Group Coursework Submission Form

Specialist Masters Programme

Please list all names of group members: 1. Sawant, Pranav 2.Subramaniam, Aditya 3. Rawat, Nikhil 4. Jain, Swasti	**GROUP NUMBER: 9**
MSc in: Business Analytics	
Module Code: SMM 635	
Module Title: Data Visualisation	
Lecturer: Prof: Sangseok Lee	**Submission Date: 20.02.24**

Declaration:

By submitting this work, we declare that this work is entirely our own except those parts duly identified and referenced in my submission. It complies with any specified word limits and the requirements and regulations detailed in the coursework instructions and any other relevant program and module documentation. In submitting this work we acknowledge that we have read and understood the regulations and code regarding academic misconduct, including that relating to plagiarism, as specified in the Programme Handbook. We also acknowledge that this work will be subject to a variety of checks for academic misconduct.

We acknowledge that work submitted late without a granted extension will be subject to penalties, as outlined in the Programme Handbook. Penalties will be applied for a maximum of five days of lateness, after which a mark of zero will be awarded.

Marker's Comments (if not being marked online):

Deduction for Late Submission: | **Final Mark:** %

SMM635 — Mid-Term Project Submission Template

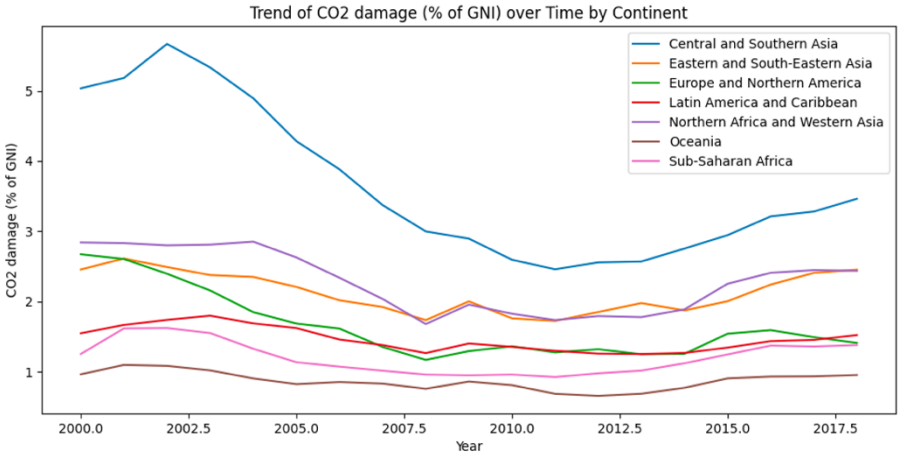
!! Do not remove the blank page between the sections!!

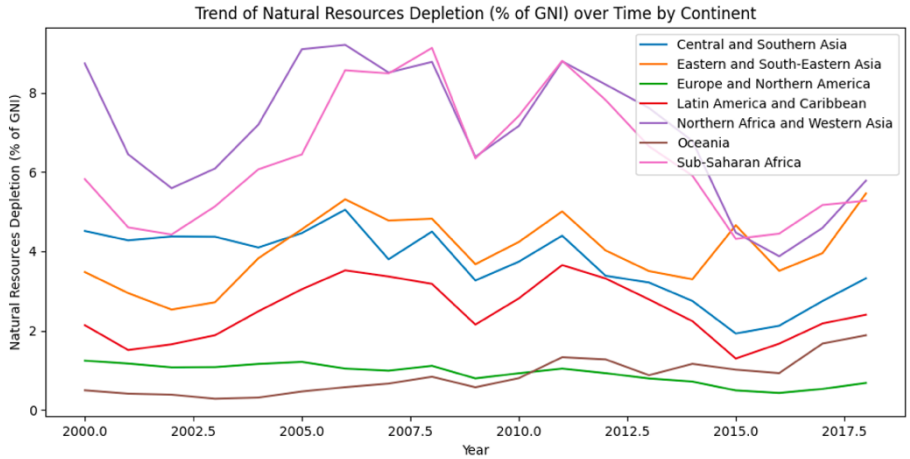
— That's the space for the marker's feedback —

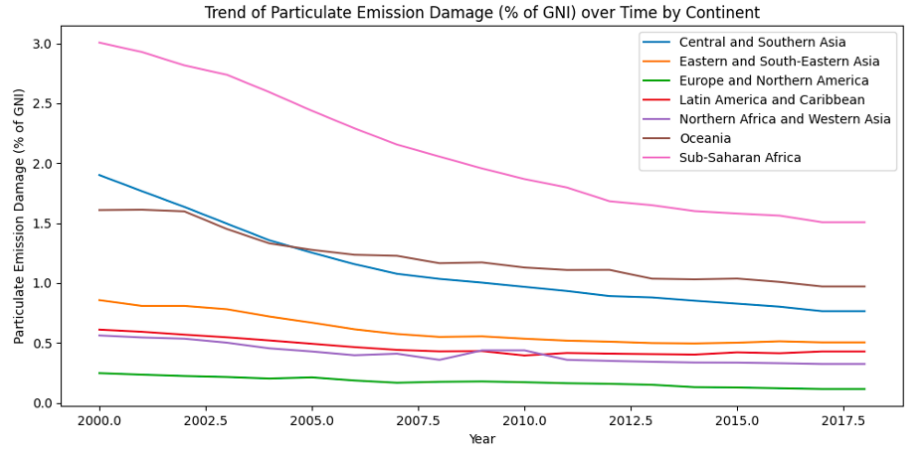
Visualization #1

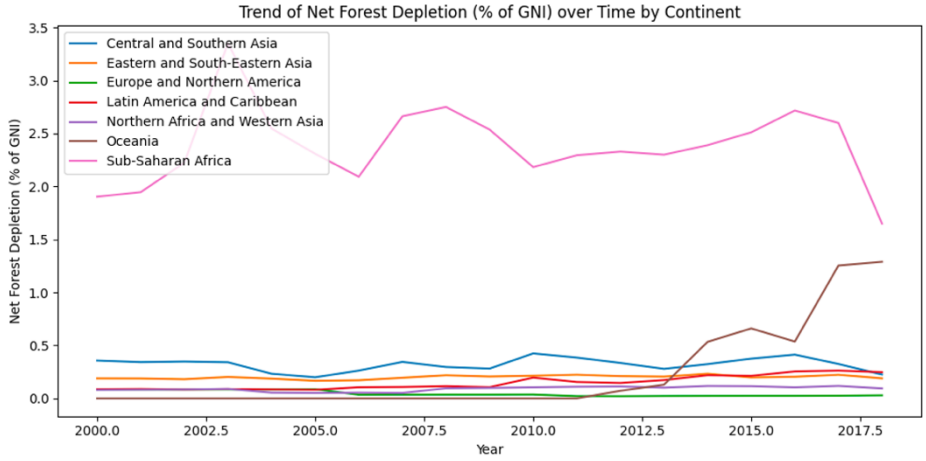
Question: How has the pattern of climate change actions varied over time?

Answer:









Question: What are the key design features of your visualization? (MAX 200 WORDS)

Answer: The key design features of the visualizations include:

1. **Time Series Line Graphs**: They depict changes over time, allowing for the observation of trends in sustainability metrics across years.
2. **Color-Coding by Continent**: Different colours represent different continents, making it easy to distinguish between them and follow their specific trends.
3. **Y-Axis Scaling**: Each graph uses a percentage scale relative to GNI, standardizing the impact measurement across diverse economies.
4. **Clear Titling**: Each graph is clearly titled to specify the sustainability metric it represents, facilitating quick identification of the data being presented.
5. **Data Smoothing**: The lines appear to be smoothed, suggesting the use of averages to present clearer trends over time.

These design features enable the viewer to discern how the pattern of climate change actions has varied over time by showing the progression or regression in key environmental impacts. For instance, the line graph for CO2 damage shows whether efforts to mitigate CO2 emissions are improving or worsening as a proportion of economic activity (GNI) on each continent. The natural resources depletion graph indicates how extraction rates have changed, while the particulate emission damage and net forest depletion graphs offer insight into the effectiveness of pollution control and forest conservation efforts, respectively. These patterns collectively provide a narrative on the evolution of climate change actions over the observed period.

Question: Why did you choose the above-mentioned design features? (MAX 200 WORDS)

Answer: The design features were chosen for their ability to present complex, longitudinal data in a clear and discernible manner:

1. **Time Series Line Graphs**: These highlight trends and changes over time, which is essential for understanding the progression of climate-related impacts.
2. **Color-Coding by Continent**: Facilitates easy comparison across different regions, allowing for a quick visual distinction of trends by continent.
3. **Y-Axis Scaling**: Using a percentage of GNI normalizes the data across countries with varying economic sizes, making it possible to compare the relative impact rather than absolute figures.
4. **Clear Titling**: Ensures the viewer knows exactly what each graph represents, which is critical for drawing accurate insights from the data.
5. **Data Smoothing**: Helps to focus on long-term trends rather than short-term fluctuations, providing a clearer narrative of progress or decline in climate change actions.

These features were selected to ensure the data's message is conveyed effectively, enabling stakeholders, policymakers, or the general public to grasp the historical patterns of climate change actions and their implications over time.

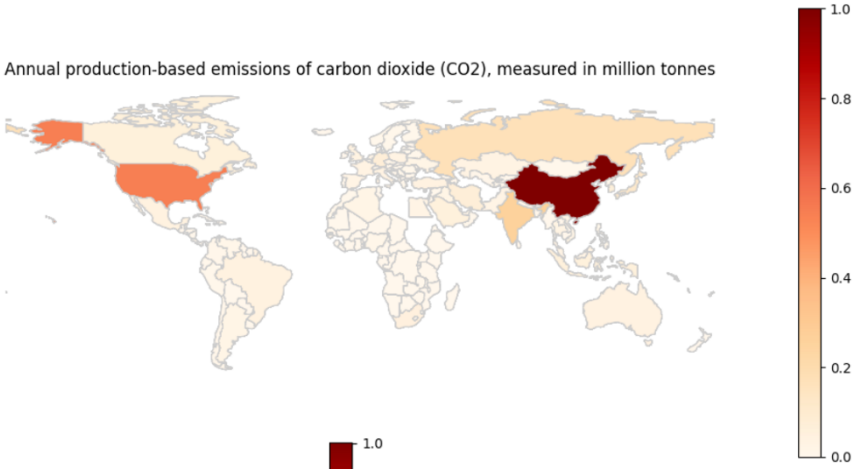
Question: What is the main insight of the chart? (MAX 100 WORDS)

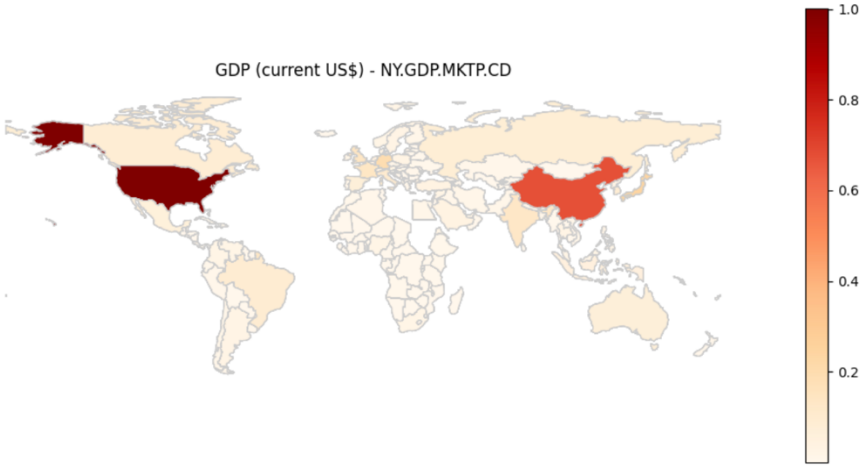
Answer: The main insight from the charts is the distinct regional trends in environmental impact over time. North America and Oceania show significantly higher CO2 damage as a percentage of GNI compared to other continents, whereas Africa has a rising trend in natural resources depletion. Particulate emission damage is consistently high in Asia, and net forest depletion is notably variable, with South America experiencing peaks that suggest substantial forest loss. The charts collectively highlight the varied environmental challenges each continent faces, emphasizing the need for region-specific sustainability strategies and policies.

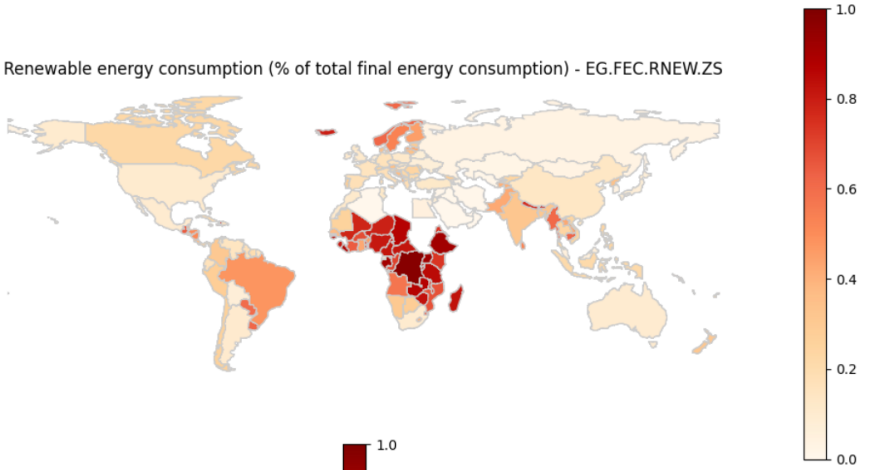
Visualization #2

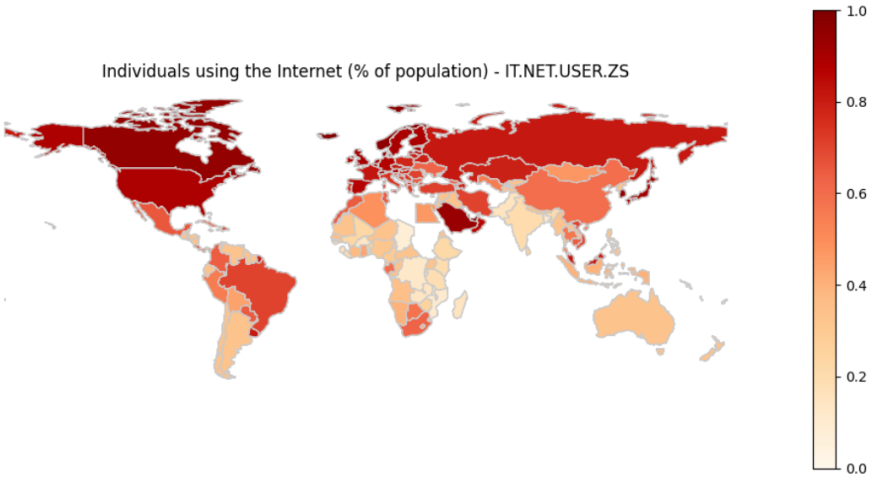
Question: How does the pattern of climate change actions change across countries? What economic and social variables account for the inter-country variation?

Answer:









Question: What are the key design features of your visualization? (MAX 200 WORDS)

Answer: The key design features of the visualizations include:

1. **Choropleth Mapping:** Countries are shaded according to the statistical variable shown, providing a clear visual distribution of data such as emissions or economic output.
2. **Colour Gradients:** Colour intensity corresponds to metric magnitude, with darker shades indicating higher values, allowing for intuitive understanding of the data scale.
3. **Legends:** Accompanying legends decode the colour scales, essential for interpreting data values represented by specific colours.
4. **Titles and Labels:** Descriptive titles and labels clarify the subject of each map, ensuring the viewer comprehends the data without additional context.
5. **Worldwide Representation:** The global scope, despite some countries not being shaded, suggests data unavailability or values below the threshold of the colour scale.
6. **Uniform Visual Design:** A consistent colour scheme and format across all maps enable cross-comparison between diverse data sets.

These design elements collectively communicate patterns in climate action across countries. Correlating economic indicators like GDP and social metrics like Internet usage suggest that wealthier nations have more means for environmental initiatives, while widespread Internet access could indicate better awareness and thus stronger climate actions. These maps allow for the exploration of economic and social drivers behind the differences in international climate change responses.

Question: Why did you choose the above-mentioned design features? (MAX 200 WORDS)

Answer: The chosen design features were selected to effectively communicate complex data in a geospatial context and to allow for cross-country comparisons and correlations:

1. **Choropleth Mapping**: This was chosen to communicate complex data within a geospatial framework, enabling insightful cross-country comparisons. Choropleth maps excel in depicting data density and distribution across regions, highlighting global patterns and anomalies.
2. **Colour Gradients**: These serve as an intuitive scale for data magnitude, with darker shades typically indicating higher values, thus allowing for rapid visual analysis.
3. **Legends**: These re indispensable, quantifying colour scales for accurate data interpretation.
4. **Titles and Labels**: They clarify the map's focus, which is vital for stand-alone visualizations.
5. **Immediate visual comparison:** This format supports immediate visual comparisons of global trends, bypassing the need for numerical analysis.
6. **Data normalization:** Normalizing the data on the colour scale ensures that comparisons are fair, independent of a country's size or population density.
7. **Geographic patterns:** One can easily identify disparities and distributions across areas, pinpointing regions of interest or concern.

These mapping features are pivotal for observing international variations in climate change responses, identifying which countries are advancing or falling behind in metrics such as CO2 emissions or renewable energy uptake. Additionally, they facilitate an initial evaluation of the impact of economic (GDP) and social (Internet usage) factors on these responses, by visually correlating these aspects with sustainability indicators.

Question: What is the main insight of the chart? (MAX 100 WORDS)

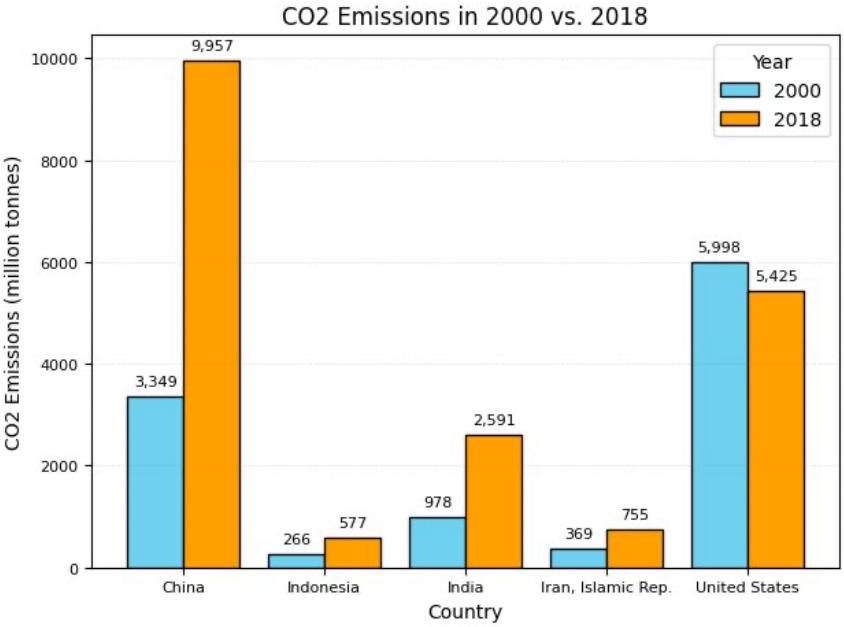
Answer: The main insight from the maps is the evident global disparity in climate change actions, economic capacity, and social development. Countries with darker shades on the CO2 emissions map tend to be those with higher GDP, suggesting that economic prosperity may correlate with higher emissions. However, regions with darker shades indicating higher renewable energy consumption don't necessarily align with higher GDP areas, suggesting economic wealth is not the sole driver of renewable adoption. Internet usage is widespread in developed regions, indicating a digital divide aligned with economic lines. Although, widespread Internet usage, indicated by darker shades, doesn't necessarily

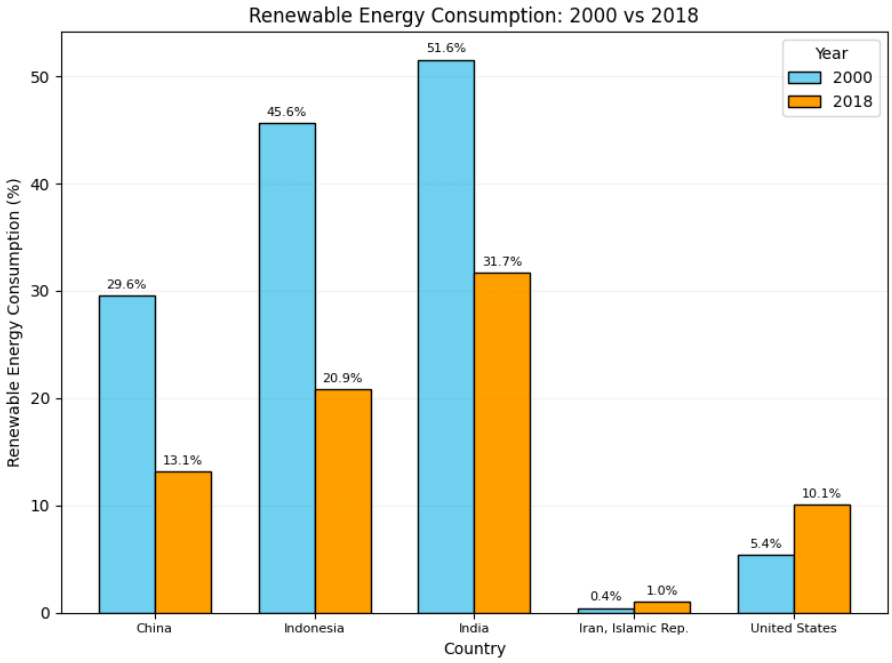
align with lower emissions or higher renewable use, hinting a complex interplay between socio economic variables as internet acts as a driving factor towards awareness about climate change.

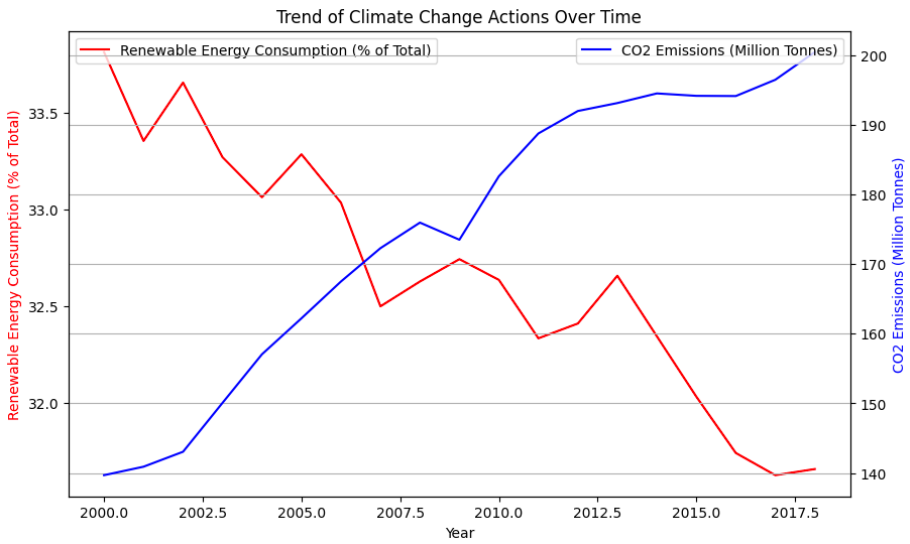
Visualization #3

Question: Are there any countries that have significantly changed their climate change actions over time?

Answer:







Question: What are the key design features of your visualization? (MAX 200 WORDS)

Answer: The key design features of the visualizations are:

1. **Comparative Bar Graphs:** These illustrate the difference in renewable energy consumption and CO2 emissions between two significant years, 2000 and 2018. The side-by-side bars allow for quick assessment of progress or regression in each country.
2. **Percentage and Absolute Values:** For renewable energy consumption, the graphs display percentages, directly indicating the proportion of renewable energy use relative to total energy consumption. For CO2 emissions, the graphs show absolute values in million tonnes, which captures the scale of emissions.
3. **Annotated Data Points:** Key data points are annotated directly on the bars for precise, at-a-glance quantification.
4. **Colour Coding:** Different colours distinguish data from the two years, aiding in quick year-on-year comparison.
5. **Dual-Axis Line Graph:** Shows the relationship between renewable energy consumption (as a percentage) and CO2 emissions (in million tonnes) over time, using different scales on the left and right to accurately reflect two different types of data.

These features allow us to answer the question about countries changing their climate change actions over time. The graphs clearly show, for instance, that some countries have increased their renewable energy consumption significantly while reducing or maintaining their CO2 emissions, indicating a substantial shift towards more sustainable practices. Conversely, if CO2 emissions have increased alongside a modest rise in renewable energy consumption, the actions towards climate change mitigation might be less pronounced.

Question: Why did you choose the above-mentioned design features? (MAX 200 WORDS)

Answer: The design features were chosen to convey information effectively and allow for easy comparison of climate action changes over time:

1. **Comparative Bar Graphs**: Enable a direct visual comparison between two points in time, highlighting changes in a country's energy profile and emissions.
2. **Percentage and Absolute Values**: Provide context-sensitive measurements, using percentages to show relative change in renewable energy consumption and absolute figures to show the scale of CO2 emissions.
3. **Annotated Data Points**: Deliver precise information without the need for cross-referencing with a legend or table, facilitating immediate understanding.
4. **Colour Coding**: Offers a visual shorthand to distinguish between different years, simplifying temporal comparisons.
5. **Dual-Axis Line Graph**: Allows for the correlation of two different types of data on the same timeline, showing the inverse relationship between the variables and how changes in renewable energy usage affect CO2 emissions.

These features were selected to make the data as accessible and understandable as possible, ensuring that the insights regarding changes in climate actions over time are clear and immediately apparent to the viewer.

Question: What is the main insight of the chart? (MAX 100 WORDS)

Answer: The main insight from the charts is that certain countries have indeed significantly altered their climate change actions over the observed period. For example, the increase in renewable energy consumption, particularly in Indonesia and India, suggests a substantial shift towards renewable energy sources. Meanwhile, the CO2 emissions data indicates that while some countries like the United States have managed to reduce emissions, others like China and India have seen significant increases, despite the growth in their renewable energy sector. These insights reveal the complex and varied approaches to climate change actions across different nations over time.