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A Multidimensional Impact Assessment of Hurricane Helene: Power

Outages, Economic Loss, and Public Sentiment

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1. Introduction

Hurricanes rank among the most devastating natural disasters (Grinsted et al.), capable of inflicting catastrophic damage that extends far beyond their immediate landfall. While the destructive winds and flooding cause visible harm to infrastructure and landscapes, the ripple effects of these storms are equally profound—disrupting power grids, crippling local economies, and leaving lasting psychological scars on affected communities. In recent decades, the increasing frequency and intensity of hurricanes, exacerbated by climate change, have underscored the urgent need for comprehensive disaster assessments that go beyond physical damage alone (Meng et al.). Understanding the full scope of a hurricane's impact requires examining not only its structural consequences but also the socioeconomic and emotional toll on residents.

This study focuses on Hurricane Helene, a historic storm that struck the southeastern United States in late September 2024 (Abbasi et al.), leaving millions without power, causing billions in economic losses, and triggering widespread public distress. By analyzing three critical dimensions—power outages, economic loss, and public sentiment—this study aims to provide a holistic view of how communities experience and recover from such disasters. Specifically, this research investigates:

1. Power Outages: The geographic extent, duration, and timeline of electricity disruptions, and how these relate to the storm's intensity and path
2. Economic Loss: The storm's impact on infrastructure and local economies, complemented by sentiment analysis of public discourse to capture emotional responses to financial hardship

3. Overall Public Sentiment Trends: How online behaviors reflect community and public concerns before, during, and after the hurricane

To achieve these objectives, this study integrates geospatial outage data, county-level damage reports, and sentiment analysis of social media platforms like YouTube, where public reactions are most visible. Linking these datasets reveals patterns that traditional damage assessments might overlook—particularly how prolonged power outages amplify economic hardship and how delays in aid distribution erode public trust. This multidimensional approach provides not only a deeper understanding of Hurricane Helene's true impact but also actionable insights for improving disaster preparedness, response, and recovery strategies in an era of escalating climate threats.

2. Methodology

This study employs a multi-dimensional analytical framework combining geospatial outage mapping, economic impact assessment, and computational sentiment analysis to evaluate Hurricane Helene's comprehensive effects. The methodology integrates both quantitative and qualitative data sources to systematically assess infrastructure damage, economic consequences, and community perceptions.

The power outage analysis utilizes county-level power outage disruption reports, which quantify the scope and duration of service failures across affected regions. Geospatial and time-series visualizations, developed using Python with Plotly and GeoPandas, reveal spatial patterns in outage severity and duration. These visualizations enable precise correlations between outage clusters and the storm's documented path and intensity. Furthermore, sentiment analysis derives from a collected dataset of over 8,000 YouTube comments and video transcripts, collected through API queries and filtered using hurricane-related keywords. A PyTorch-based emotion classification model, validated at over 90% accuracy, processes this corpus to track evolving public sentiment across different disaster phases. The model's architecture captures nuanced emotional responses, extending beyond simple positive/negative classifications to identify specific affective states tied to recovery challenges.

For economic impact assessment, the study combines structured analysis of post-storm reports with sentiment analysis of public discourse. Natural language processing techniques extract key financial data from official documents and post hurricane recovery reports using targeted keywords such as "economic loss," "damage," and "insurance." Parallel to this, sentiment analysis using the VADER library in Python examines YouTube comments specifically tied to Hurricane Helene related economic recovery and infrastructure repair videos, providing insight into how financial strain and delayed aid influenced public perception.

The methodology's strength lies in its integration of these three analytical streams. Power outage data establishes a timeline of physical infrastructure damage, while economic metrics quantify material losses. Sentiment analysis then overlays this with psychosocial impacts, revealing how disruptions in energy access and financial stability shaped community distress. This tripartite framework enables a nuanced analysis of both the material and emotional toll of Hurricane Helene

2.1 Data Sources

The research is based on three primary data collection methods:

- Power Outages: Collected from county-specific outage reports, mapping power outage data by county over time, from 09/28/2024 to 10/08/2024, over the hurricane path in real time
- Economic Loss: Collected economic loss data by extracting and filtering keywords from post-storm PDF reports through Python and analyzing YouTube comments on recovery-related videos using the Youtube Data API. Applied sentiment analysis on comments to assess public response to financial disruption
- General Public Sentiment Trends: Gathered using YouTube API and then used machine learning model to analyze search behavior, comments, and discourse surrounding Hurricane Helene

2.2 Power Outage Analysis

To assess the severity and duration of outages, the study examines:

- Spatial Distribution: Counties along with their percentage of power outages

- Temporal Progression: Outage trends before, during, and after the storm, from 09/26/2024 to 10/08/2024

- Correlation with Hurricane Intensity: Matching outage patterns with the storm path in real time

2.3 Economic Loss Assessment

Financial impact is estimated based on:

- Post-Storm Report Extraction: Keyword extraction and filtering from post-storm reports to quantify economic losses

- Public Sentiment on Recovery: Sentiment analysis of YouTube comments from videos focused specifically on economic recovery to capture public perception of financial disruption

2.4 Public Sentiment Analysis

To evaluate public response, we use natural language processing (NLP) to analyze:

- YouTube Search Trends: Identifying peak search interest around "Hurricane Helene," "power outage," and emergency-related queries

- Emotional Sentiment in Comments: Categorizing sentiment shifts using positive, negative, and neutral indicators

- Geographic Variation: Comparing sentiment fluctuations over time, along with sentiment towards specific electricity providers

This integrated methodology enables cross-validation between datasets, for instance, correlating prolonged outages in specific counties with both economic losses and negative sentiment spikes. This approach not only quantifies direct impacts but reveals how infrastructure failures cascade into financial and emotional consequences for affected communities. Temporal synchronization across all analyses ensures coherent tracking of disaster progression from immediate impacts through recovery challenges.

3. Results

3.1 Power Outages

Hurricane Helene's landfall triggered a large-scale breakdown of the regional electrical grid, leaving millions without power. The scope and duration of outages varied significantly by location, as outlined below.

### Extent of Outages and Affected Areas

Hurricane Helene caused widespread electrical outages on an unprecedented scale across the Southeastern United States. At the storm's peak, an estimated 5.5 to 6 million customer accounts lost power as Helene's impact spread from Florida through Georgia and the Carolinas into the Appalachian region (Duke Energy). This ranks Helene among the most disruptive hurricanes in recent memory in terms of power infrastructure. Entire communities went dark; NOAA satellite imagery from the night after landfall shows large swaths of the Southeast with no lights, clearly tracing Helene's path through the Florida Panhandle and into the Carolinas. According to real-time outage data across Hurricane Helen, the highest concentration of outages occurred in the following counties

- Greenville, SC: 1,070,642 outages
- Spartanburg, SC: 724,674 outages
- Pinellas, FL: 582,436 outages
- Buncombe, NC: 568,009 outages
- Anderson, SC: 425,808 outages

These county-level figures mirror the state-level impact seen in the data. On September 28 at 12 AM, the top five states most affected were:

- South Carolina: 4,627,237 customers out

- Georgia: 3,562,621 customers out

- North Carolina: 3,336,589 customers out

- Florida: 2,234,319 customers out

- Ohio: 1,070,004 customers out

Coastal areas in northern Florida were hit especially hard. However, the most prolonged outages occurred inland, particularly in Greenville County in South Carolina, where cumulative outage events exceeded one million. These areas also faced severe flooding and mountainous terrain, making restoration much more difficult.
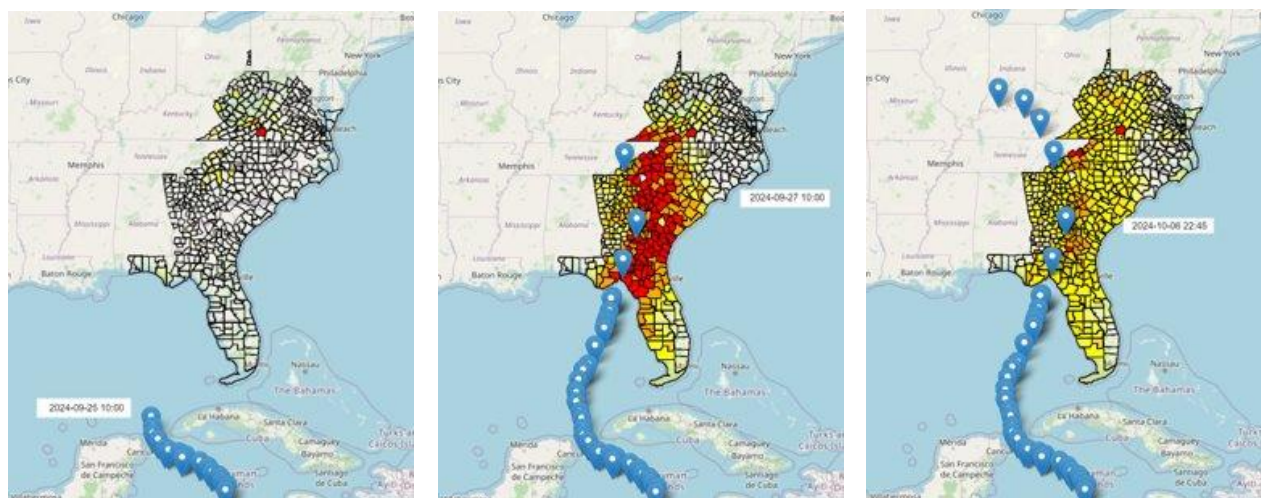
This map overlays Hurricane Helene's path with the progression of power outages across the Southeast, revealing a clear correlation between the storm's trajectory and regional grid failures. The darkest areas indicate the highest concentration and duration of outages, tracing Helene's destructive path from Florida through the Carolinas.

Timeline and Peak Outage Events
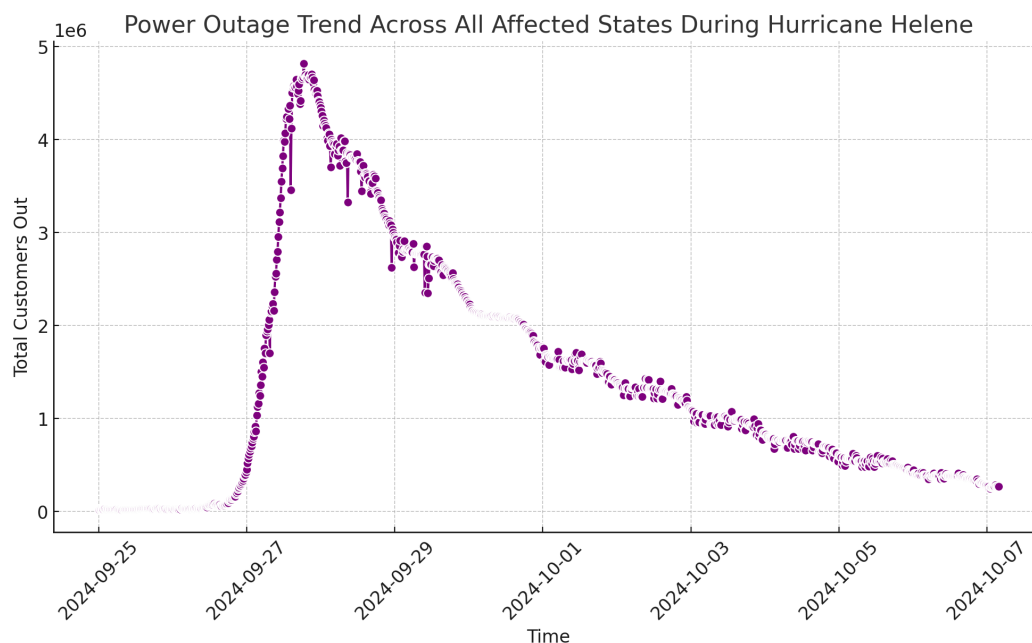
The following graph shows the top 10 counties with the most power outages on every

other day. Outages peaked in between the 9-27 and 9-29. As Hurricane Helene made landfall in

Florida on September 26, power failures began to escalate rapidly. Outages peaked on September

27–28, as the above graph shows, aligning with the hurricane's most destructive phase. By 3 PM

on the 27th, over 4.7 million customers were concurrently without power (S&P Global

Commodity Insights). The outages closely followed Helene's path, with winds above 130 mph

and intense rainfall toppling thousands of power poles and submerging substations (North

Carolina Department of Public Safety)

After the peak, outages briefly dipped to 4.4 million as winds eased, but new blackouts

emerged further inland. By September 30, over 1.6 million customers remained in the dark

across nine states, including Tennessee, Kentucky, Ohio, and West Virginia—well beyond the

coastal strike zone. In total, about 5.5 million unique customers experienced outages during the event.

Restoration Efforts and Challenges

Helene triggered one of the largest utility restoration operations in U.S. history. Nearly 50,000 utility workers from 36 states mobilized to repair the electrical grid (Waldman). Crews worked around the clock clearing roads, fallen trees, and mud to access damaged lines and transformers. Critical infrastructure—hospitals, emergency response centers, and water treatment plants—was prioritized, often with generators deployed immediately.

Through these massive efforts, approximately 4 million customers had power restored within four days (Waldman). Duke Energy alone reported restoring electricity to over 800,000 customers in Florida by September 30 (Duke Energy). Within a week, over 90% of outages across the Southeast had been resolved.
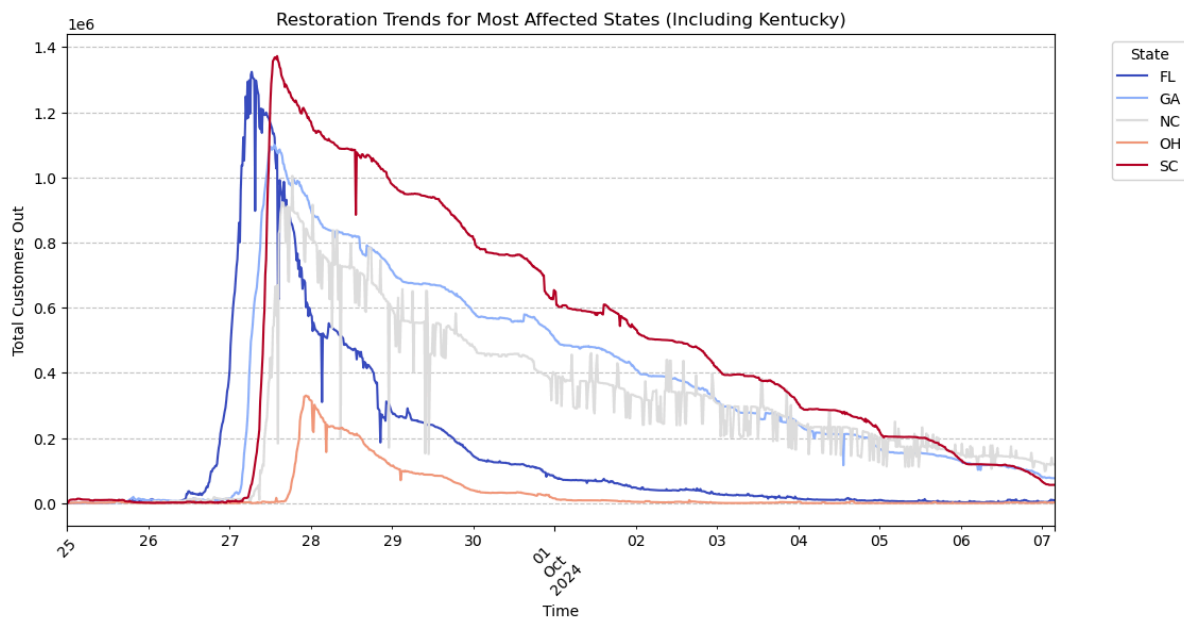
This graph illustrates the pace of power restoration across the most affected states following Hurricane Helene. It highlights how quickly each state was able to recover electrical service, revealing disparities in infrastructure resilience and emergency response effectiveness. However, rural areas in western North Carolina and upstate South Carolina faced greater challenges. Washed-out roads and mudslides made some communities inaccessible for days. Entire substations were submerged, and in some regions, infrastructure had to be rebuilt from scratch, not just repaired (Waldman). As Duke's storm director noted, "There are lots of areas in the South Carolina upstate and North Carolina mountains where we're going to have to completely rebuild parts of our system, not just repair it" (Duke Energy).

Infrastructure Vulnerabilities

Helene laid bare major vulnerabilities in the region's aging power grid. The Southeast's transmission and distribution networks often pass through forested terrain, making them highly susceptible to wind and debris damage. Helene's 140 mph gusts snapped over 12,000 power poles, while mudslides in the mountains buried transmission lines (Waldman).

Low-lying substations were particularly vulnerable. Several flooded, causing fires and transformer failures. Because large transformers are custom-built and hard to replace, restoration was significantly delayed in areas where they failed. These compounded outages also disrupted water supply systems, telecommunications, and even 911 emergency services in parts of the Carolinas (North Carolina Department of Public Safety).

Public Impact and Response

The blackout's social consequences were extremely significant. Daily functions like refrigeration, cooking, heating/cooling ground to a halt. Emergency shelters were opened across the region to house those without power. As days passed, frustration mounted, especially in rural areas that were slower to recover. Public criticism centered on utility providers for lack of preparation and on government agencies for communication gaps. These concerns were validated by widespread communications blackouts—areas without internet or cell service couldn't access outage maps or recovery information (North Carolina Department of Public Safety). This communication void exacerbated emotional distress. In response, some communities reverted to analog updates like printed bulletins or radio broadcasts to reach residents.

3.2 Economic Loss

The financial toll of Hurricane Helene was vast and multifaceted, impacting infrastructure, homes, agriculture, and livelihoods across the Southeastern U.S., with North Carolina and Florida among the hardest hit.

Impact on Infrastructure and Housing

Flooding from Hurricane Helene led to massive uninsured flood property losses, estimated at $20 billion to $30 billion. This includes damage to residential properties, public infrastructure, and business facilities. More than 73,000 homes were damaged, with many facing severe or catastrophic impacts. Furthermore, essential services such as water, sewage, and power were disrupted, affecting millions of residents (North Carolina Office of State Budget and Management).

Insured property losses from Hurricane Helene are estimated to range from $11.5 billion to $17.5 billion (North Carolina Office of State Budget and Management). These figures reflect

the compensation provided to property owners and businesses to help rebuild and recover from the damages.

Insurance and Financial Damages

Insurance claims were a significant part of the recovery process. The $11.5 billion to $17.5 billion in insured property losses will cover a portion of the costs for home repairs and business recovery. However, uninsured losses, particularly those from flooding, remain a major financial challenge. It's estimated that over $20 billion in uninsured flood property losses will place a significant financial burden on communities without insurance coverage (North Carolina Office of State Budget and Management). The storm's economic impact extends beyond just property damage. Business disruptions due to loss of essential services, damaged facilities, and transportation blockages will further strain local economies.

Agricultural Impact

Agricultural lands in Florida were severely affected by the storm, with over 6 million acres impacted by high-intensity weather conditions. The largest portion of the damage occurred to grazing lands, which accounted for 68% of the total affected acreage. Additionally, field crops, including hay, sugarcane, and vegetables, experienced significant damage, reducing the productivity of vital agricultural sectors (Court et al.).

Agricultural losses in these areas are expected to be significant, affecting industries like livestock production and crop yields. Over 6 million acres of agricultural land were impacted with 68% of the affected land being grazing land and significant damage to field crops like hay and sugarcane (Court et al.). The economic value of these losses includes $2 billion in lost

revenue from disrupted supply chains and damaged crops. This is expected to have long-lasting effects on the agricultural sector, with recovery projected to take multiple seasons for crops like nursery plants, which will require several years to regrow (Court et al.).

Recovery and Economic Support

FEMA provided $264 million in housing and other assistance to 138,000 households affected by the storm. Additionally, North Carolina requested $30 million from the Economic Development Administration (EDA) to capitalize a revolving loan fund aimed at helping small businesses recover from the disaster. This fund will provide low-interest loans to businesses, particularly in tourism, agriculture, and retail, helping them rebuild facilities, replace assets, and restore operations (North Carolina Office of State Budget and Management). Workforce training initiatives, amounting to $10 million, are also critical for supporting displaced workers and diversifying the local economy. These funds will target high-demand, resilient sectors, with an emphasis on disaster-resilient job training (North Carolina Office of State Budget and Management).

The economic impact of Hurricane Helene was both extensive and multifaceted, spanning infrastructure damage, insurance gaps, and agricultural devastation. While insured losses provided some relief, the overwhelming scale of uninsured damages left many households and communities financially vulnerable. Agricultural disruptions not only caused immediate revenue losses but also pose long-term challenges for recovery. Government assistance programs played a critical role, yet the overall data suggests a recovery effort that will require sustained investment and policy attention.

Sentiment Breakdown

In addition to financial estimates and institutional reports, public sentiment offers a crucial perspective on the perceived effectiveness of recovery efforts. By analyzing YouTube comments on Hurricane Helene-recovery related and financial loss videos, we assessed how individuals emotionally responded to insurance claims, government support, and infrastructure recovery.

An analysis of comment sentiment revealed:

- 55% negative: Reflect frustration with insurance processing, FEMA delays, and perceived abandonment
- 34% positive: Highlight appreciation for community help and personal recovery efforts
- 11% neutral: Offering factual updates or non-emotive information
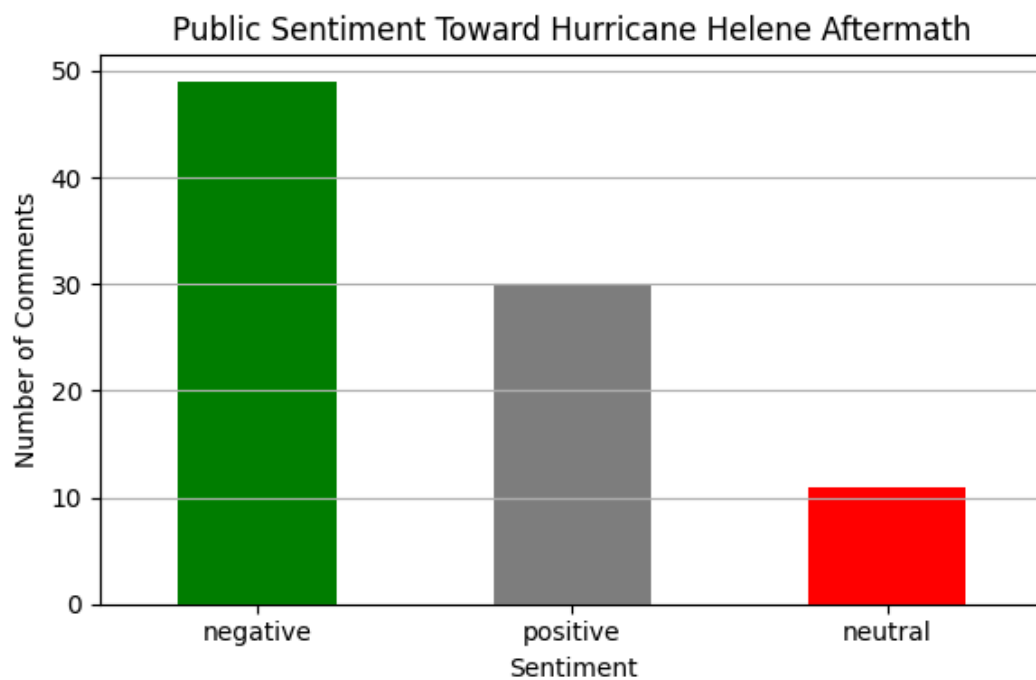
Common Topics of Frustration and Concern

The most frequently mentioned keywords reinforce central economic issues:
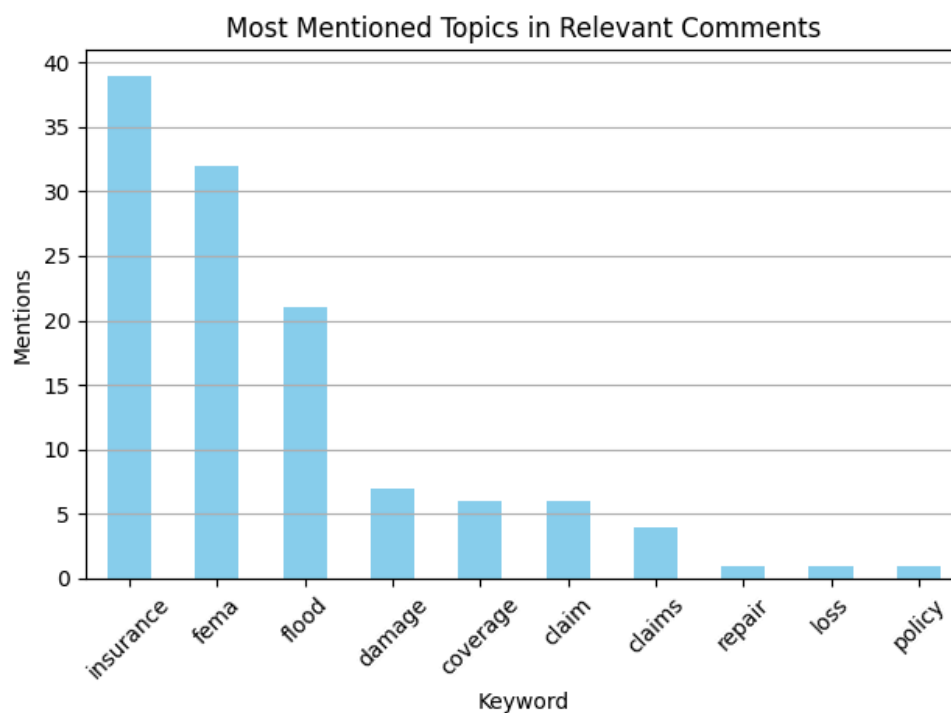
These topics mirror key categories in economic recovery reports, particularly insurance coverage gaps, flood loss, and infrastructure repairs, and highlight where the public feels recovery is either supported or lacking.

Word Cloud Insights

The word cloud reveals a high concentration of emotionally charged language, including:

- "Insurance," "people," "disaster," "damage," "help," and "money."
- Words like "destroyed," "blame," "shame," and "cut" suggest emotional distress and anger toward institutions.

Word Cloud of Relevant Comments

Interpretation

While financial reports capture the scale of Hurricane Helene's economic damage in billions, public sentiment offers critical insight into how those losses were felt by individuals and communities. The sentiment analysis of YouTube comments revealed that over half (55%) of relevant discussions carried a negative tone, pointing to deep frustration and emotional fatigue. Much of this negativity was linked directly to economic pain points, particularly delays in insurance claims, dissatisfaction with FEMA's response, and confusion around coverage policies. Rather than abstract complaints, these comments told concrete stories of people waiting for checks, living in damaged homes, or being denied support. This emotional data reinforces what formal reports hinted at: that uninsured and underinsured losses, particularly in flood-prone areas, had long-term human consequences beyond structural repair.

The keyword frequency analysis adds further weight to this finding. The most frequently mentioned terms ("insurance," "FEMA," "flood", "damage") mirror the most urgent themes in state-level recovery reports. However, the comment data adds a human lens: people weren't just

talking about policy or damage; they were talking about being left behind, struggling to rebuild, and navigating bureaucratic systems under stress. These repeated mentions confirm that economic recovery, from the public's perspective, was more about the accessibility and responsiveness of aid than about the raw number of dollars distributed. Additionally, terms like "claim," "repair," "coverage," and "loss" appeared repeatedly, showing how granular frustrations accumulated into widespread discontent.

The word cloud also offers a visual summary of these emotions, with prominent words like "insurance," "people," "disaster," "help," "damage," and "money" reflecting both personal loss and institutional critique. Notably, words like "blame," "shame," "cut," and "destroyed" point to strong emotional undercurrents, elucidating feelings of abandonment, anger, and helplessness that often accompany delayed or insufficient support. The word "FEMA" appears with the second highest high frequency, often surrounded by language suggesting inefficiency or unmet expectations, further signaling the disconnect between institutional relief efforts and public perception.

Taken together, these sentiment findings demonstrate that the economic impact of Hurricane Helene cannot be fully understood through financial losses alone. This public sentiment data adds depth and context to traditional economic indicators and offers a more complete picture of the storm's long-term consequences.

3.3 General Public Sentiment Trends

Public sentiment surrounding Hurricane Helene shifted dramatically over time, evolving through distinct emotional phases. The following section outlines how emotions like fear,

sadness, and frustration played out across social media, particularly YouTube, before, during, and after the storm.

Pre-Landfall Fear and Anticipation

In the lead-up to Hurricane Helene's landfall, public sentiment was dominated by fear and anxiety, a pattern evident in both YouTube video titles and comment sections. As illustrated in the graph generated from sentiment classification, fear peaked approximately two days before landfall, around September 24–25, driven by heightened media coverage and community anticipation. Video titles during this period showed significantly higher levels of fear-related language than viewer comments, suggesting that media outlets and content creators amplified alarmist tones to drive engagement.
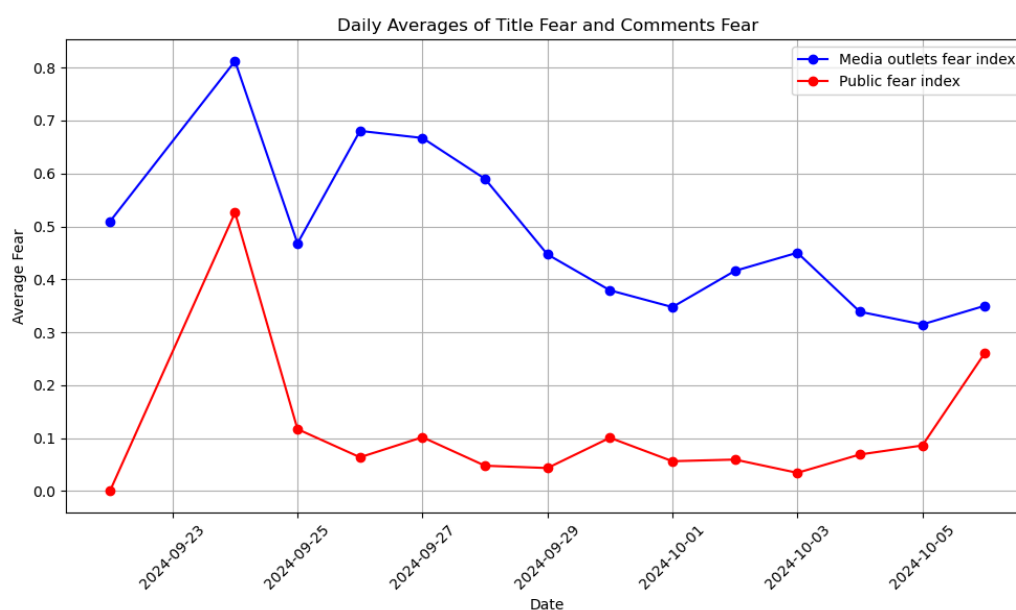

This pre-impact media strategy aligns with disaster communication research showing that excessive exposure to storm warnings and emotionally charged language can trigger anticipatory trauma and elevate public stress levels even before landfall occurs (S&P Global Commodity

Insights). Phrases such as "monster storm" and "catastrophic impact" were common in headlines and sparked a surge in search queries like "Hurricane Helene evacuation," which were observed through YouTube and Google API search trend tracking.

Despite the intense fear, this period also featured expressions of hope and preparation. Users described boarding up homes, assembling emergency kits, and organizing neighborhood support. This emotional dichotomy is typical in the warning phase of disaster psychology, where high uncertainty coexists with a strong motivation to act..

Emotional Reactions During Landfall

As Helene made landfall on September 26 and churned north through Georgia and the Carolinas, public sentiment shifted dramatically from fear to sadness and empathy. This transition is reflected in the emotion classification graph below. Sadness overtook fear as the most dominant sentiment, especially as images of flooded streets, destroyed homes, and overwhelmed shelters began circulating online.
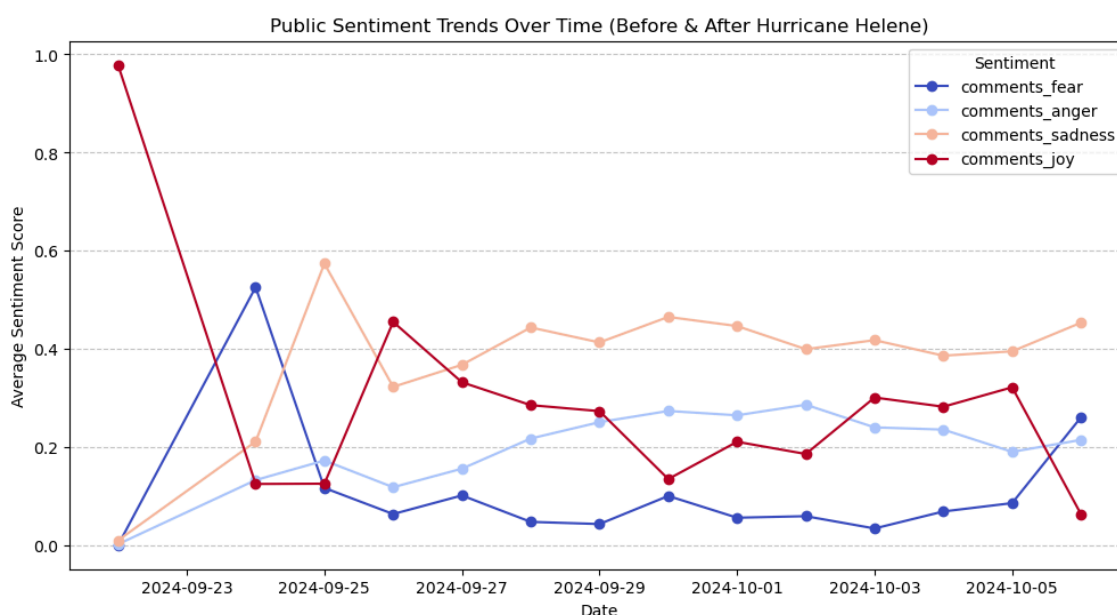
User comments expressed heartbreak and solidarity. Tragically, over 160 deaths were reported by the weekend following landfall, with the final count rising above 225 (FEMA, 2024). This human toll was deeply felt across platforms, driving a wave of donation links, support messages, and community-organized aid. Interestingly, the graph also shows a minor peak in joy sentiment at landfall, possibly reflecting moments of relief when some residents survived the worst, or felt prepared. However, this was short-lived and geographically uneven. Residents in northern Florida, who were affected early, showed more positive emotion than those in the Carolinas, where the storm's peak impact occurred later.

This pattern aligns with disaster psychology's "honeymoon phase", where communities temporarily come together in shared empathy before frustration sets in. During this phase, people actively used platforms like YouTube and Facebook to report on-the-ground conditions, coordinate aid, and share emotional support. This human-centered discourse provided a more vivid and immediate sense of the hurricane's emotional toll than traditional news coverage.

Post-Storm Frustration and Anger

In the days and weeks following landfall, sentiment shifted again—this time toward frustration and anger, especially in regions that experienced prolonged power outages and delayed government response. As shown in both your data and external sentiment analyses, anger steadily increased after landfall, peaking in the second week of October.

Key sources of frustration included:

- Delayed power restoration (see Section 3.1)
- Lack of clean water and blocked road access

- Confusion over FEMA aid eligibility

- Insurance claim denials or delays

Sentiment classification and keyword analysis highlight a clear trend: terms like "FEMA," "insurance," "help," and "rebuild" became dominant in post-landfall discussions. The word "FEMA" in particular appeared frequently alongside negative terms such as "slow," "incompetent," and "no update." In total, 55% of post-storm comments analyzed were classified as negative, reflecting public exhaustion and anger.

Media vs. Public Sentiment

Another key observation from the sentiment data is the disconnect between institutional media narratives and grassroots public sentiment. Media coverage before the storm heavily emphasized fear, as indicated by the disproportionately high fear levels in video titles. While such framing can improve preparedness, research also shows it can worsen emotional stress and post-traumatic symptoms.
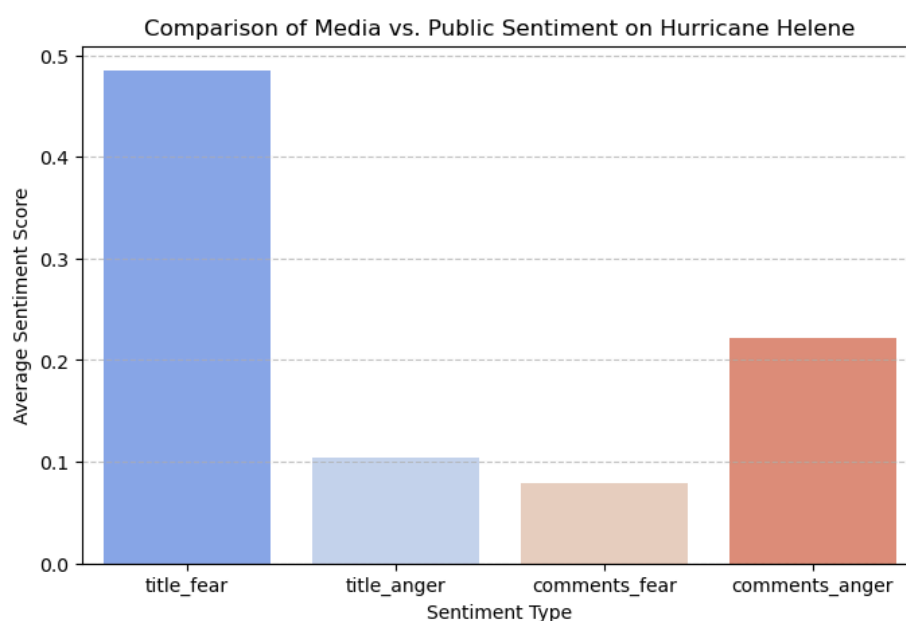
After landfall, traditional media shifted toward impact and recovery coverage, including heroic rescues and infrastructure updates. Meanwhile, public discourse, especially in YouTube comment sections, evolved more organically, emphasizing personal loss, insurance frustrations, and community anger. Comments accusing the media of "moving on too fast" or not showing "the real story" were very common. At the same time, some media outlets helped amplify specific needs. Radio stations and local papers highlighted isolated towns that lacked food or water, prompting outside volunteer support (Waldman). Social media users often shared and built upon these reports, creating a feedback loop between news and community mobilization.

Connections Between Infrastructure and Emotion

Sentiment trends closely mirrored physical impacts, especially power outages. The correlation between sustained blackouts and anger was particularly strong in rural counties like Buncombe, NC and Henderson, SC, which also had among the highest outage durations (see Section 3.1).

This underscores a key finding: infrastructure vulnerability translates directly into emotional vulnerability. Without electricity, people not only suffered from physical discomfort but also lost access to communication tools; no internet, no phone, no TV. This total communications blackout", documented in official North Carolina storm reports, left residents feeling isolated and anxious (North Carolina Department of Public Safety). In this void, peer-to-peer networks became essential. People drove to signal zones to post updates, used walkie-talkies or car radios, and leveraged platforms like Reddit and Facebook to connect and inform others. These digital lifelines became emotional outlets.

The data illustrates this trajectory clearly:

- Fear rose with warnings

- Sadness peaked at landfall

- Anger escalated during recovery

Each emotional phase was deeply intertwined with the operational timeline of Helene's impact. Real-time emotion tracking offers actionable insights: for instance, FEMA or utility companies could have used spikes in angry keywords (e.g., "FEMA," "power," "forgotten") to identify where public frustration was surging and deploy more focused communication or resources.

4. Discussion

This multidimensional impact assessment of Hurricane Helene reveals a complex interplay between physical infrastructure damage, economic losses, and public sentiment, each influencing and exacerbating the others. By integrating geospatial power outage data, economic loss reports, and sentiment analysis of public discourse, this study provides a comprehensive understanding of how communities experienced and responded to the hurricane. The findings underscore the importance of addressing not only the material consequences of disasters but also the emotional and psychological toll on affected populations.

Power Outages and Infrastructure Vulnerabilities

The power outage analysis highlights the severe and widespread disruption caused by Hurricane Helene, particularly in the Southeastern United States. At its peak, over 5.5 million customers were without electricity, with the hardest-hit counties including Greenville, SC, and Buncombe, NC. The outage timeline (Figure on Page 8) clearly correlates with the storm's path, demonstrating how Helene's intensity directly impacted electrical grids. The prolonged outages in rural and mountainous areas, such as western North Carolina, further exposed vulnerabilities in aging infrastructure, including susceptibility to wind damage, flooding, and mudslides. These challenges were compounded by the difficulty of accessing and repairing submerged substations and transmission lines, as noted in utility reports (Duke Energy). The graph on Page 9 illustrates the slow restoration in these regions, emphasizing the need for more resilient infrastructure and targeted emergency response strategies in geographically isolated areas.

Economic Loss and Recovery Challenges

The economic impact of Hurricane Helene was staggering, with uninsured flood losses estimated at $20–30 billion and insured losses ranging from $11.5–17.5 billion. The damage extended beyond property to critical sectors like agriculture, where 6 million acres of land were affected, including significant losses in grazing and field crops (UF-IFAS, 2024). The financial strain was exacerbated by delays in insurance claims and FEMA assistance, which left many households and businesses in precarious situations. The sentiment analysis of YouTube comments (Page 14) revealed widespread frustration, with 55% of discussions expressing negativity toward recovery efforts. Keywords like "insurance," "FEMA," and "damage" dominated public discourse, reflecting the emotional and financial distress caused by bureaucratic inefficiencies and coverage gaps. The word cloud (Page 16) visually captures these concerns, with terms like "destroyed" and "blame" underscoring the depth of public anger and helplessness.

Public Sentiment and Emotional Phases

Public sentiment evolved through distinct phases—fear before landfall, sadness during the storm, and anger in the recovery period—as illustrated in the graphs on Pages 18 and 21. The pre-landfall fear spike (Page 18) was driven by media coverage, while the post-landfall anger (Page 21) correlated strongly with prolonged power outages and delayed aid. The disconnect between media narratives and grassroots sentiment was particularly striking; while the media emphasized fear and recovery heroics, public discourse focused on personal struggles and institutional failures. This divergence highlights the need for more empathetic and accurate communication during disasters. The sentiment data also revealed how infrastructure failures, such as power and communication blackouts, amplified emotional distress, leaving residents feeling isolated and abandoned (North Carolina Department of Public Safety).

Interconnected Impacts and Policy Implications

The study's findings demonstrate that the impacts of Hurricane Helene were deeply interconnected. Power outages disrupted economic activity and heightened public frustration, while economic losses worsened emotional distress. For example, the slow restoration of electricity in rural areas delayed business reopenings and agricultural recovery, which in turn fueled negative sentiment. These cascading effects suggest that disaster response strategies must adopt a holistic approach, addressing infrastructure, economic, and emotional needs simultaneously. Policy recommendations emerging from this analysis include:

1. Infrastructure Resilience: Prioritizing upgrades to power grids, especially in vulnerable regions, and implementing flood-resistant designs for substations.

2. Economic Support: Streamlining insurance and FEMA processes to reduce delays and expanding coverage for uninsured losses, particularly in flood-prone areas.

3. Communication Strategies: Enhancing real-time, localized communication during disasters to mitigate misinformation and emotional distress. Utilities and government agencies could use sentiment analysis tools to identify and address public concerns proactively.

The lessons from Hurricane Helene underscore that resilience is not just about rebuilding what was lost, but about reimagining systems to anticipate how failures propagate across interconnected domains. By adopting this holistic framework, policymakers can develop more adaptive strategies that not only restore communities after disasters but also strengthen their capacity to withstand future shocks.

5. Conclusion

The devastating impacts of Hurricane Helene documented in this study reveal profound interconnections between infrastructure failures, economic losses, and community distress. The findings demonstrate how power grid vulnerabilities translate into cascading consequences, where prolonged electrical outages amplify financial hardship while simultaneously eroding public trust in recovery efforts. This research provides compelling evidence that disasters extend far beyond physical damage, creating complex socioeconomic and psychological challenges that persist long after the storm passes. The emotional toll captured through sentiment analysis offers particularly valuable insights, showing how delayed restoration efforts and bureaucratic obstacles generate frustration that compounds the initial trauma of the event itself. These patterns demand urgent attention from policymakers and disaster response professionals who must recognize that true resilience requires addressing both material and human dimensions of recovery. Moving forward, strategic investments in grid modernization should prioritize climate-resistant designs for high-risk regions while economic recovery programs need to streamline aid distribution and close critical insurance gaps. Equally important are innovations in public communication that leverage real-time sentiment monitoring to address community concerns more effectively. The lessons from Hurricane Helene present both a warning and an opportunity to fundamentally rethink disaster preparedness. By integrating infrastructure planning with economic support systems and psychosocial services, communities can develop more comprehensive strategies to withstand future climate events. This study underscores that the time for action is now, as the increasing frequency and intensity of hurricanes make these improvements essential rather than optional. The path forward requires commitment to systemic change that values human

experience alongside technical solutions, ensuring that vulnerability reduction becomes central to disaster policy at all levels.

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