
Accelerate effective risk communication of warnings

An Overview of the Social and Behavioral Science
Hurricane Supplemental Projects

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Weather Act & Disaster Supplemental Appropriations

Section 104 of the Weather Research and Forecasting Innovation Act of 2017 (“Weather Act”) and the Bipartisan Budget Act, 2018: Division B - Supplemental Appropriations, Tax Relief, and Medicaid Changes Relating to Certain Disasters and Further Extension of Continuing Appropriations (“Disaster Supplemental Appropriations”) provide NOAA with a unique and important opportunity to integrate the social, behavioral and economic sciences into NOAA’s tropical products, information and services

Further, the Strategic Plan for the Next Phase of HFIP articulates a path forward to incorporate risk communication research into the design and communication of its products:

- By 2021 NOAA will complete a baseline understanding of partner and stakeholder needs relating to the TC product suite,
- By 2023, through social and behavioral science research, NOAA intends to improve communicating the forecasted risks by transitioning 2 -3 TC hazard guidance products per year and,
- By 2028, modernize all products in the TC product suite.

The following 4 supplemental projects, Cone of Uncertainty project and the economic valuation project of improved hurricane forecasts, will advance our efforts!

Wait, that forecast changed? Assessing how publics' process changing tropical cyclone forecasts over

How does the public consume and process tropical cyclone information?

Operational Challenges During an Event

1. The public is processing and gathering information from multiple channels
 - a. To prioritize where the NWS should focus their communication efforts, the NWS needs to know what this process looks like
2. The NHC issues products at different time points, leading the public to possibly anchor to the first available information.
 - a. NHC needs help to understand how the public anchors and subsequently shifts their risk to newly available information from NHC and other sources.

Research Questions

- What tropical cyclone information does the public hear from different channels?
- How does the public incorporate uncertainty into their decision process?
- How does the public anchor to the hurricane risk and associated uncertainty?
- How are they shifting their risk perceptions over the duration of the hurricane event?
- How do emergency managers compare to the broader public in terms of their risk perceptions? (Note. The NWS has had a growing interest in shifting risk preferences)

Optimizing tropical cyclone information: An NHC website usability study from a public perspective

How can NOAA's hurricane web presence be modernized?

Operational Challenges

1. The NHC website is not optimized for mobile or tablet platforms
 - a. Most commonly accessed via a Google search (39%) or URL/bookmark (30%).
 - b. Social media-driven traffic has increased by three times. However, direct access decreased by more than 10% over the past 3 years
 - c. Over 50% of sessions are conducted with a mobile device.
2. Website is also not designed from a public perspective
 - a. The most -accessed products are the cone graphic (>50% of users) and Tropical Weather Outlook (20 -25% of users).
 - b. Users strongly prefer graphical products over text products.
3. There are many additional sources of information vital to hurricanes that are not incorporated into NHC's website

Deliverables

- Using a combination of approaches, this project uses a user-centered interaction design method to conduct a usability test of NOAA's hurricane information in order to:
- Understand the public information needs relative to website tropical cyclone information
 - Conduct a scenario in which to have participants walk through current NWS hurricane related websites to determine current functionality
 - Provide guidance on how to optimize the design of NOAA hurricane information website as well as for tablet/phone use.
 - Results may lead to: a) improved product titles, b) more lay language, c) ideas for redesigning website layout.

Minding the gap: Modernizing the TC product suite by evaluating NWS

How can the NWS prioritize their efforts to modernize their tropical cyclone product suite and identify gaps needed to enhance NWS partner and public decision -making?

Operational Challenges

1. Currently, NWS has the ability to create a multitude of new tropical cyclone products. However, these efforts must be prioritized based on:
 - a. How NWS core partners are using their current products
 - b. What perceived gaps exist
 - c. Perceived conflicts among their product suite

Deliverables

- This project represents a baseline study on tropical cyclone information needs and the utility of the current tropical cyclone product suite in supporting key decision -making by NWS core partners and the public by:
 - Capturing what NWS core partners and the public need to know about a tropical cyclone and when.
 - Cross reference this with the current product suite will begin to identify needs not currently met.
 - Further identifying information gaps, needs, or conflicts the current product suite is not meeting by focusing on meteorological characteristics that are missing, technological aspects that limit utility, and/or product message enhancements,

There's a chance of what? Assessing numeracy skills of forecaster publics to improve TC product uncertainty communication, IDSS,

How can adding probabilistic maximum intensity forecast information to the NHC's product suite be best presented while taking into account end -users interpretation of probabilistic information?

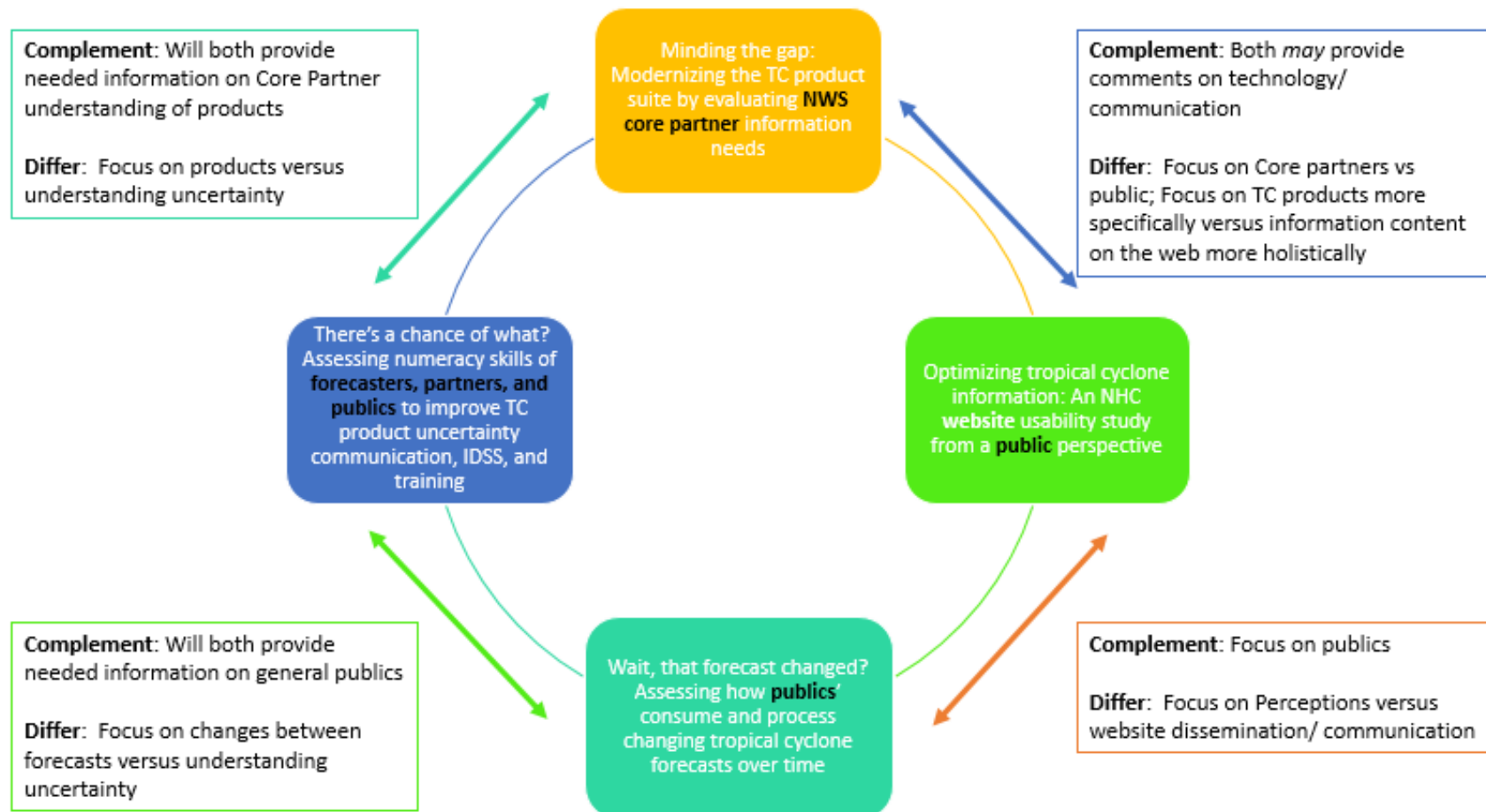
Operational Challenges

1. Probabilistic forecast information disseminated by the NHC is often misinterpreted and/or miscommunicated due to misstated "reference classes."
 - a. Forecasters and customers may understand probabilities in general, but sometimes forget to consider what the probability is referring to

Description and Advancements

- This study will conduct a baseline assessment of forecaster, NWS core partner, and public's understanding of probabilities broadly (called numeracy) related to tropical cyclone hazards (including inland flooding, etc.).
- This effort will advance research on numeracy and related communication framing of probabilistic information as it relates to tropical cyclone hazards by focusing on the ways to express probabilities and its respective reference class to enable forecasters, NWS core partners, and publics to assess their risk.

The complementary design behind the project



But, wait, there's more!
In addition to the supplemental...

A web-based survey to estimate the economic value of improved hurricane forecasts

How does a skillful but uncertain hurricane intensification forecast create societal and economic value by informing evacuation decisions?

Operational Challenges

1. The Weather Research and Forecasting Innovation Act of 2017 requires NOAA to prioritize research that improves forecasts and warnings for the protection of life, property, and *the enhancement of the national economy*.
 - a. Hurricane forecasts have economic value if they are able to lead to lives saved.
 - i. However, measuring the value of improved hurricane forecasts requires a model of how the forecasts influence the actions taken by individuals (*In other words, the economic value of hurricane forecasts is directly related to its ability to affect behavior; namely household evacuation.*)

Description and Advancements

- Using a survey, members of the general public will be exposed to a series of scenarios that mix hypothetical hurricane forecasts of varying precision.
- Then, participants will be asked to indicate their likely behavioral reaction by selecting from a list of possible mitigation actions, including evacuation.
 - The survey instrument randomly varies the attributes and allows for conjoint analysis, researchers are able to generate estimates of the “tradeoffs” between those attributes.
- By manipulating forecast and behavioral attributes, this project will estimate the overall economic value of improving hurricane forecasts.

Cone of Uncertainty

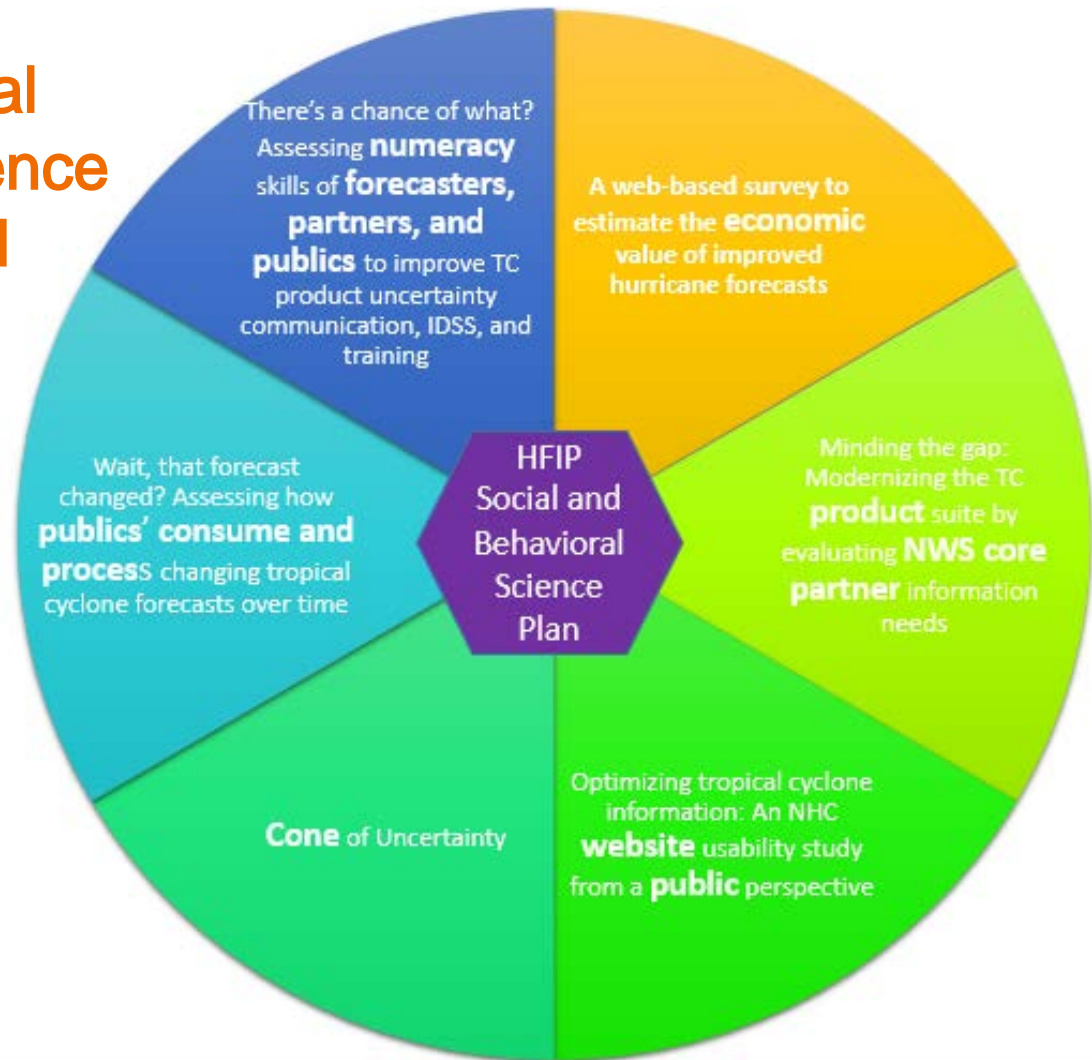
Operational Challenges

- NHC's cone of uncertainty, may be both the most viewed and the most misinterpreted tropical cyclone product,
- The cone has been criticized as a complicated figure that attempts to provide too many messages,
- Members of the public can misinterpret the cone, believing it depicts the region that will experience the effects of the hurricane,
- The graphic also tends to give a false sense of security to those living outside the cone,
- The cone also does not convey impacts (heavy rains or damaging winds) which can extend many miles from a landfalling hurricane.

Description and Advancements

- Conduct literature review on (public's, broadcast meteorologists' and emergency managers') interpretations of, uses of, implications of, and key decisions made using the cone of uncertainty.
- Conduct a use study of the cone with the transportation, utilities, marine, and tourism sectors. Use study will include both domestic and international users.

A Coordinated Social and Behavioral Science Approach: OAR and NWS work together



Questions? Comments?

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