

# Visualizing Billion-Dollar Disasters in the USA (1980–2024)

Team Oldlace

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## INTRODUCTION

The Disaster Relief Fund (DRF), which is crucial for providing immediate aid and support in the wake of disasters, is being rapidly drained due to the rising number and intensity of these events. This financial strain not only hampers immediate relief efforts but also puts the country at risk of being underprepared for future catastrophes. To highlight the need for enhanced disaster preparedness in the USA, Dottle and Kaufman<sup>1</sup> presented a combined plot visualizing the total estimated costs by disaster type and the frequency of such events from 1980 to 2023. The plot demonstrated the increased frequency of various types of disasters over the years, likely driven by factors such as climate change, along with their escalating financial impact and costs. Coupled with the depletion of the country's DRF, this elucidates the dire need for proactive preparations and mitigations to address the growing threat of such disasters effectively.

## PREVIOUS VISUALIZATION

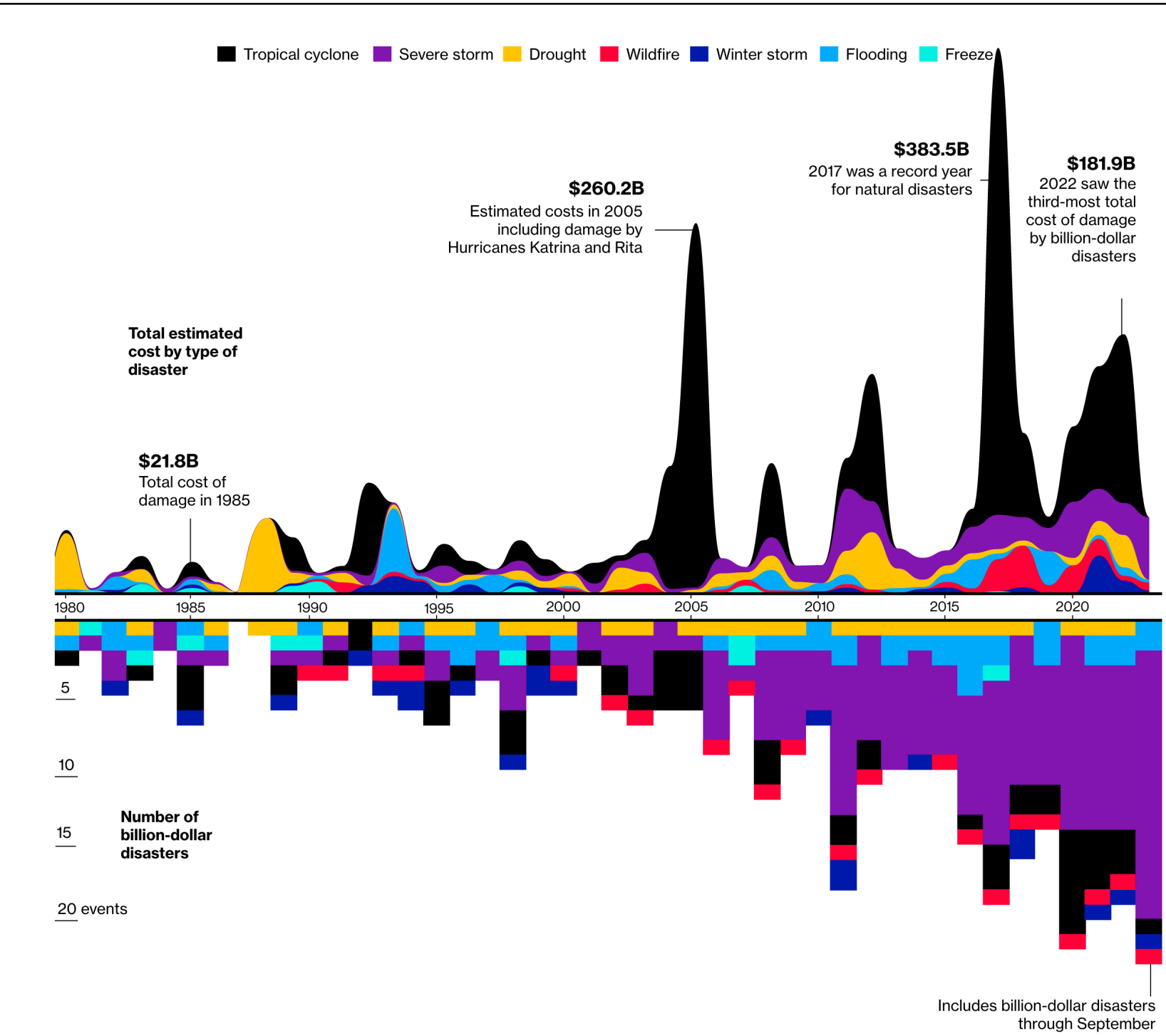


Figure 1: Frequency and Estimated Costs of Billion-Dollar Disasters in the USA by year, published by Bloomberg.

## STRENGTHS

- The graph includes a *dual-axis* representation of the frequency and costs of billion-dollar disasters, providing a comprehensive overview of the data with the use of stacked areas and bars.

<sup>1</sup>Dottle, R., & Kaufman, L. (2023). Climate Disasters Drain US Emergency Fund, Adding to Government Shutdown Risk. Retrieved from <https://www.bloomberg.com/graphics/2023-fema-disaster-relief-fund-extreme-weather-climate-aid/>

- It includes *annotated descriptions* on certain data points, enhancing the interpretability of the visualisation.
- The timeline shows *clear trends* over the decades, highlighting the increasing frequency and costs of natural disasters.

## SUGGESTED IMPROVEMENTS

- Split the visualisation into two separate plots* to better highlight the trends in frequency and costs of billion-dollar disasters.
- Enhance the color palette* to improve readability and distinguish between different disaster types which caters for color-blind individuals.
- Group disaster types* together to provide a clearer overview of the data.
- Combine data into 5-year intervals* to reduce visual clutter and improve readability.
- Relabeled axes* to provide clearer information on the data presented.
- Changed stacked area chart to line chart* to better show trends over time.
- Included annotation for events* to highlight significant rise of cost.
- Sorted frequency and included trend line* before stacking histogram.

## IMPLEMENTATION

### Data

- Frequency and estimated cost for each disaster type is obtained from the National Centers for Environmental Information (NCEI).<sup>2</sup>
- Consolidated data with NCEI USA to obtain more detailed information on each disaster specific to the United States.<sup>3</sup>
- Combined individual disaster types into broader disaster categories for better visualisation and capturing of trends.
- Combined data from each disaster category into 5-year intervals for better visualisation of trends.

### Software

We used the Quarto publication framework and the R programming language, along with the following third-party packages:

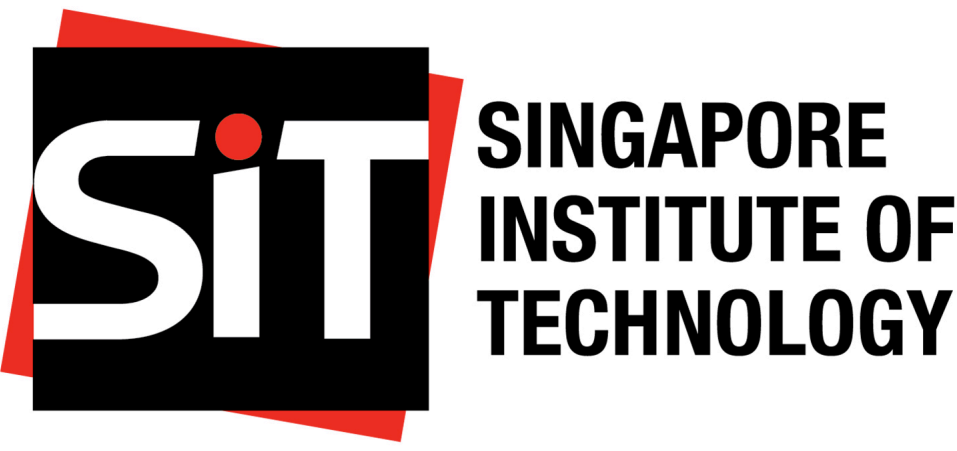
- tidyverse* for data transformation, including *ggplot2* for visualization based on the grammar of graphics
- knitr* for dynamic document generation
- scales* for data transformation and visualization
- patchwork* for combining multiple plots
- dplyr* for data manipulation

## FURTHER SUGGESTIONS FOR INTERACTIVITY

Since the visualization is intended for a poster, we could include features such as *hover-over tooltips* to display detailed information, *interactive legends* where users could click to highlight specific disaster types and *zoom and pan* to allow users to closely examine selected areas of the visualisation. This enhances user engagement and provides a more interactive experience.

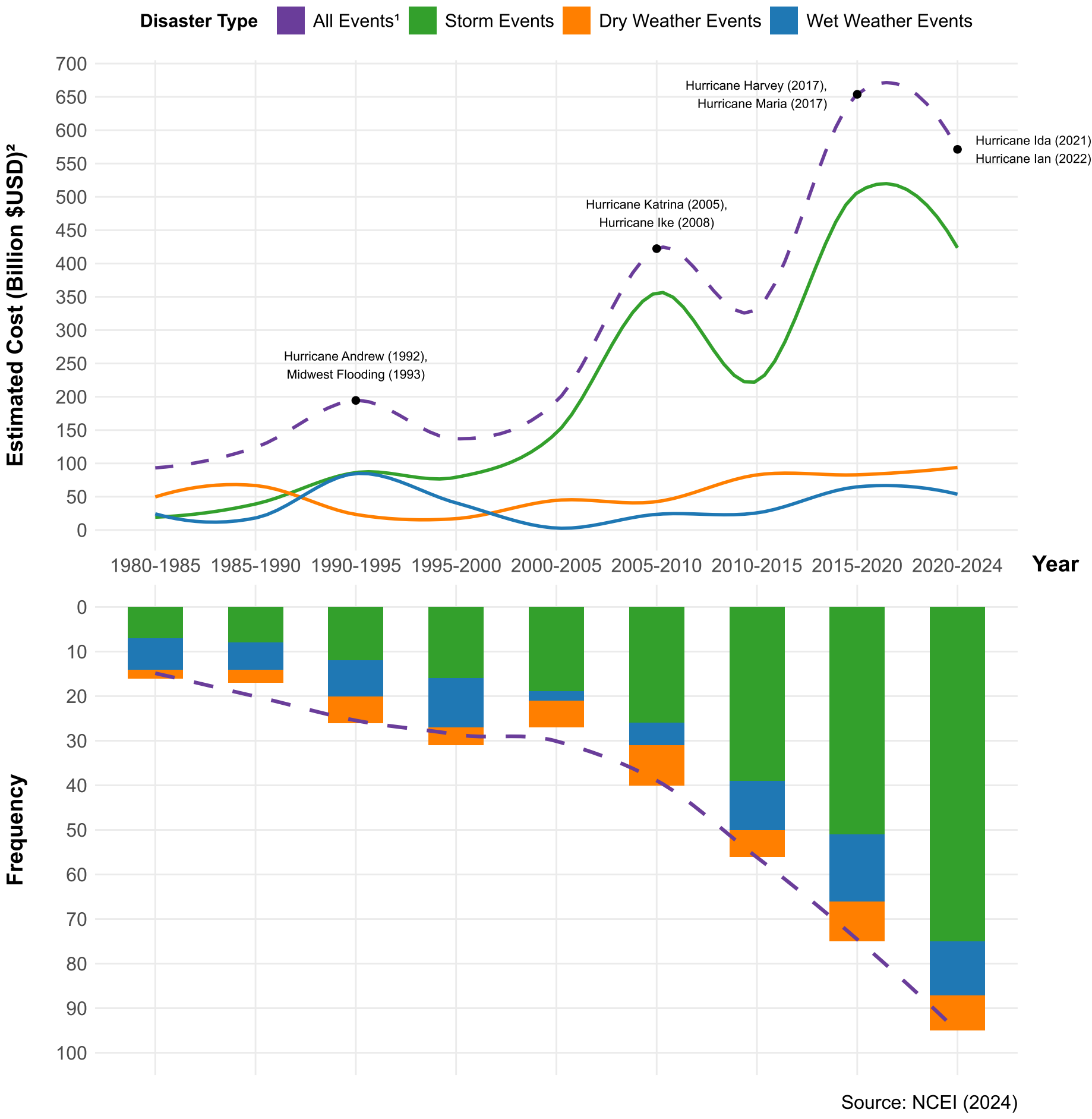
<sup>2</sup><https://www.ncei.noaa.gov/access/billions/time-series>

<sup>3</sup><https://www.ncei.noaa.gov/access/billions/state-summary/US>



## IMPROVED VISUALIZATION

### Frequency and Estimated Costs of Billion-Dollar Disasters in the USA (1980-2024)



<sup>1</sup>Significant contributing events are highlighted in the plot

<sup>2</sup>Values adjusted for inflation using the Consumer Price Index

Figure 2: Revised Visualisation of Frequency and Estimated Costs of Billion-Dollar Disasters in the USA by year.

## CONCLUSION

The revised visualization of billion-dollar disasters in the USA improves clarity and accessibility by separating frequency and cost data, enhancing the color palette, and grouping disaster types. These improvements highlight the increasing impact of the disasters alongside with the escalating costs over the years. By providing a more detailed and visually appealing representation of the data, the revised visualization conveys the urgency for enhanced disaster preparedness.