



# Assessment of Emergency Response Planning and Implementation in the Aftermath of Major Natural Disasters and Technological Accidents

National Radiological Emergency Preparedness  
Conference

April 2008

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US NRC

# NUREG/CR-6864

## Identification and Analysis of Factors Affecting Emergency Evacuations

- NRC published NUREG/CR-6864  
“Identification and Analysis of Factors Affecting Emergency Evacuations” January 2005
- Conducted extensive research
- Identify “universe” of evacuation incidents meeting specified criteria
- Conduct 50 case studies out of a possible 230 evacuations
- Identify factors contributing to efficient and effective evacuations (regression & correlation analyses)

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## Identification and Analysis of Factors Affecting Emergency Evacuations

- Evacuation decision-making
- Notification of response personnel/officials
- Citizen notification and warning
- Citizen action
- Emergency communications
- Traffic movement & control
- Congregate care centers
- Law enforcement Issues
- Re-entry Issues

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## Identification and Analysis of Factors Affecting Emergency Evacuations

- Shadow evacuations
- Special facilities evacuations
- Training & drills
- Type of emergency plan
- Community preparedness & history of emergencies
- Number of deaths/injuries
- Unusual, or special, circumstances

# Major Findings

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- Evacuations successfully protect the public health & safety over a broad range of initiating circumstances & challenges
  - Public evacuations **occur frequently (~once every 3 weeks)**
  - Shadow Evacuations **Do Not affect the effective implementation of adequate protective actions**
  - Emergency workers **report to duty when asked**
  - Public education **is an important contributor to efficient & effective evacuations**
  - Route Alerting **is effective & a significant contributor to efficient & effective evacuations**

# Along came a Hurricane or two..



# Need to revisit evacuation study ?

- **Review recent large scale disasters for new insights.**
- **Use the knowledge gained from recent large-scale emergency response activities as a resource to determine if emergency planning elements available at the time, were implemented and proven effective or ineffective in managing the response effort.**
- **Look at lessons learned for possible enhancements in emergency planning.**

# Evacuation Study Reassessment

- Assess the effectiveness of emergency planning in place and implemented for 11 large scale evacuations
- Assess NRC/FEMA EPP programmatic infrastructure
- Identify potential enhancements to NRC/FEMA Emergency Preparedness Program



# Case Studies

Name	Date	Type	State(s)	# Evacuated	Comments
Georges	September 2008	Hurricane	FL,MS,AL	~70,000	1 <sup>st</sup> time Superdome used as shelter
Wildfire	October-03	Southern California Fires	CA	100,000	Fire prone area
Ivan	September-04	Hurricane	FL, NC, MS, GA	>200,000	Mandatory evacuations in LA
Katrina	August-05	Hurricane	LA<MS<AL <FL	2 million	Catastrophic disaster
Rita	September-05	Hurricane	TX,LA	3 million	Difficult evacuations

# Case Studies

Name	Date	Type	State(s)	# Evacuated	Comments
<b>EQ Fire in Romulus</b>	<b>September-05</b>	<b>Chemical Fire</b>	<b>MI</b>	<b>3,000</b>	<b>Initially thought terrorism involved</b>
<b>Wilma</b>	<b>October-05</b>	<b>Hurricane</b>	<b>FL</b>	<b>300,000</b>	<b>Large storm</b>
<b>New England Flooding</b>	<b>October-06</b>	<b>Flood</b>	<b>NH, ME, MA</b>	<b>~2,000</b>	<b>High % of Spanish speaking residents</b>
<b>EQ Fire in Apex</b>	<b>October-06</b>	<b>Technological</b>	<b>NC</b>	<b>17,000</b>	<b>Officials were not able to identify hazards</b>
<b>Hawaii Earthquake</b>	<b>October-06</b>	<b>Earthquake</b>	<b>HI</b>	<b>~3,000</b>	<b>Special Facilities Evacuated</b>
<b>California Wildfires</b>	<b>October-07</b>	<b>Wildfire</b>	<b>CA</b>	<b>~900,000</b>	<b>Large, rapid evacuation, special needs, pets,</b>

# Evacuations

- Hurricane Katrina- successful evacuation from a traffic management perspective
- Hurricane Rita had over 100 deaths attributed to the evacuation and 0 deaths to hurricane
- 2007 CA wildfires implemented many lessons learned from 2003 fires resulting in fewer consequences & improved communications.

# Themes Identified

- Regional resources are being integrated into large scale planning
- Evacuation techniques improve when tested
  - i.e. communications, contraflow, etc
- Enhancements in emergency communications have improved response effectiveness
- Awareness of need to plan for special needs individuals who do not live in special facilities

# Response Elements Assessed

#	Planning	Implementation
1	Training	Training
2	Public Education	Public Education
3	Communication with Public	Communication with Public
4	Communication with Responders	Communication with Responders
5	Evacuation	Evacuation
6	Special Needs	Special Needs
7	Shelter Facilities	Shelter Facilities

**Criteria were established to support rating each element**

# Rating Criteria

- Planning:
  - Was the plan comprehensive/broad enough to encompass the hazard encountered?
  - Did the plan include adequate descriptions of responsibilities and authorities?
  - Did the plan include elements necessary for successful evacuation including public education, training, chain of command, public notification and warning, communications, transportation routes and modes, special needs individuals and facilities, and shelterings?
- Implementation:
  - Was the chain of command followed?
  - Were timely and effective decisions made?
  - Were the evacuation elements carried out in accordance with the plan?
  - Were plans coordinated with other jurisdictions, if applicable?

# Assessment of NRC Emergency Planning and Implementation

- Success of implementation is, as may be expected, directly related to the level of planning.
- Training and communications with responders have received a lot of attention post 9/11 and have been areas of significant growth and improvement- very effective.
- Public education, communication with the public, evacuation, and shelters continue to be effective.
- Special needs was not as effective in implementation
  - Primarily due to issues experienced in hurricanes Katrina and Rita and a consistent lack of planning for special needs individuals who do not reside in special facilities.

# Potential Enhancements

- NRC/FEMA EP program could be enhanced through planning that addresses:
  - Integrating regional approach to evacuations;
  - Assessment of traffic management aspects of evacuations to better understand implementation time;
  - Local review of evacuation plans for special needs facilities to ensure that resources are available to support evacuation;
  - Communication to the non-affected public to support staged evacuations and to mitigate shadow evacuations;
  - Consistent terminology for shelter facilities/congregate care centers;
  - Consideration of the impact of parents arriving at schools to pick up their children; and
  - The need to accommodate pets at congregate care centers.





# Thank you!!

- Questions???
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