



# University of Mississippi



## Specification, Validation and Verification of Imagery Products for Disaster Management and Response

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Prevent, Protect, Respond, Recover

### Homeland Security Challenge:

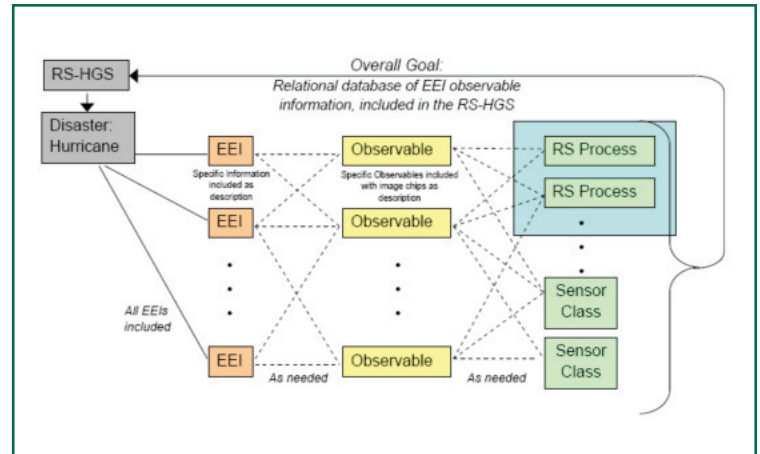
The use of imagery and imagery-derived products is very robust for some hazard types such as fires, but has not been used to its full potential for other hazards such as hurricanes. FEMA has completed the development of a set of Essential Elements of Information (EEI) that specify functional requirements for critical information concerning a variety of hazard types. While this information describes the need in a functional manner there is no defined, integrated approach to developing this information.

### Research Project Solution:

This project will use a systems engineering approach to determine methods that will optimize the use of remotely sensed data to this complex integration problem. This systems engineering function includes determining user needs, selection and mission assignment of appropriate imagery source, validating and verifying the imagery, and researching and developing advanced data exploitation methods to extract information from imagery and distribute the needed product in a reliable, consistent manner achievable within the existing technology structure for incident response. The goal of this project is to create a system designed to increase the utility of imagery products for disaster response. This system will describe the technical specifications for remote sensing data acquisition systems that are necessary to produce data products that address the functional requirements of the first responder community and the FEMA Essential Elements of Information. This will be accomplished by a thorough analysis of information needs, evaluating the appropriate imagery sources against operational needs of response agencies, and developing advanced methods of information extraction and distribution to meet specific needs of incident response teams.

### National Implications:

The goal of this project is to develop a web-based tool for federal, state, and local emergency response agencies to improve their use of imagery-based geospatial products for disaster response and recovery for such hazards as hurricanes, floods and fire. The tool will also provide methods to select, acquire, and process imagery products that meet the requirements of the Essential Elements of Information developed by FEMA.



Prototype system design illustrated in the context of the Remote Sensing Hazard Guidance System (RS-HGS) with process mapping highlighted with a blue box.

Sample EEI	Sample Observable	Sample Specific Observable	Sample Products	Sensor Class
Status of Transportation	Ground	Transportation infrastructure interrupted; Water filled streets; Displaced, trains, trucks, and vehicles; Bridges out, pilings exposed, water flow disrupted around bridges; Roadway signs down; Traffic congestion point or absence of traffic	Imagery produced maps Damage assessment	High resolution aerial High resolution satellite
	Water	Waterways blocked; Flow pattern altered; Displaced boats and barges; Marine infrastructure damage (dock, pier, oil platform, seawall, breakwater, jetty)	Guidance for emergency operations	Moderate resolution satellite
	Air	Planes damaged; Debris in runway	Change detection	

Shown above are a sample EEI and examples of results of the classification processes used to produce imagery products for hurricanes.

[www.serri.org](http://www.serri.org)

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SERRI is managed by the Department of Energy's Oak Ridge National Laboratory for the U.S. Department of Homeland Security