SAND2015-4799PE

NHP Technology Modernization Working Group

June 10, 2015

Washington, DC

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Objectives

The fourth National Hurricane Program (NHP) Technology Modernization Working Group meeting has the following objectives:

- ✓ To show how the hurricane evacuation study (HES) process can be automated resulting in reduced cost and execution time
- ✓ To demo the progress of the new HES tool and gather feedback
- ✓ To demo GeoSPAN/FASTMap tool that could be leveraged for infrastructure considerations in planning and response
- ✓ To give an overview of HURREVAC-X capabilities and architecture and gather user feedback
- ✓ To discuss transition plans for HURREVAC-X

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Agenda

- 9:30 -9:45 Welcome, Introductions, Agenda
- 9:45 -10:00 Review of WG Objectives and Activities to Date
- 10:00– 11:00 HES Capability Overview, modeling tool demo and discussion
- 11:00 -11:15 Break
- 11:15- 12:00 GeoSPAN/FASTMap Demo and Discussion
- 12:00- 1:00 Working Lunch: HURREVAC-X Capabilities Overview
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Introductions

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Working Group Overview

➢ Working Group Purpose and Scope:

The primary purpose of the working group is to provide content, inform, and validate the NHP Preparedness and Response Planning Guidance Document

➢ Roles and Responsibilities of Working Group Members:

- ✓ Provide input to and validate the NHP Preparedness and Response Planning Guidance document
- ✓ Review plans, evaluate progress, and provide feedback on the technology pilots
- ✓ Help evaluate impact of proposed technology solutions, course correct modernization effort, and identify new technology and policy gaps if applicable
- ✓ Serve as the interface between the emergency management community and program leadership for the project
- ✓ Pursue what is best for the NHP over an individual location or jurisdiction

➢ Overview of NHP Technology Modernization Effort:

- ✓ DHS S&T and FEMA are sponsoring modernization of technology components of NHP
- ✓ Primary performers are MIT Lincoln Laboratory and Sandia National Laboratories
- ✓ Working Group facilitated by Sandia National Laboratories
- ✓ NHP Technology Modernization Project has 7 focus areas:
  - HURREVAC
  - Training
  - NHP guidance and best practices
  - Hurricane Evacuation Studies
  - Emergency Managers Decision Support Products
  - Resilience and mitigations
  - Metrics

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Working Group Activities

- First Working Group meeting: Conference Call in August, 2014
- Second Working Group meeting: in person, held in Orlando in December, 2014
- Third Working Group meeting, held at NHC February, 2015

Please continue to provide feedback on the Working Group activities and topics we cover. For any questions or feedback, please email Jovana.Helms@sandia.gov

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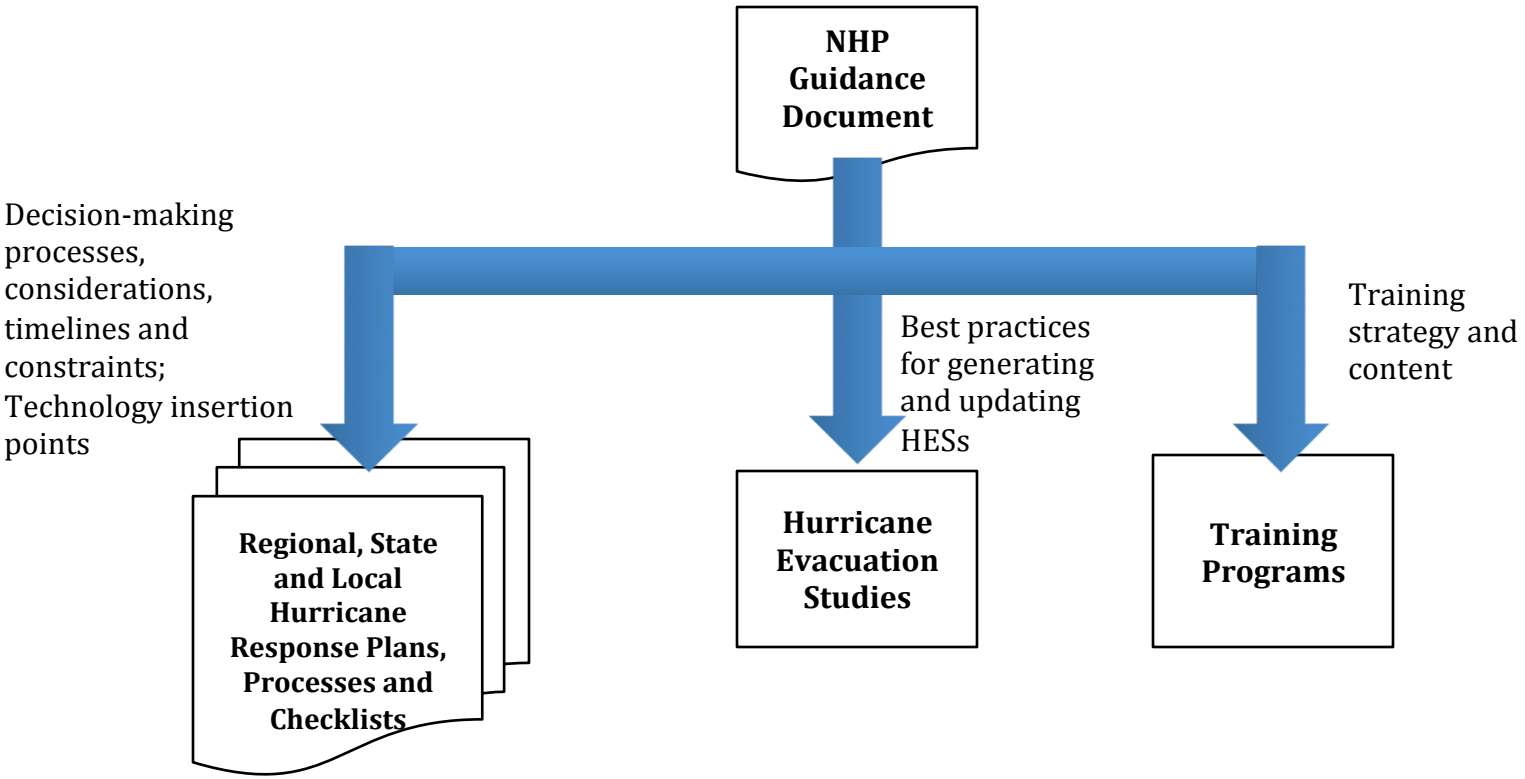
Guidance Document Overview

The Guidance Document will be **owned** and **developed** by the **Working Group.** It will **leverage existing experience and knowledge** in the community to provide **framework for regional, state and local emergency planners** across the program to help them develop localized hurricane response plans, hurricane evacuation studies and post-storm assessments



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Guidance Document Outline

1. Introduction
   - Guidance Document Purpose
   - Guidance Document Scope
   - Program Background
2. NHP Operational Overview
   - Roles and Responsibilities
   - Operational Model
   - Metrics
3. Planning and Preparedness
   - Hurricane Evacuation Studies
   - Post-Storm Assessments
   - *Infrastructure*
4. Real Time Hurricane Response
   - Decision Making Process: >120h pre-storm landfall
   - Decision Making Process: 120-72h pre-storm landfall
   - Decision Making Process: 72-48h hours pre-storm landfall
   - Decision Making Process: 48-36h hours pre-storm landfall
   - Decision Making Process: 36-24h hours pre-storm landfall
   - Decision Making Process: 24-12h pre-storm landfall
   - Decision Making Process: 12-0h pre-storm landfall
5. Training
   - Recommended Training

The Guidance Document is the core purpose of the NHP TM Working Group

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Guidance Document Format

Considerations for Staging

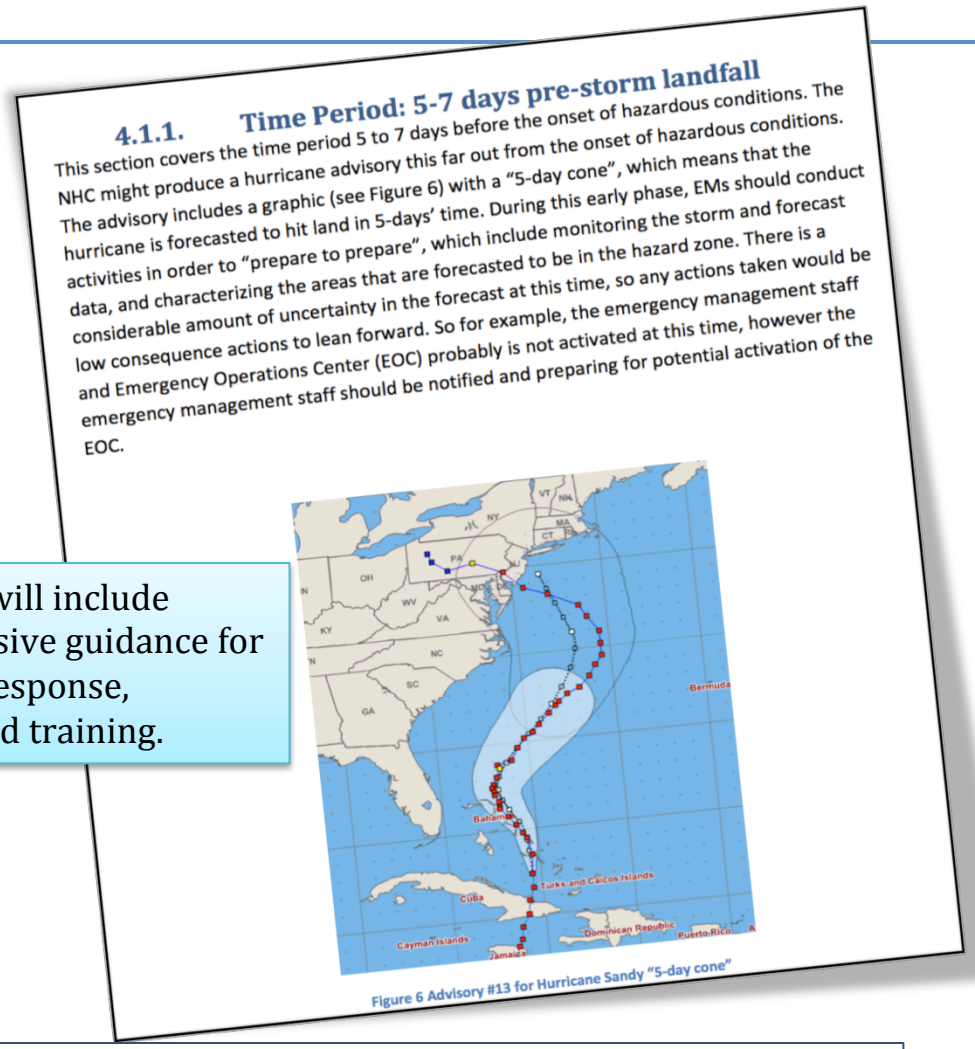
Once early evacuations begin, the local population will begin to inquire about their evacuation—be prepared to answer their questions and publish a communication channel for them to get these answers.

Staging may have an unintended effect of causing the local population to begin to evacuate. This population that is self-evacuating should be monitored and accounted for in the evacuation plans. For example, self-evacuees in zones that won't be impacted may use up resources (e.g., fuel, road throughput) that those in the impacted zones may eventually need.

Communicate and coordinate with neighboring jurisdictions, especially ones that share evacuation routes, provide mutual aid, and would be indirectly affected by response activities in your jurisdiction.

Pro-tips "call out" boxes

Document will include comprehensive guidance for hurricane response, planning and training.



4.1.1. Time Period: 5-7 days pre-storm landfall

This section covers the time period 5 to 7 days before the onset of hazardous conditions. The NHC might produce a hurricane advisory this far out from the onset of hazardous conditions. The advisory includes a graphic (see Figure 6) with a "5-day cone", which means that the hurricane is forecasted to hit land in 5-days' time. During this early phase, EMs should conduct activities in order to "prepare to prepare", which include monitoring the storm and forecast data, and characterizing the areas that are forecasted to be in the hazard zone. There is a considerable amount of uncertainty in the forecast at this time, so any actions taken would be low consequence actions to lean forward. So for example, the emergency management staff and Emergency Operations Center (EOC) probably is not activated at this time, however the emergency management staff should be notified and preparing for potential activation of the EOC.

Figure 6 Advisory #13 for Hurricane Sandy "5-day cone"

Technology Insertion "call out" boxes

Technology Insertions for, and in addition to, HURREVAC—

- A HURREVAC pilot is underway in the NHP Technology Modernization effort. This pilot, scheduled to complete in 2015, will integrate additional tools and new features per EM feedback.
- HAZUS is a FEMA software tool that estimates hurricane effects (HAZUS Wind model and SLOSH-SWAN surge model), population impacts, infrastructure and economic damages and losses for hazards including wind, rain and storm surge due to hurricanes. EMs use HAZUS results to inform mitigation planning, response activities, and restoration and recovery.

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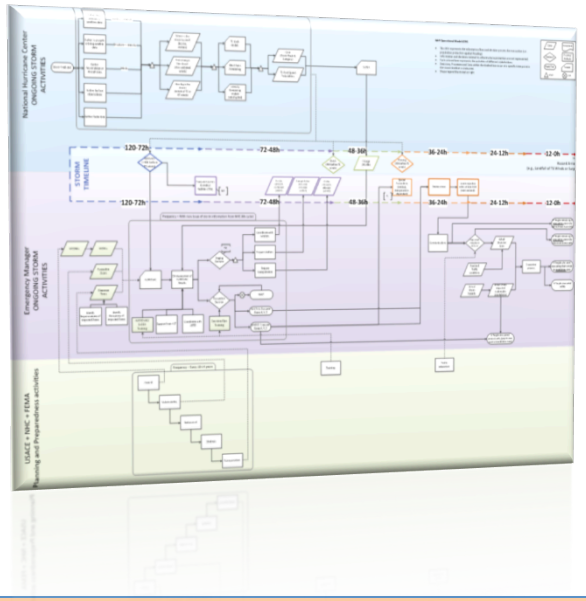
Operational Model: Introduction

Operational Model is a diagram that shows stakeholders, roles, decision support tools, decisions and information flow, and hurricane response timeline during a hurricane event. The operational model has 4 swim-lanes: 3 represent different stakeholders and the 4th represents storm timeline.



What questions can the Operational Model help answer?

- What decisions are made, when, and by whom?
- Which decisions are time critical?
- What data is communicated between stakeholders?
- When is the data used and by whom?
- How do different parts of the program interact with each other?

What is the value of the Operational Model?

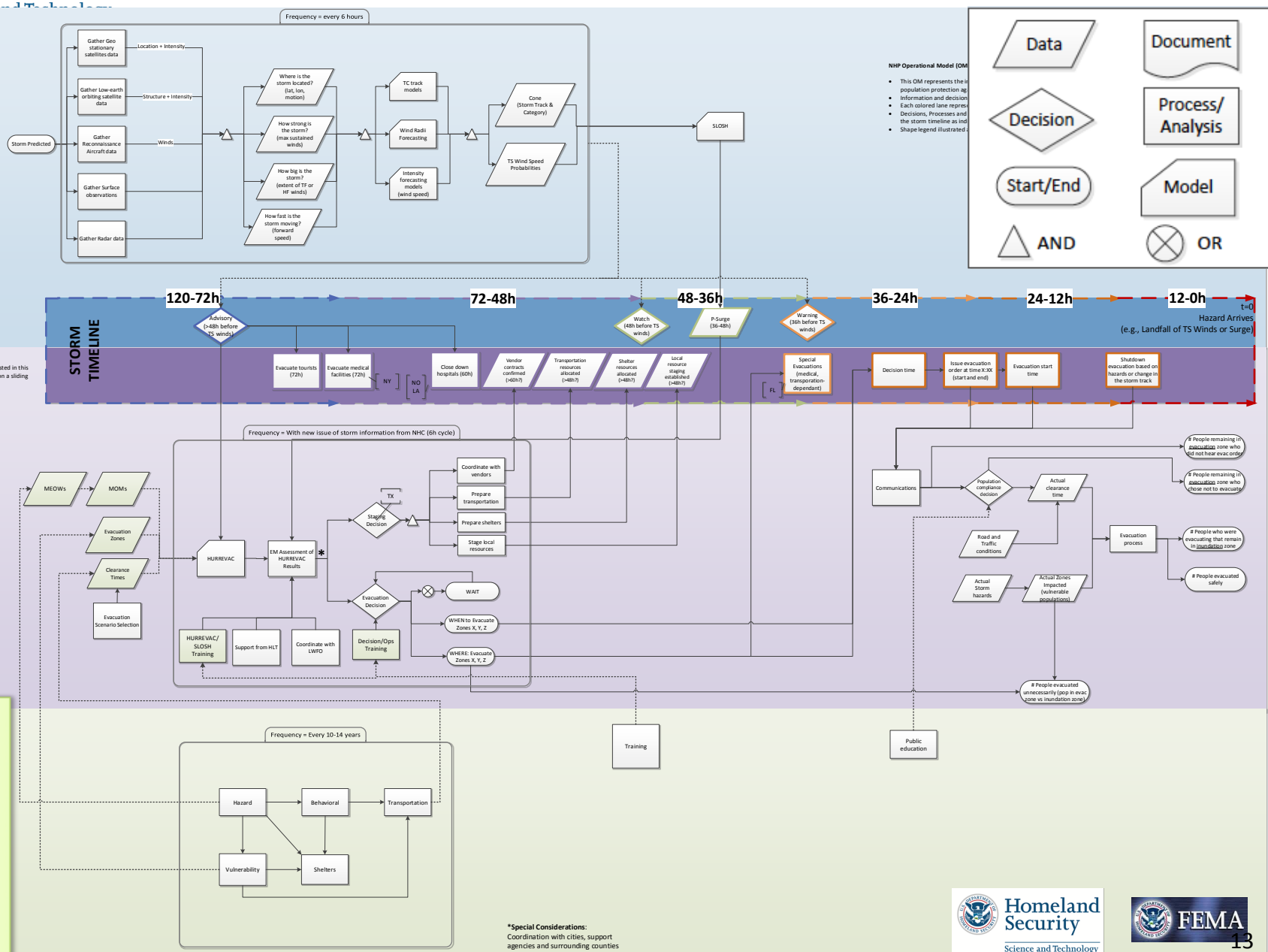
- NHP leadership can use the Operational Model to estimate return on its investments
- For local jurisdictions, the Operational Model will provide a standardized workflow that represents best practices

Operational Model Diagram

National Hurricane Center Ongoing Storm Activities

Emergency Manager Ongoing Storm Activities

USACE+NHC +FEMA Planning and Preparedness Activities



*Special Considerations:
Coordination with cities, support agencies and surrounding counties

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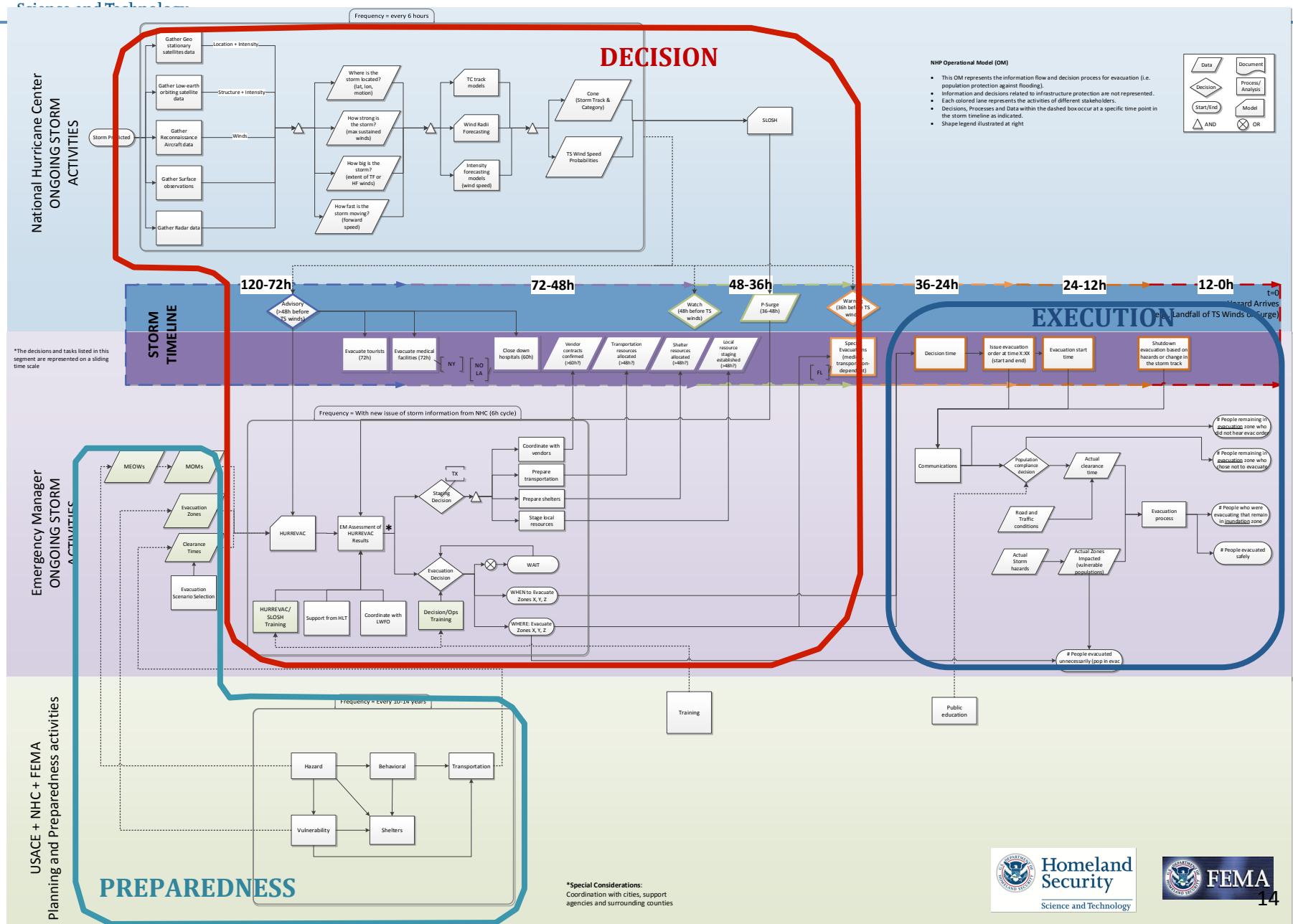
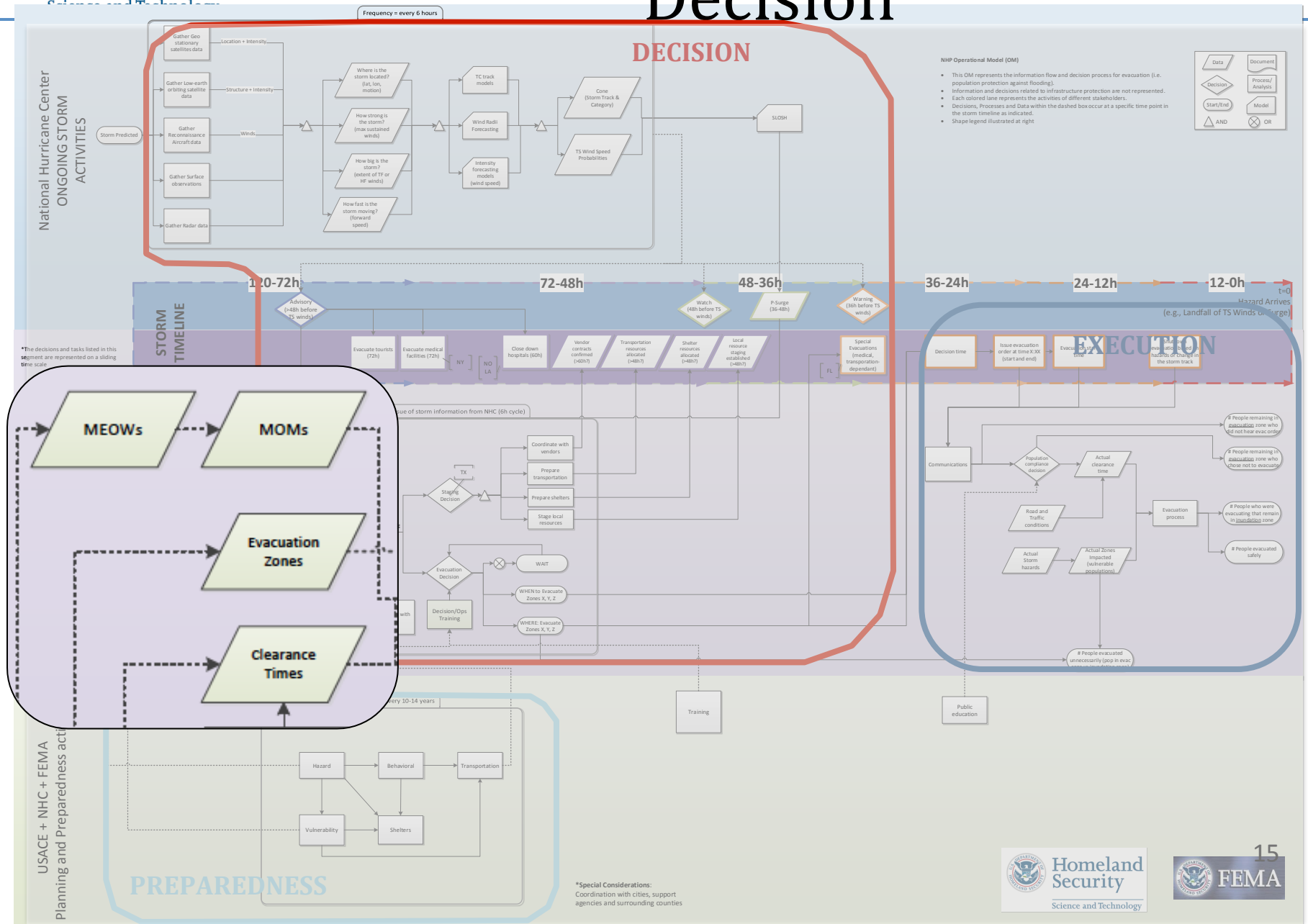
FEMA

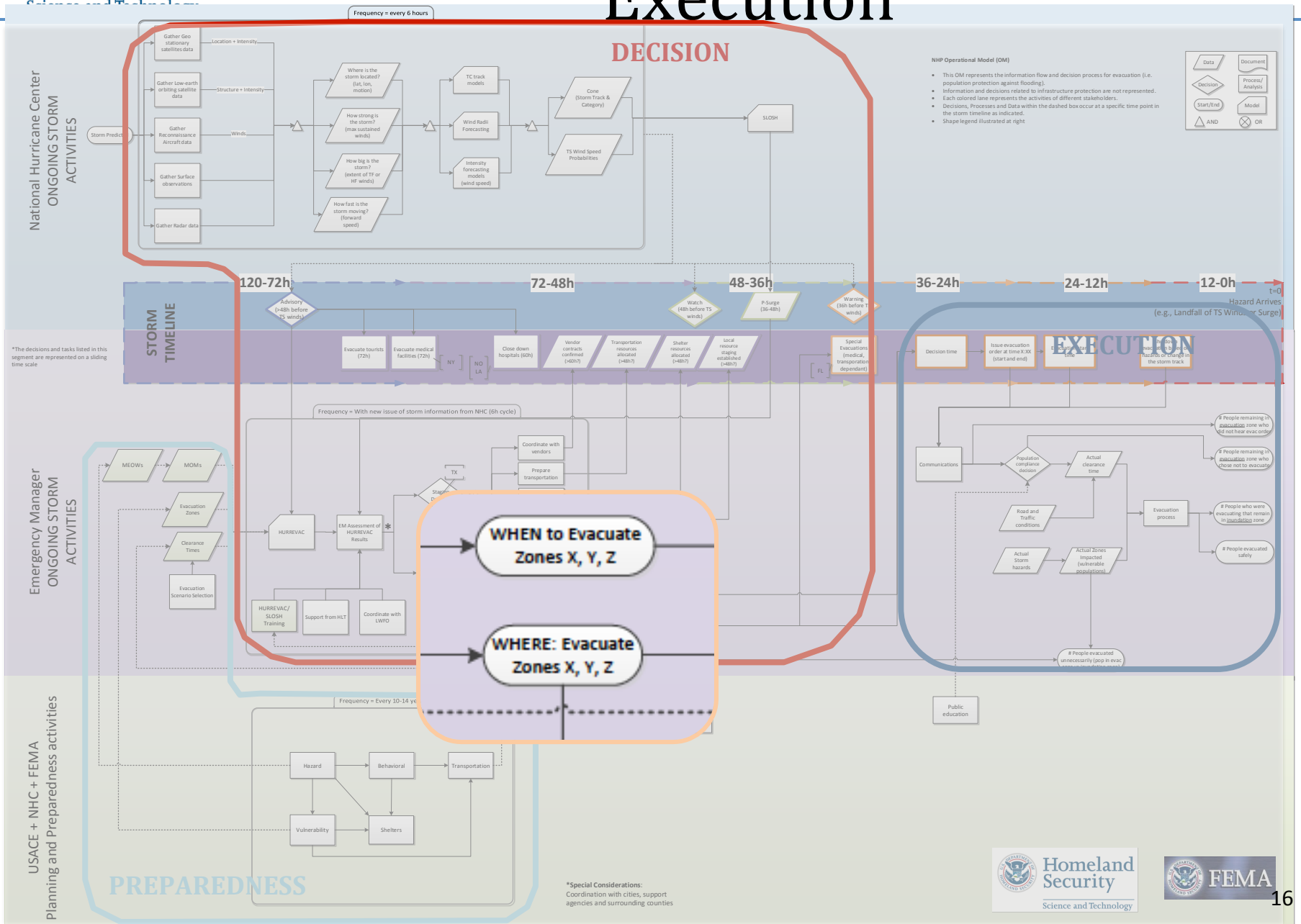
Operational Model Has 3 Submodels



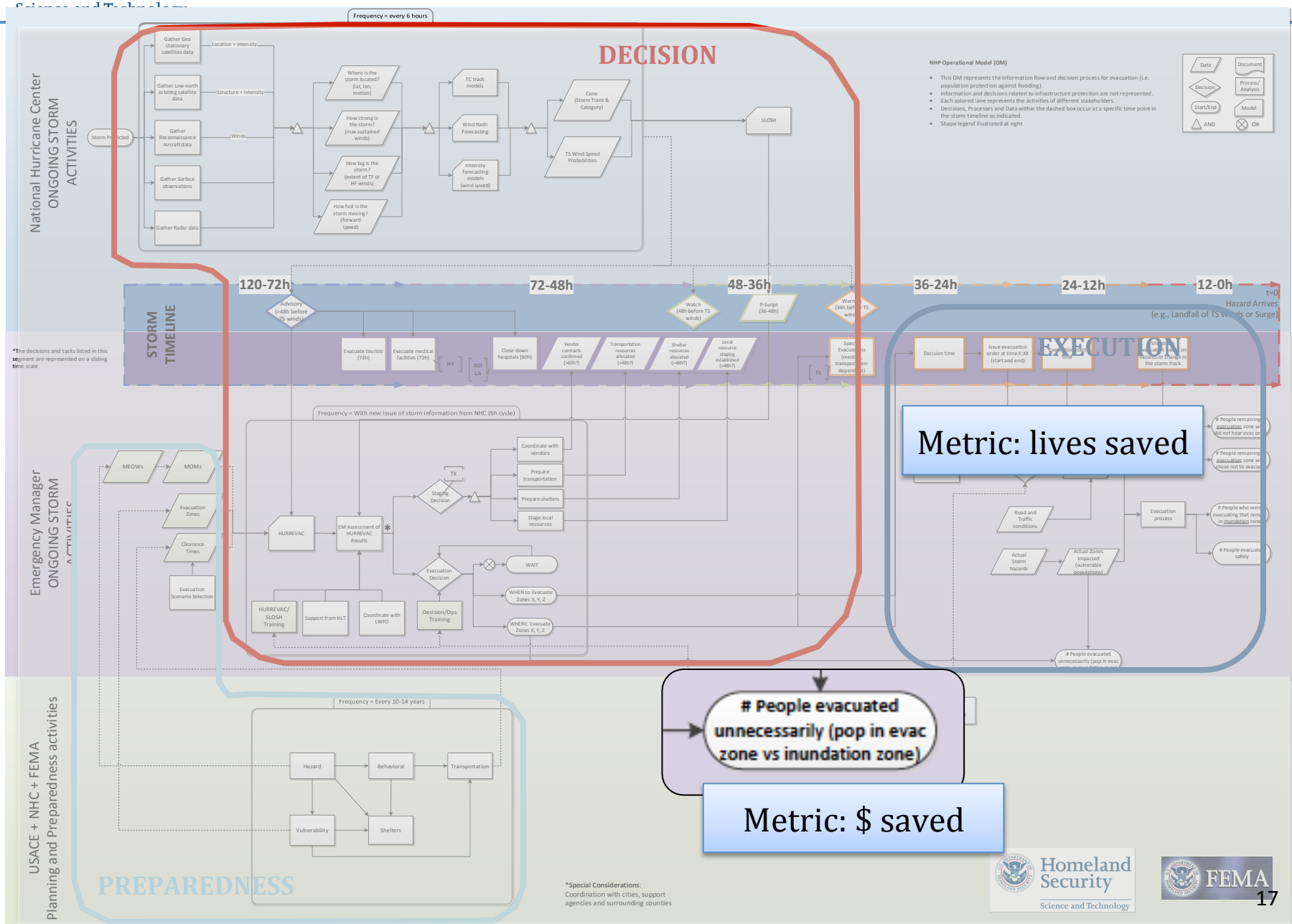
Preparedness Outputs Feed Into Decision



Decision Outputs Feed Into Execution



NHP Metrics


DECISION
EXECUTION
PREPAREDNESS
National Hurricane Center ONGOING STORM ACTIVITIES
Emergency Manager ONGOING STORM ACTIVITIES
USACE + NHC + FEMA Planning and Preparedness activities
STORM TIMELINE
120-72h
72-48h
48-36h
36-24h
24-12h
12-0h
Hazard Arrives
Metric: lives saved
People evacuated unnecessarily (pop in evac zone vs inundation zone)
Metric: $ saved
*Special Considerations: Coordination with cities, support agencies and surrounding counties

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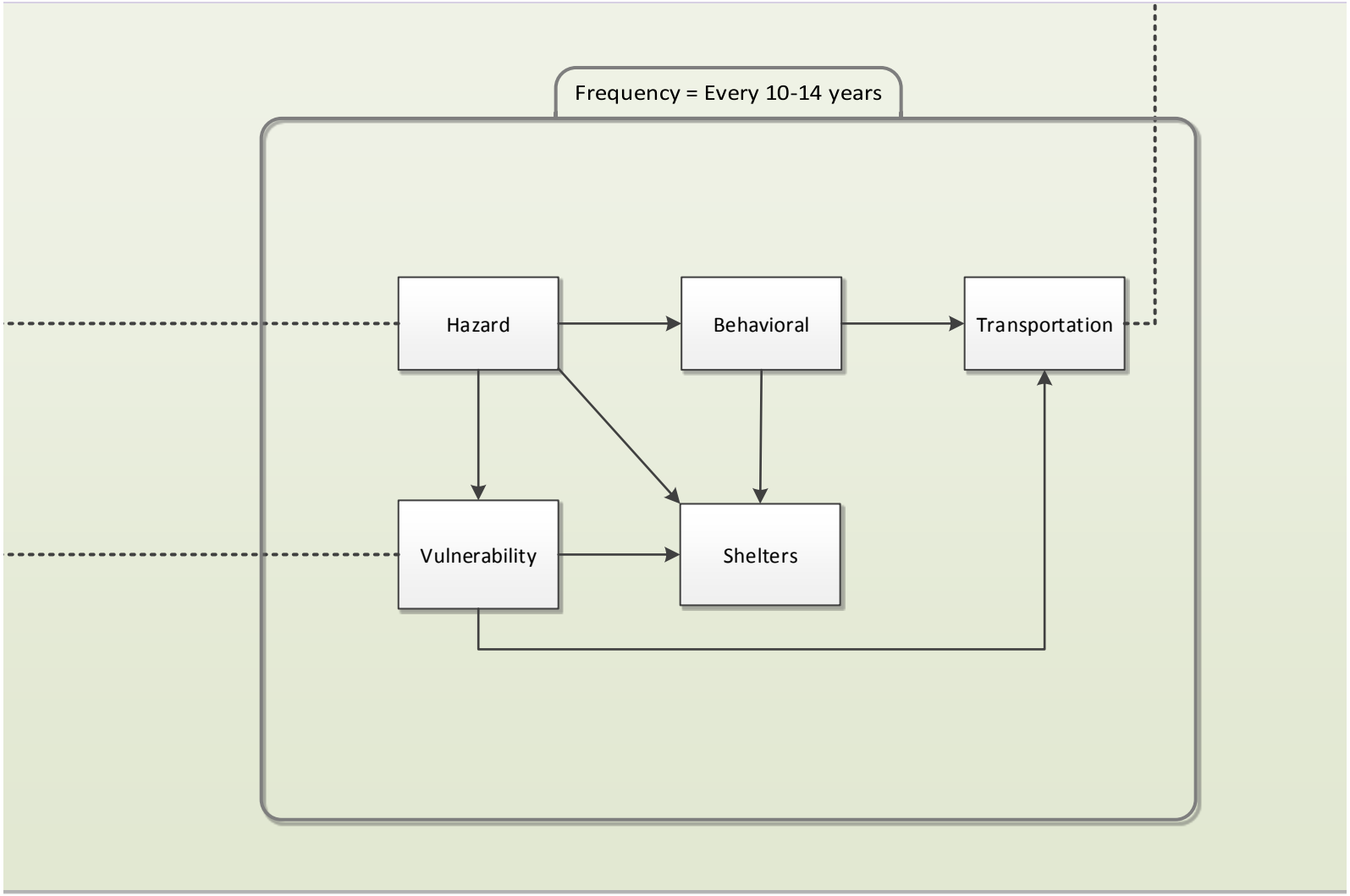
Planning



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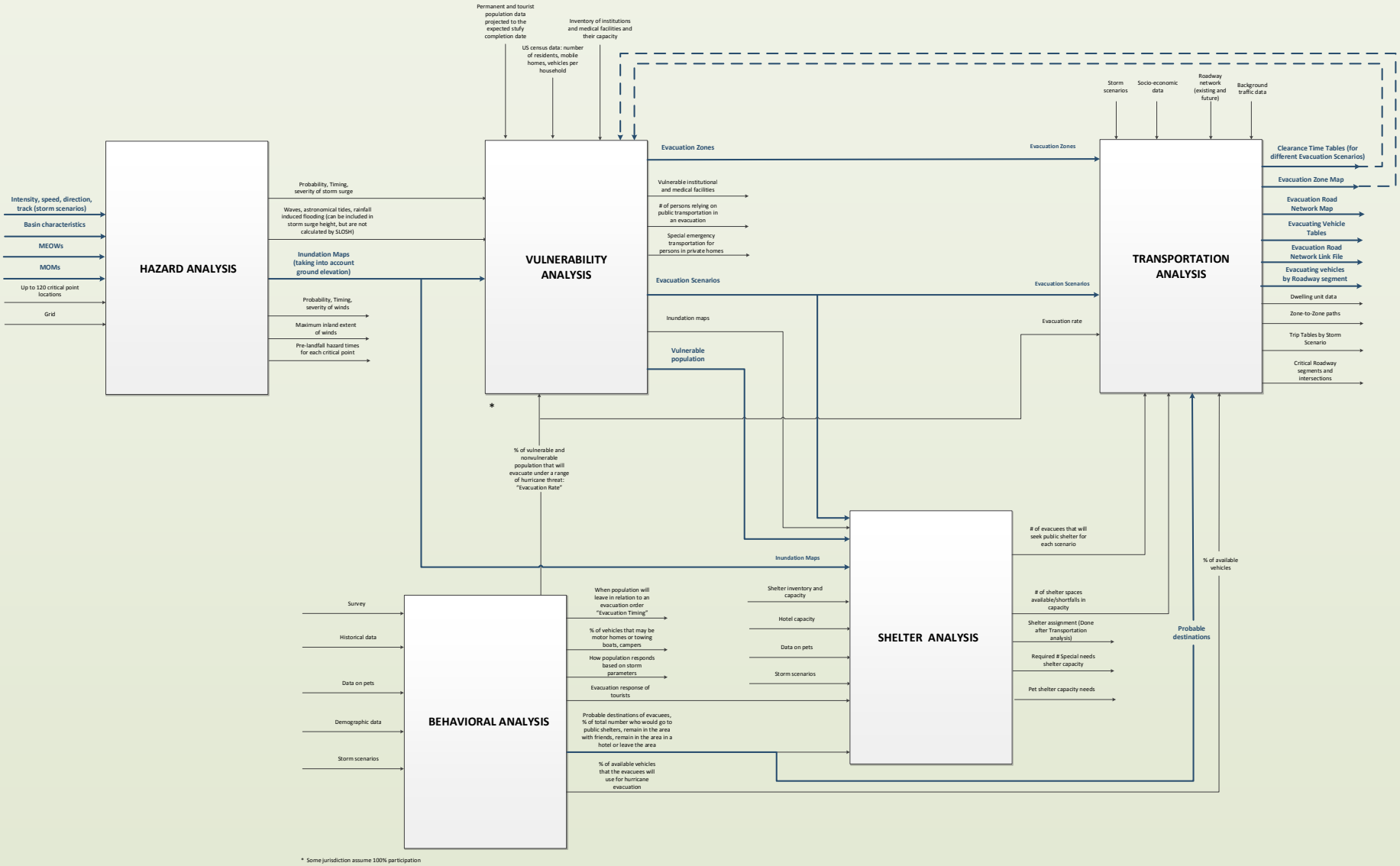
Hurricane Evacuation Studies Process



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HES Modernization

HES modernization effort has 2 main objectives:

1. Automate and modularize existing process

Automation and modularization of existing HES process will result in cost and time reduction for HES execution.

2. Add advanced modeling and simulation capabilities

Modeling and simulation capabilities will lead to more cost efficient evacuations and increased public confidence – resulting in dollars saved and lives saved, respectively.

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Existing HES Process is Expensive and Lengthy

Analysis	"As Is" Cost	"To Be" Cost	"As Is" Length (months)	"To Be" Length (months)
Hazard	$60-$80k	$33-$41k	6-16	3 – 8
Vulnerability	$70-$100k	$42.5-$60.5k	7-18	5 – 12
Behavioral	$125-$160k	$38-$50k	10-17	2 – 4
Shelter	$35-$45k	$10-$12k	3-8	1 – 2
Transportation	$160-$230k	$43.5-$61k	12-19	2 – 4
Total	**$450-$615k**	**$123.5-$224.5k**	**38-78**	**13 - 30**

The HES modernization effort will result in cost reduction of up to 72% and time reduction of up to 66%.

- By leveraging SHERPA, a web-based software framework that links different models together, the HES process can be automated resulting in significant cost and time savings.
  - The user will still have full control and increased visibility into the process.
- The new HES process will allow for standardization, while still allowing flexibility and customization at the local and state level.
- The new HES process will provide tools for easier coordination and communication between stakeholders.

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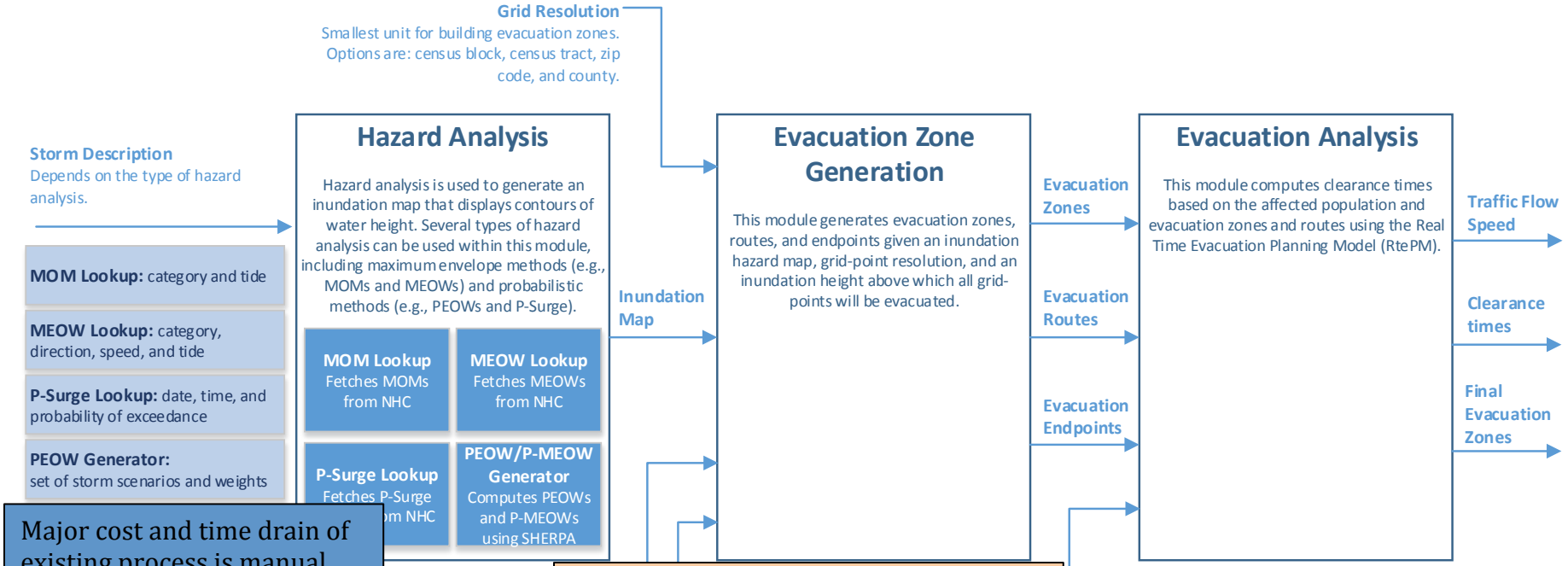
Modernized HES Process Overview

- HES process will link three models together: Hazard Analysis, Evacuation Zone Generator and Evacuation Analysis.
- User will be able to interact with outputs of each individual model or run a full simulation over a range of parameters.
- The process will provide more data and insight for a fraction of cost and time.



Major cost and time drain of existing process is manual processing of information and multiple iterations of coordination with Local and State government.

In the new process, stakeholders can design evacuation zones and calculate clearance automatically and make real time changes, reducing the number of iterations necessary for State and Local approval. (DEMO)

Users will be able to choose which models they want to use, allowing flexibility and local customization.

HES Demo

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Please take some time to look at the Operational Model Posters. Feel free to add notes and feedback on the posters.

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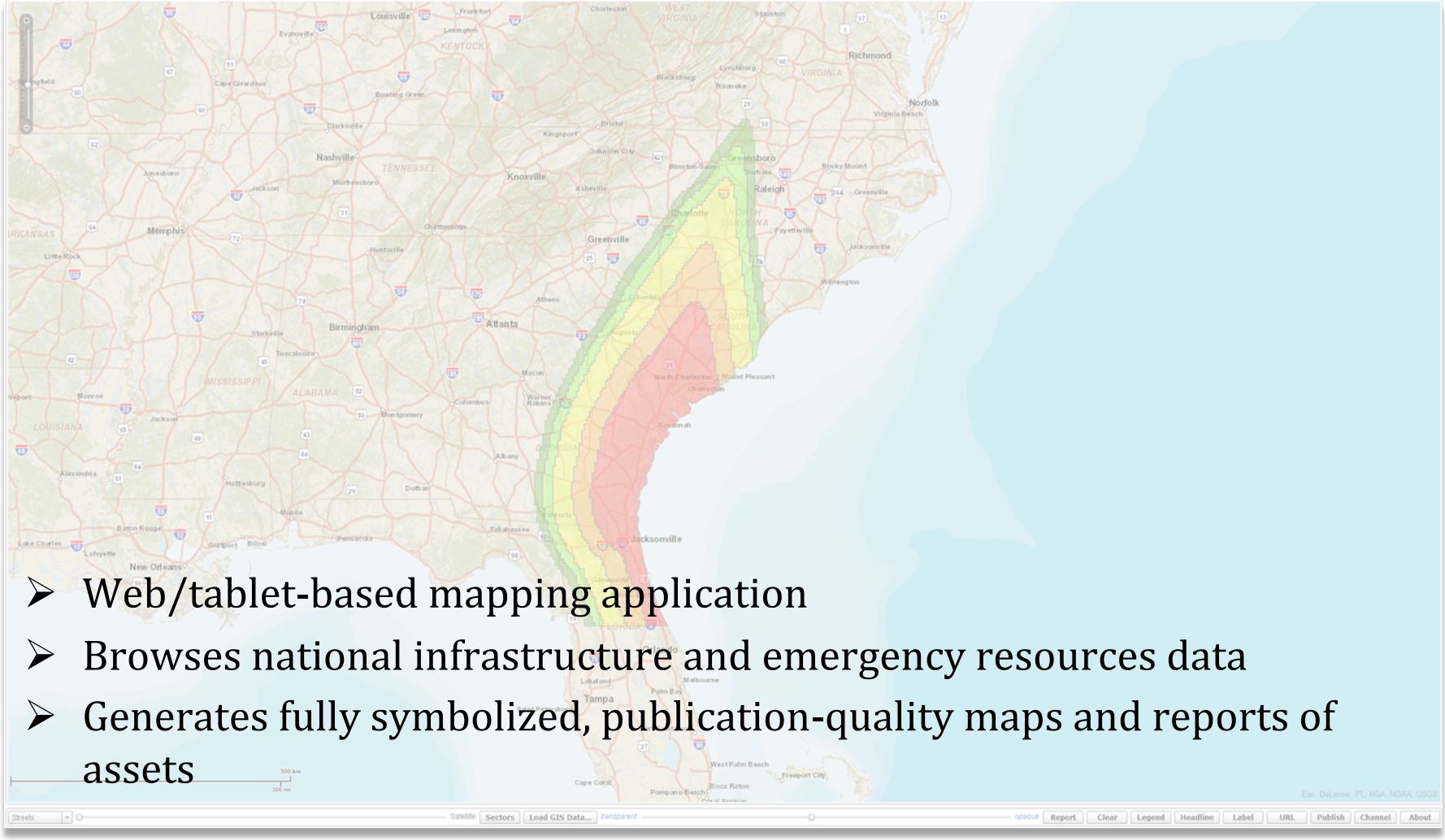
Infrastructure Analysis Could Be Included in HES Process



- Web/tablet-based mapping application
- Browses national infrastructure and emergency resources data
- Generates fully symbolized, publication-quality maps and reports of assets

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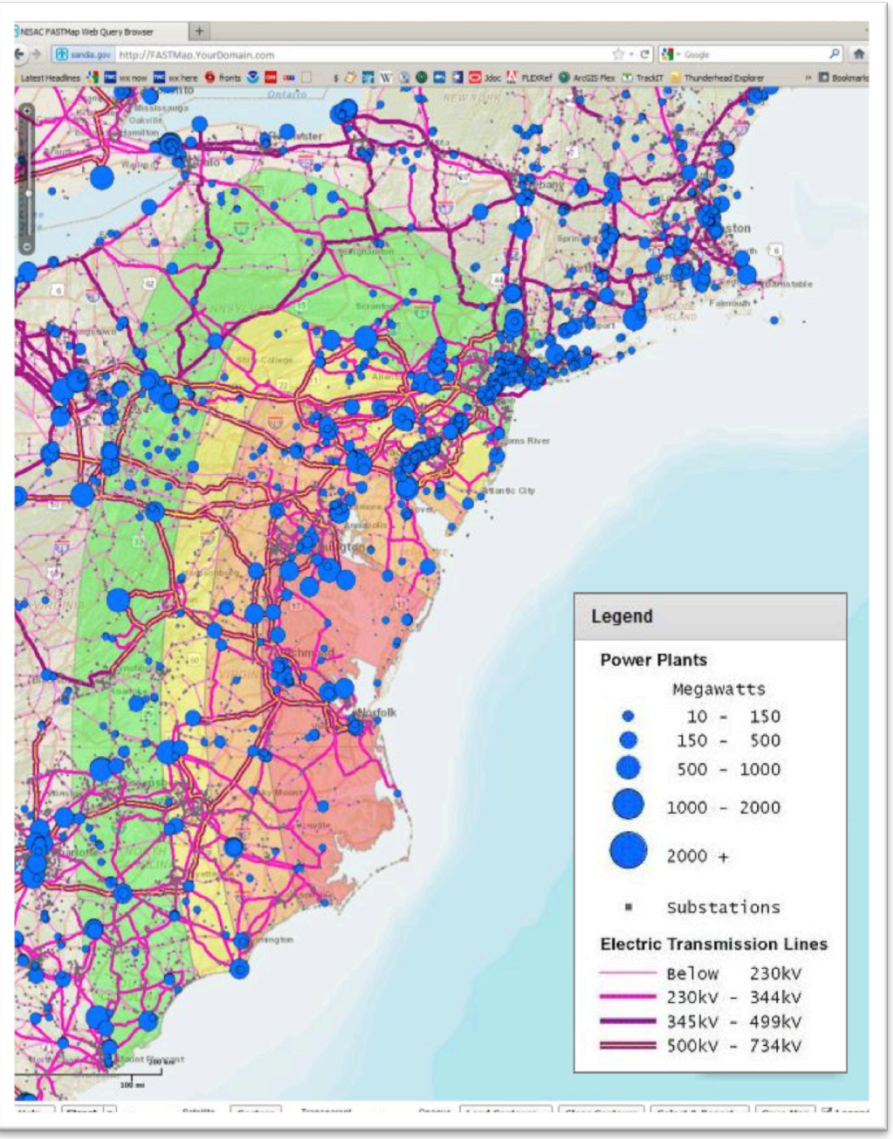
GeoSPAN/FASTMap: Example



Questions Addressed:

- ✓ What is the map or satellite imagery overlay of the infrastructure in context with the disruption area?
- ✓ What is the listing, description, count, and total capacity of the infrastructure assets at risk?
- ✓ What are the attribute details of any infrastructure asset on the map?
- ✓ How can impacted assets and a disruption area be rapidly visualized and identified?

Table of Contents:

- Hospitals
- EP Generation Plants
- EP Substations

Hospitals

Total Number of Hospitals Having 50 Beds or More in the Inundation Zone Zone: 2

Number of Beds in the Inundation Zone Zone: 836

Name	Address	City	State	Phone	Lat	Lon	Beds
<1 ft. (count: 1)							
[redacted]		JACKSONVILLE	FL	904-202-2000	30.315221	-81.664168	574
4-6 ft. (count: 1)							
[redacted]		SAVANNAH	GA	912-356-2011	32.000837	-81.081091	262

EP Generation Plants

Total Number of Power Generation Plants in the Inundation Zone Zone: 8

Power Generation Capacity (megawatts) in the Inundation Zone Zone:

Fuel	Capacity (megawatts)	Total	%
Coal	624.80	368,171.00	0.17
Renew	172.00	84,550.00	0.20
Petro	134.20	75,404.00	0.18
Total	931.00	528,125.00	0.18

GeoSPAN/FASTMap Demo

Key Takeaways

- NHP Modernization Effort will provide modeling and simulation capabilities to improve hurricane planning and response.
  - ✓ EMs will be able to use computational models to dynamically create and refine evacuation zones
  - ✓ There is potential for adding infrastructure vulnerability analysis models into HES process

- Hurricane planners will be able to use one integrated HES software platform, which will greatly reduce the cost and time needed to conduct HESs.

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