“Breathing Life: Air Pollution, Health and Economic Indicators”

Introduction

Overview & Topic

The Power BI dashboard explores the relationship between air pollution (PM2.5), life expectancy, economic indicators (GDP per capita), health spending, CO_2 emissions and population across countries, continents and time. The dashboard’s stated aim (inferred from the visuals) is to reveal geographic patterns in pollution, link pollution with public health and economic capacity, and show temporal trends and country-level extremes.

Significance & Context

Air pollution (PM2.5) is a leading environmental risk factor for premature mortality. By combining PM2.5 with health and economic metrics, the dashboard intends to show both human impact (life expectancy) and country capacity to respond (GDP, health expenditure). This context helps policymakers and the public prioritize interventions e.g., investments in clean energy or health systems.

Data Description

The dataset includes following fields:

- Country, Continent, Year.
- PM2.5 (annual mean concentration).
- LifeExpectancy (years).
- GDP_per_capita (current US$).
- Health_Expenditure_%GDP (share of GDP).
- CO2_Emissions (per capita).
- Population (absolute).
- Income_Group (World Bank-like classification)

Data Types

- Numeric continuous: PM2.5, LifeExpectancy, GDP_per_capita, CO2_Emissions, Population, Health_Expenditure_%GDP.
- Categorical: Country, Continent, Income_Group.
- Temporal: Year.

Methodology

Data extraction / collection

- Sources likely downloaded as CSV/Excel time series: country-year PM2.5, life expectancy, GDP per capita, health expenditure, CO_2 and population.
- Bring all datasets into Power BI Desktop .

Data cleaning

- Country name harmonization: Ensure consistent country names across datasets (e.g., “United States” vs “USA”).
- Missing values: Deal with missing years/countries — either leave them out of aggregated averages or impute (interpolate) if appropriate. The visuals show continuous time series and averages, so missing data was likely handled (either by excluding missing observations from averages or interpolation).
- Outliers: For some small territories with extreme values, either retain (if valid) or flag. For example, extreme PM2.5 spikes could be real (wildfires, dust storms).
- Power BI operations used: Power Query transforms — merge queries, replace values, fill down/up, remove nulls or create fills.

Data transforming

- Calculated measures: The dashboard uses aggregates such as Average of PM2.5, Average of LifeExpectancy, Sum of Population, Sum of GDP_per_capita and Sum of Health_Expenditure_%GDP
- Grouping: Countries mapped to Continent and Income_Group.
- Time series index: Year converted to numeric/time data type for trend charts.

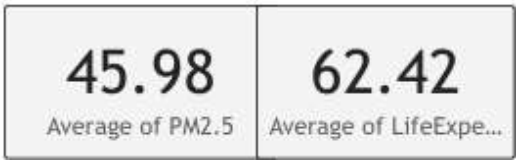
Data visualization

Visual 1 - KPI

1.Average Metrics Summary

Interpretation

- Card visuals displaying averages across the selected scope (likely global average across the selected year or all years).
- Quick high-level indicators: global mean PM2.5 approx. 46 µg/m³ and life expectancy ~62.4 years



2.Population Metric

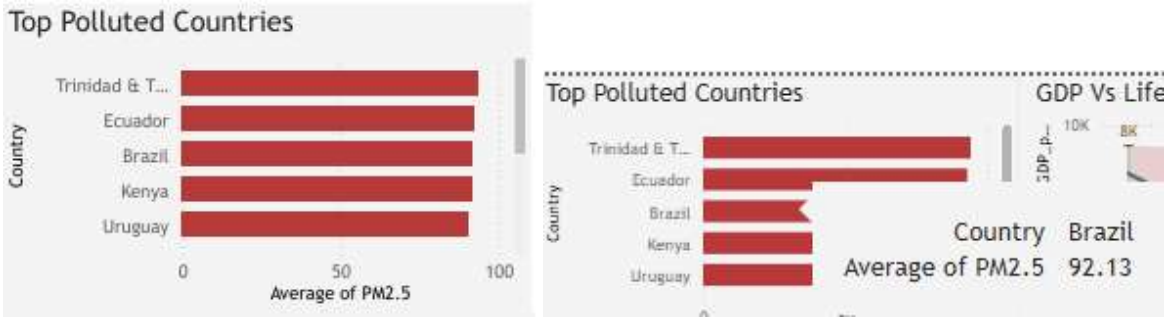
Interpretation

- Card showing the sum of population in billions unit across the dataset scope.
- Useful to show potential scale of population exposed to the observed PM2.5 levels (useful when combined with weighted averages).

Visual 2 - Top Polluted Countries (Horizontal Bar Chart)

Interpretation

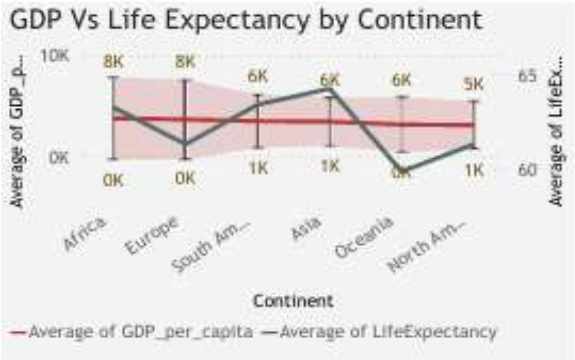
- Horizontal bar chart sorted descending by Average PM2.5
- Identifies top 10 countries with the highest mean of PM2.5 in the selected year(2023).
- The tooltip shows the information about Average PM2.5 per country.

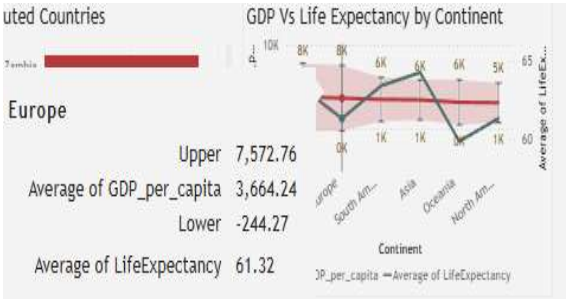


Visual 3 - GDP Vs Life Expectancy by Continent

Interpretation

- Dual-axis chart showing average GDP per capita and average life expectancy for each continent.
- Demonstrates the economic gradient: continents with higher GDP per capita (e.g., Europe, North America, Oceania) have higher life expectancy. Lower GDP continents show lower life expectancy.
- Also the graph contains error bars applied to average GDP per capita varying by standard deviation of 1 and also it shows error band highlighted in shades of red with upper and lower range.
- The line of average GDP per capita doesn't show any changes as the value of each continent lies within 3k - 4k range.

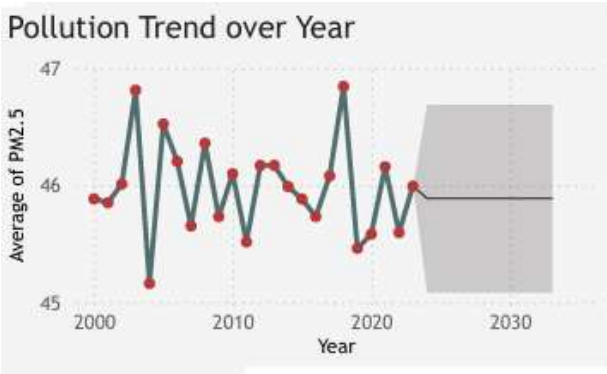


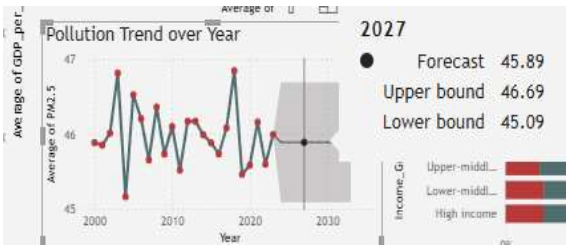


Visual 4 - Pollution Trend over Year (Time Series)

Interpretation

- Line chart with Year (2000–2023) plotting average PM2.5 across scope (global or selected filter).
- Shows how average PM2.5 has changed over time.
- This visual also contains forecast features which predicts the Average PM2.5 till the year 2033,which is shown by a straight line as the forecast value is 45 and doesn't vary .
- The tooltip shows the forecast value and also the upper and lower bound values.

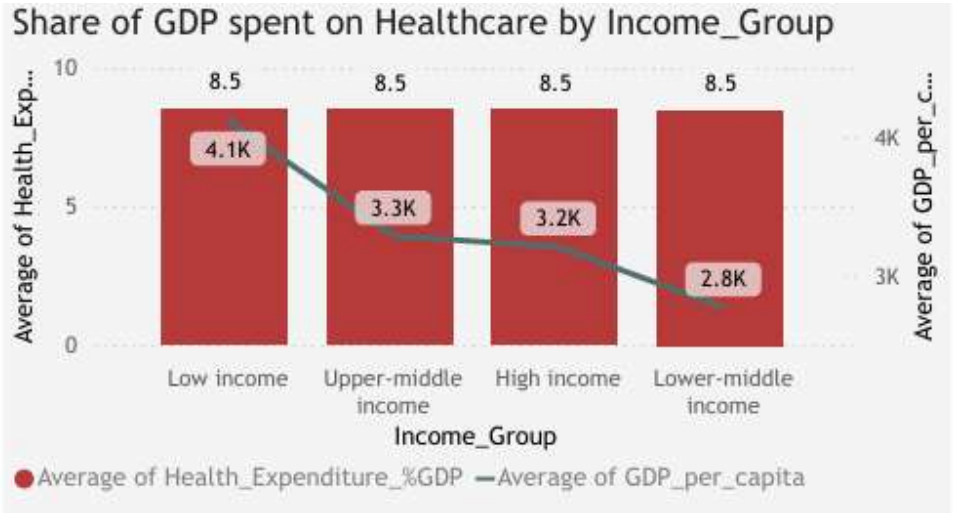




Visual 5 - Share of GDP spent on Healthcare by Income Group

Interpretation

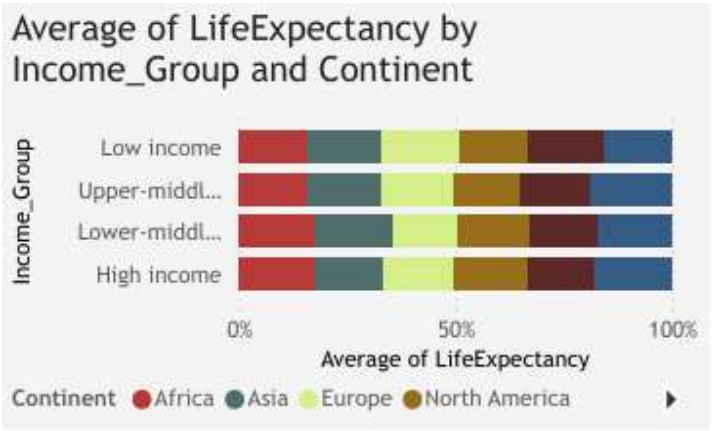
- A Line and stacked column chart showing the average of health expenditure percent of GDP (bar) and average of GDP per capita by income group (line).
- Attempts to show how much of national economic output is devoted to healthcare across income groups.



Visual 6 - Average of LifeExpectancy by Income_Group and Continent

Interpretation

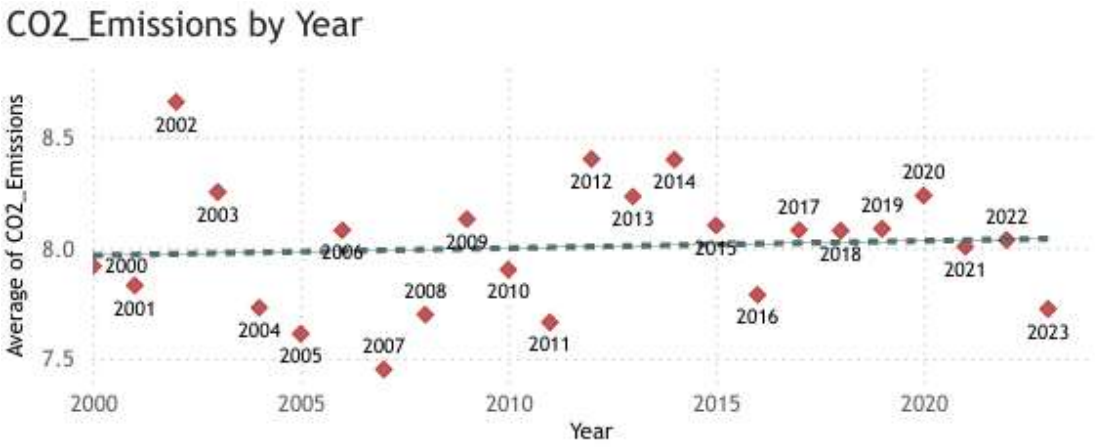
- A stacked bar chart where X = Average LifeExpectancy and Y= Income_Group and differentiated by Continent in colour.
- Highlights disparities: high-income groups have higher life expectancy irrespective of continent; low-income groups have markedly lower life expectancy. Regional differences within income groups may appear.

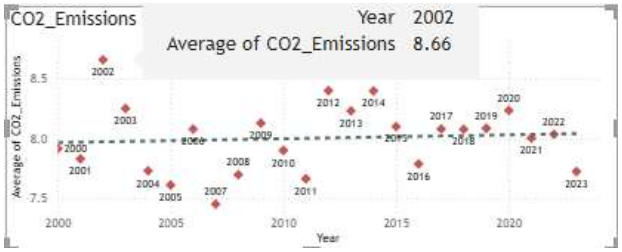


Visual 7 - CO_2 Emissions by Year (Time Series)

Interpretation

- Scatter chart plotting average CO_2 emissions per capita over time.
- The graph also has a trend line helping to identify patterns, forecast future values.
- The tooltip shows average CO_2 emissions per year.
- Tracks global greenhouse gas emission intensity. Comparing CO_2 trends with PM2.5 trends can be useful but they are related yet distinct phenomena.

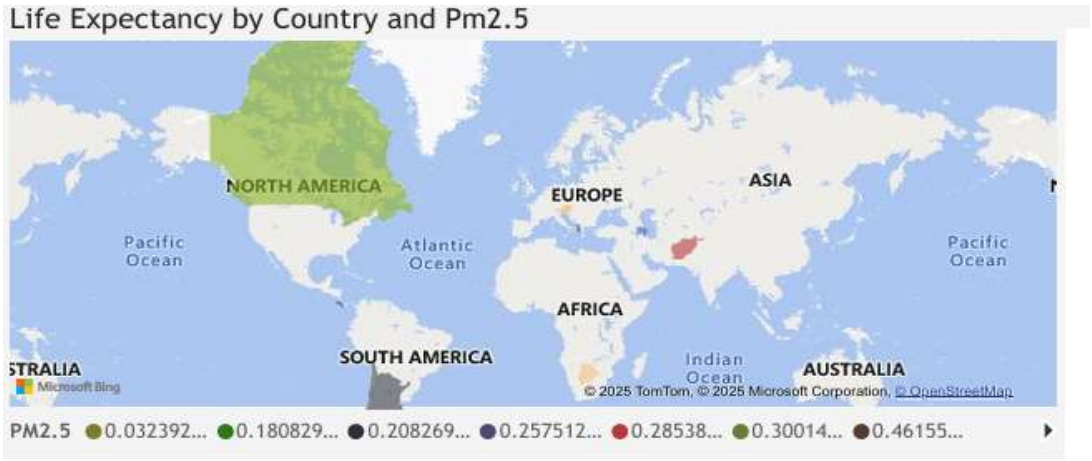




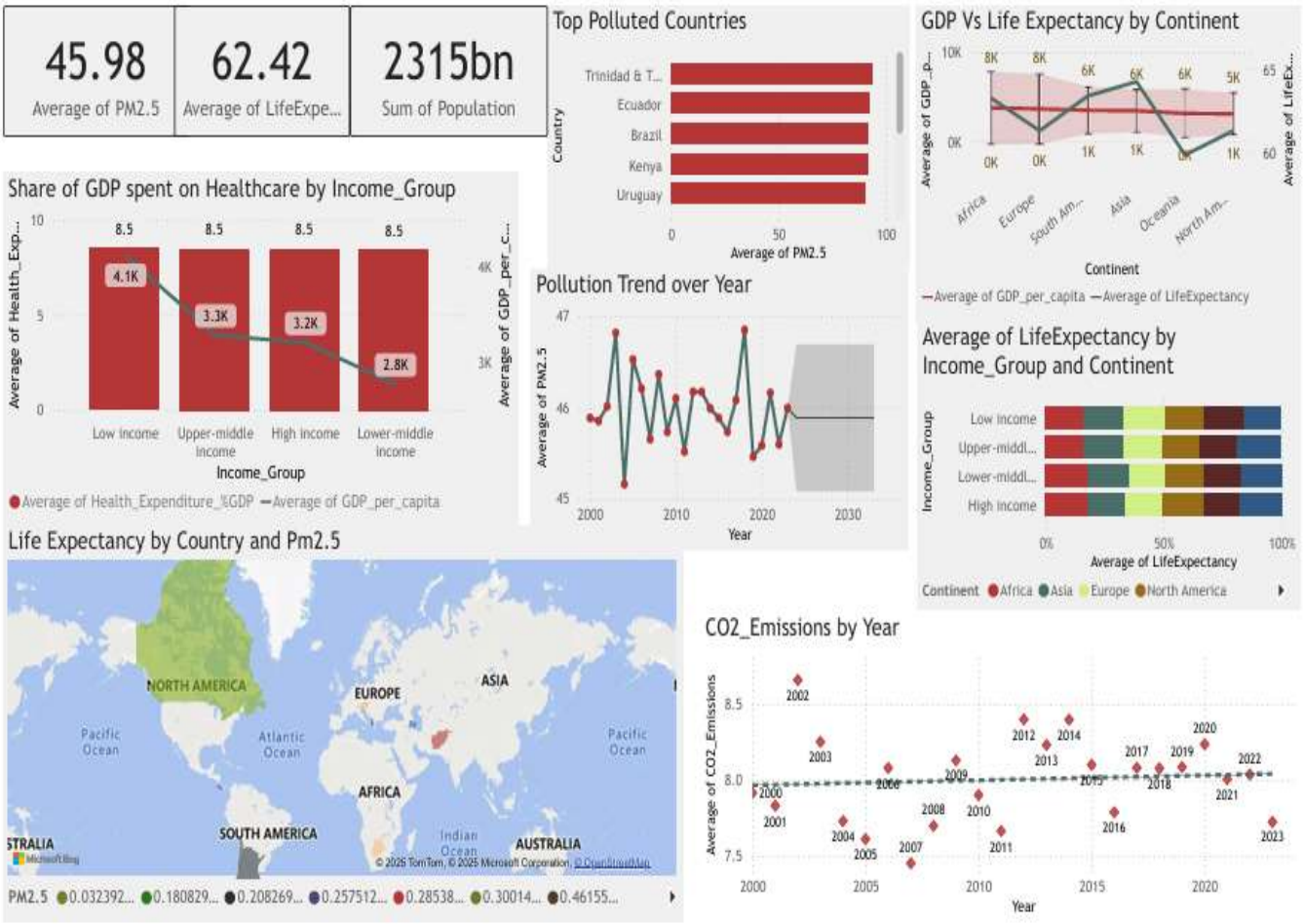
Visual 8 - Geographic map: Life Expectancy by Country and PM2.5

Interpretation

- Location = Country (mapped to geocoding).
- Color or size = Average of PM2.5.
- Tooltip includes PM2.5 ,Sum of GDP per capita and Sum of LifeExpectancy.
- Geographic distribution of PM2.5. Regions with high PM2.5 stand out (North America, parts of Africa and South America).
- Visual quickly identifies hotspots of pollution. The map's zoom and filled-color gradients help prioritize regions for action.



Dashboard Visualization



Analysis

Key Patterns Observed

- Geographic hotspots: Map & Top Polluted Countries show higher PM2.5 concentrated in certain countries (South Asia, parts of Africa and North America).
- Economic gradient: GDP vs Life Expectancy by Continent confirms wealthier continents have higher life expectancy and typically lower PM2.5.

- Health investment mismatch: Income groups show varying health expenditure shares, but the method of using sums is potentially misleading — the intuition remains: high-income groups spend more (in absolute GDP terms) and often a higher % of GDP on health.
- Temporal stability or changes: Time series for PM2.5 and CO_2 suggest year-to-year fluctuations.

Quantitative observations (from dashboard values)

- Global averages displayed: PM2.5 ≈ 45.98, LifeExpectancy ≈ 62.42 (verify scope/time).
- Sum of population displayed: 2315bn (likely the sum across included country-year combinations).

Conclusions

- Pollution remains a global health priority. The dashboard identifies specific countries with high PM2.5 that require urgent attention.
- Clear link between economic status and health outcomes. Continents/countries with higher GDP per capita show higher life expectancy and typically lower PM2.5.
- Health spending is unequal and may not be sufficient in poorer countries. However, the dashboard's current use of sum measures for percent-of-GDP can obscure the true comparative picture.
- Temporal trends require more nuanced presentation. Global averages mask regional divergence,some regions may have improved while others worsened.