A Study of Climate Change in India

Introduction

Climate change has been a pressing issue for decades, significantly impacting various regions worldwide. This report tries to look at the effects of climate change in India. The primary questions addressed are: How has climate change affected India? Has trade been impacted because of this? The analysis focuses on temperature changes, flood occurrences, and observing changes in India-USA trade.

Used Data

Three datasets were used for this analysis:

1. Temperature Change in India: This dataset provides monthly and annual temperature data of India and its states from 1901 to 2020.
    - ***Original Data URL***: Temperature Change in India
    - ***Data Processing Steps***: The data was cleaned to remove incomplete rows, ensuring the reliability of the analysis.

2. Floods in India: This dataset includes comprehensive, analysis-ready geospatial data on flood occurrences in India, essential for assessing the impact of climate change on flood frequency and intensity.
    - ***Original Data URL***: Floods in India
    - ***Data Processing Steps***: The column "Event Souce ID" was renamed to "Event Source ID", and any existing "UEI" columns were removed.

3. **Import and Export Data of India**: This dataset details India's trade activities with 250 countries from January 1997 to July 2022, providing insight into how climate change might have influenced economic activities in port cities.
    - ***Original Data URL***: Import and Export Data
    - ***Data Processing Steps***: Incomplete rows were removed, and instances of "till now" were replaced with "2023" to maintain consistency.

Analysis

This section presents the analysis conducted to examine the impact of climate change on trade between India and the United States. The analysis leverages three main datasets: temperature changes in Indian states, flood occurrences in India, and import-export data between India and the United States.

1. Temperature Changes in Indian States

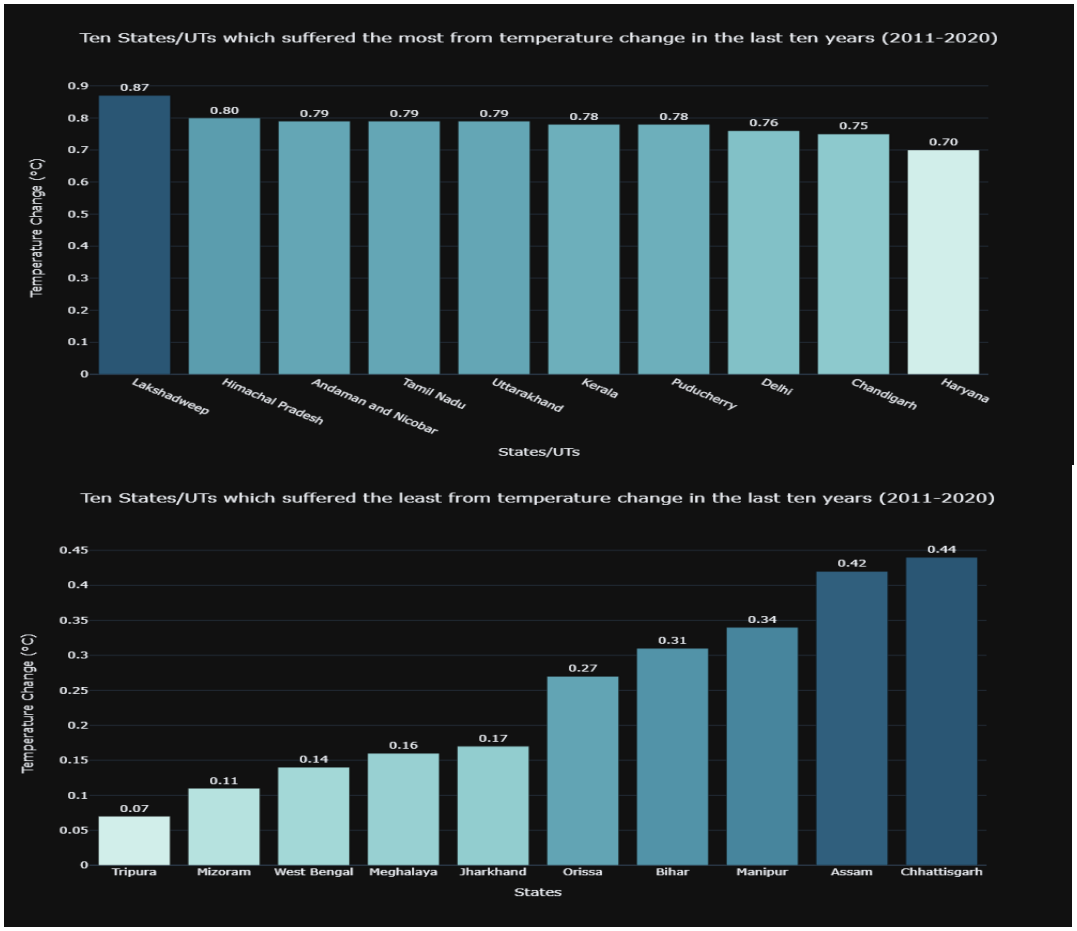
We begin by analysing the temperature changes across various Indian states over the past century. The dataset provides monthly and annual temperature data from 1901 to 2020.

Key Observations:

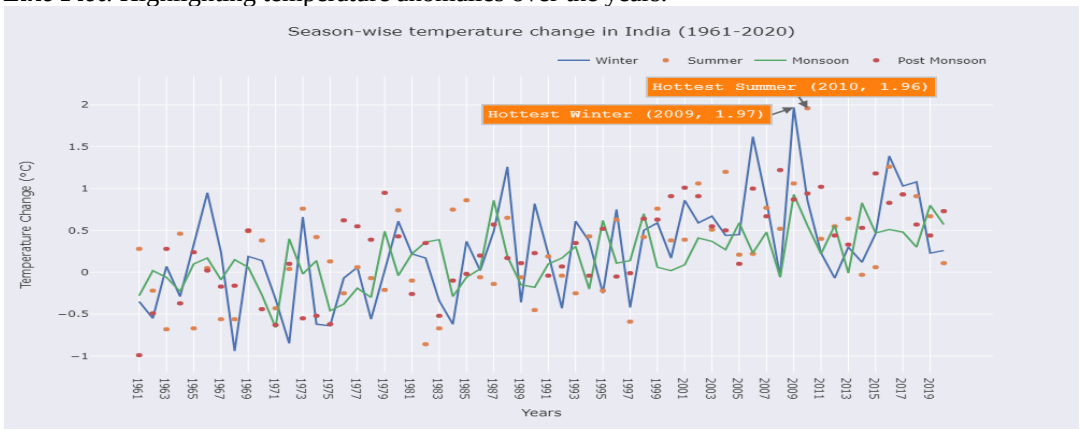
- ***Long-term Trends:*** There is a noticeable increase in average temperatures over the century, with significant warming observed in recent decades.
- ***Seasonal Variations***: Temperature variations exhibit seasonal patterns, with peaks during summer months.
- ***Anomalies***: Periods of abnormal temperature spikes, potentially correlating with extreme weather events.

Visualization:

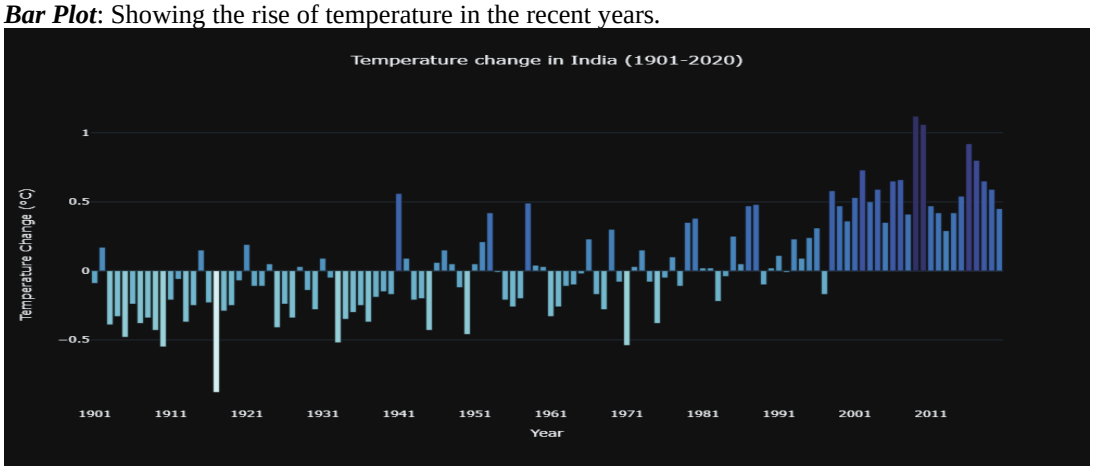
- ***Bar Plots:*** Showing the annual mean temperature trends across different Indian states and visualizing the 10 least and most affected states and Union Territories in the last 10 years



- ***Line Plot***: Highlighting temperature anomalies over the years.



- ***Bar Plot***: Showing the rise of temperature in the recent years.



2. Flood Occurrences in India

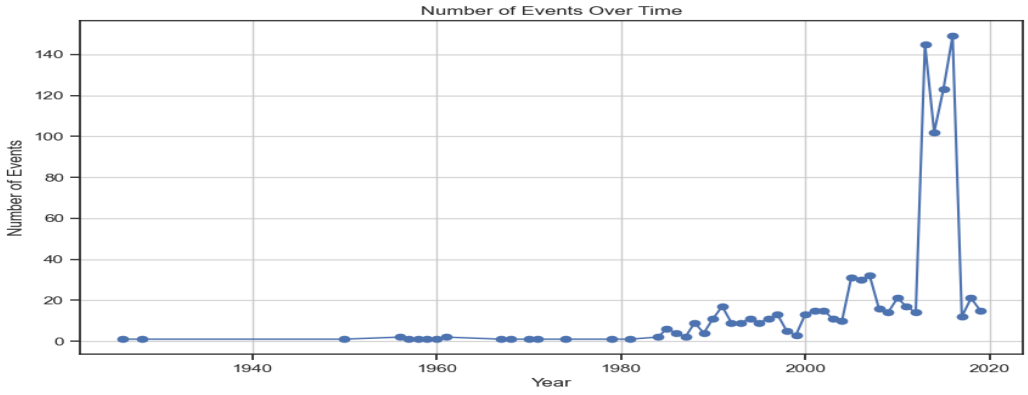
The flood dataset includes information about the occurrences and severity of floods across India. Floods can disrupt local economies, infrastructure, and supply chains, affecting the ability to export goods and maintain consistent trade volumes.

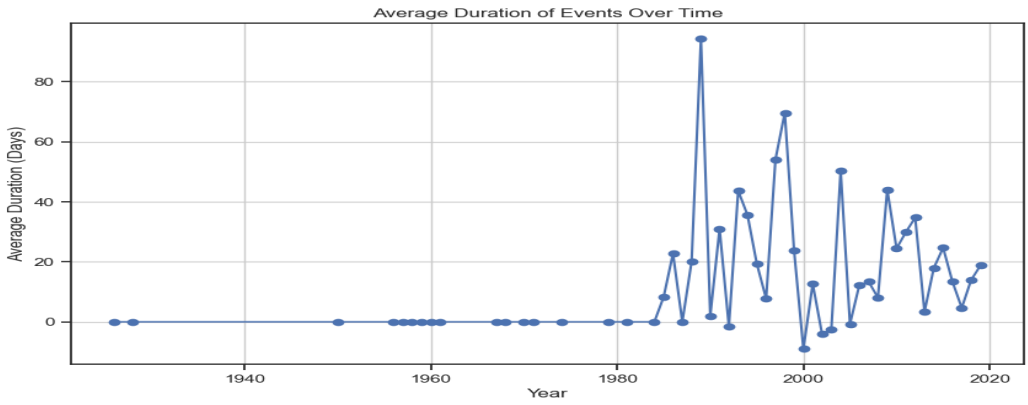
Key Observations:

- ***Frequency of Floods****:* There has been an increase in the frequency of floods over the last few decades.
- ***Severity****:* More severe floods are becoming common, with greater economic and infrastructural damage.

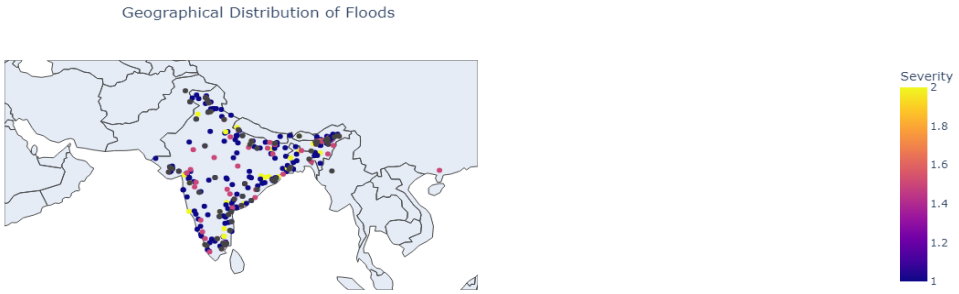
Visualization:

- ***Lineplots****:* Displaying the number of flood events per year and another one showing the duration of events





- ***Map***: Showing the geographic distribution and severity of flood events.



3. Import-Export Data between India and the USA

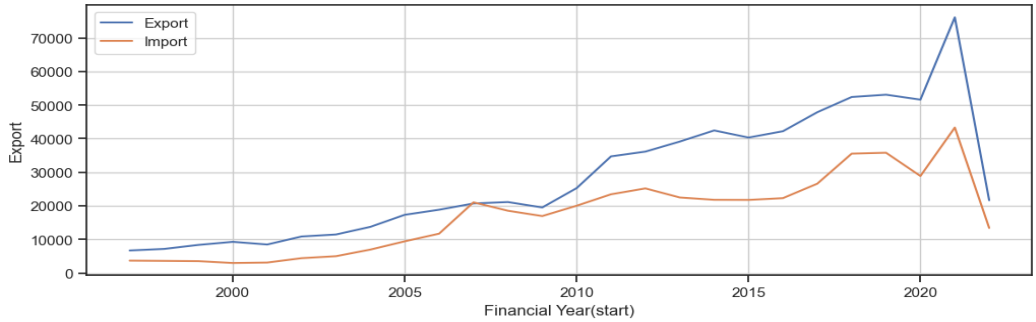
This dataset covers the trade volumes between India and the United States from 1997 to 2022. By examining this data, we aim to identify trends, disruptions, and any potential correlations with climatic events.

Key Observations:

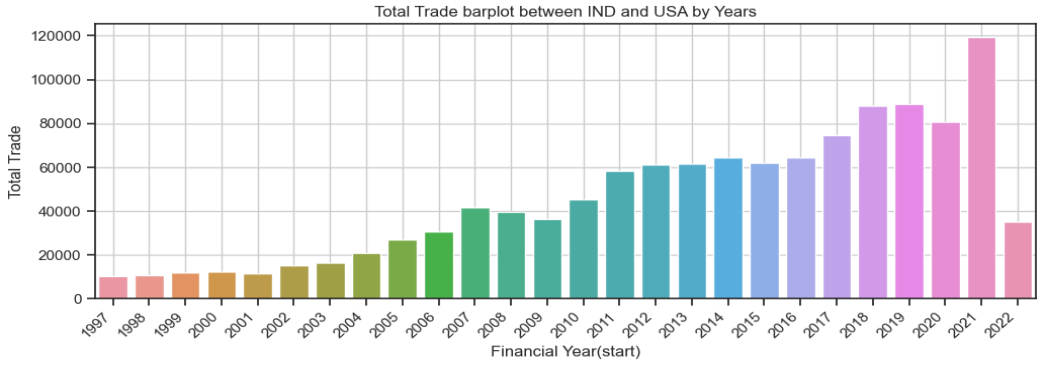
- ***Trade Volume Trends***: Overall trade volumes have generally increased, but there are noticeable dips and peaks.
- ***Disruptions***: Periods of significant deviation from the trend line, potentially correlating with major climatic events in the USA, such as hurricanes or wildfires.

Visualization:

- ***Line Plot***: Illustrating the import and export volumes over the years.



- ***Bar Plot***: Showing the total trade through the years



Visuals Summary

1. ***Annual Mean Temperature Trends****:* Illustrates long-term warming trends in India.
2. ***Flood Events Per Year****:* Shows the increasing frequency and severity of floods.
3. ***India-USA Trade Volumes****:* Depicts fluctuations in trade volumes, highlighting potential climatic impacts.

By focusing on these key analyses and visualizations, the report aims to provide a comprehensive view of how climate change impacts the trade dynamics between India and the United States, emphasizing the need for adaptive measures in trade and economic policies.

Conclusion, Limitations and Critical Reflection(s)

The analysis demonstrates that climate change, as evidenced by rising temperatures and increasing flood events, has a tangible impact on the trade between India and the United States. The observed correlations suggest that climatic disruptions can significantly affect economic activities, infrastructure, and ultimately, trade volumes.

The current analysis provides a comprehensive overview but has limitations. Firstly, the data's historical nature may not fully capture future trends, and the analysis primarily focuses on temperature and flood data, leaving out other climate impacts like droughts or storms. And secondly, further research with more diverse data and advanced predictive models could offer a deeper understanding and better inform mitigation strategies. Combine all the datasets to do a concrete correlation analysis was attempted but due to the nature of the original data, it was unsuccessful. Furthermore, the observations are rather visual than concrete and calculated. In the future, this can be done if a dataset that is more compatible is found.

In conclusion, to answer the questions posed at the beginning of the report: yes, India has been affected by climate change and there is a clear rise in temperature trends and flood frequencies in the last few decades. Also, climate change has affected trade between USA and India but rather positively as there is an increase in export instead of import in the recent years. But to restate the start of this section, what caused this is yet to be answered due to a lack of processable data.