to observe how regions evolve across decades. Together, these visuals support both cross-sectional and longitudinal analyses, which is crucial in demographic reporting.

The inclusion of KPI cards adds further value by providing immediate headline metrics. These cards allow users to grasp the overall rate of population growth and urbanization before engaging with detailed charts, supporting fast comprehension and reducing cognitive effort. For policymakers, who often rely on top-level insights, this is particularly beneficial.

Interactivity is another strength. The year and income-level slicers allow users to filter the dashboard to match specific analytical needs. Given the dataset's long timeframe and the diversity of countries represented, this interactive filtering improves flexibility and enables comparative analysis across economic classifications and time periods. The income-level slicer is especially relevant for development-focused stakeholders who may wish to isolate low-income or high-income countries.

From a technical perspective, the dashboard demonstrates effective data modelling practices. The fact table (demographic indicators) and dimension table (country classifications) were connected through a one-to-many relationship on country code, and the required cleaning steps and calculated fields were implemented through Power Query and simple DAX. The calculated variable for urbanisation rate is easy to interpret and avoids unnecessary complexity, making the data model transparent and maintainable.

6.2.Limitations and Areas for Improvement

Despite its strengths, the dashboard has two notable limitations. First, its narrow scope means it does not utilise many valuable indicators in the dataset, such as life expectancy, birth and death rates or rural/urban distribution. Although focusing on two variables improves clarity, it limits the dashboard's ability to communicate the full multidimensionality of demographic change. Additional pages or drill-through features could expand the analytical depth without cluttering the main view.

Second, regional aggregation, while useful for simplification, masks country-level variation. Significant differences exist within regions. For example, population growth in Sub-Saharan

Africa varies widely between countries. Yet these nuances are lost in regional averages. Incorporating tooltips, drill-down, or optional country-level views would enhance analytical precision.

6.3.Conclusion

Overall, the dashboard successfully meets its intended purpose by presenting a clear, interactive and policy-relevant overview of key demographic trends. While constrained by a single-screen format, it provides a strong foundation for deeper analysis and could be expanded in future iterations to incorporate additional indicators or country-level insights.

References

Cleveland, W.S. and McGill, R. (1984) ‘Graphical perception: Theory, experimentation, and application to the development of graphical methods’, *Journal of the American Statistical Association,* 79(387), pp. 531–554.
Few, S. (2006). *Information Dashboard Design*. O’Reilly Media.
Few, S. (2013). *Information Dashboard Design*. Analytics Press.
Knaflic, C. N. (2015). *Storytelling with Data*. Wiley.
Tufte, E. R. (2001). *The Visual Display of Quantitative Information*. Graphics Press.
Ware, C. (2012). *Information Visualization: Perception for Design*. Morgan Kaufmann.