Looking Beyond Damage Assessment

Imagery Applications for Recovery

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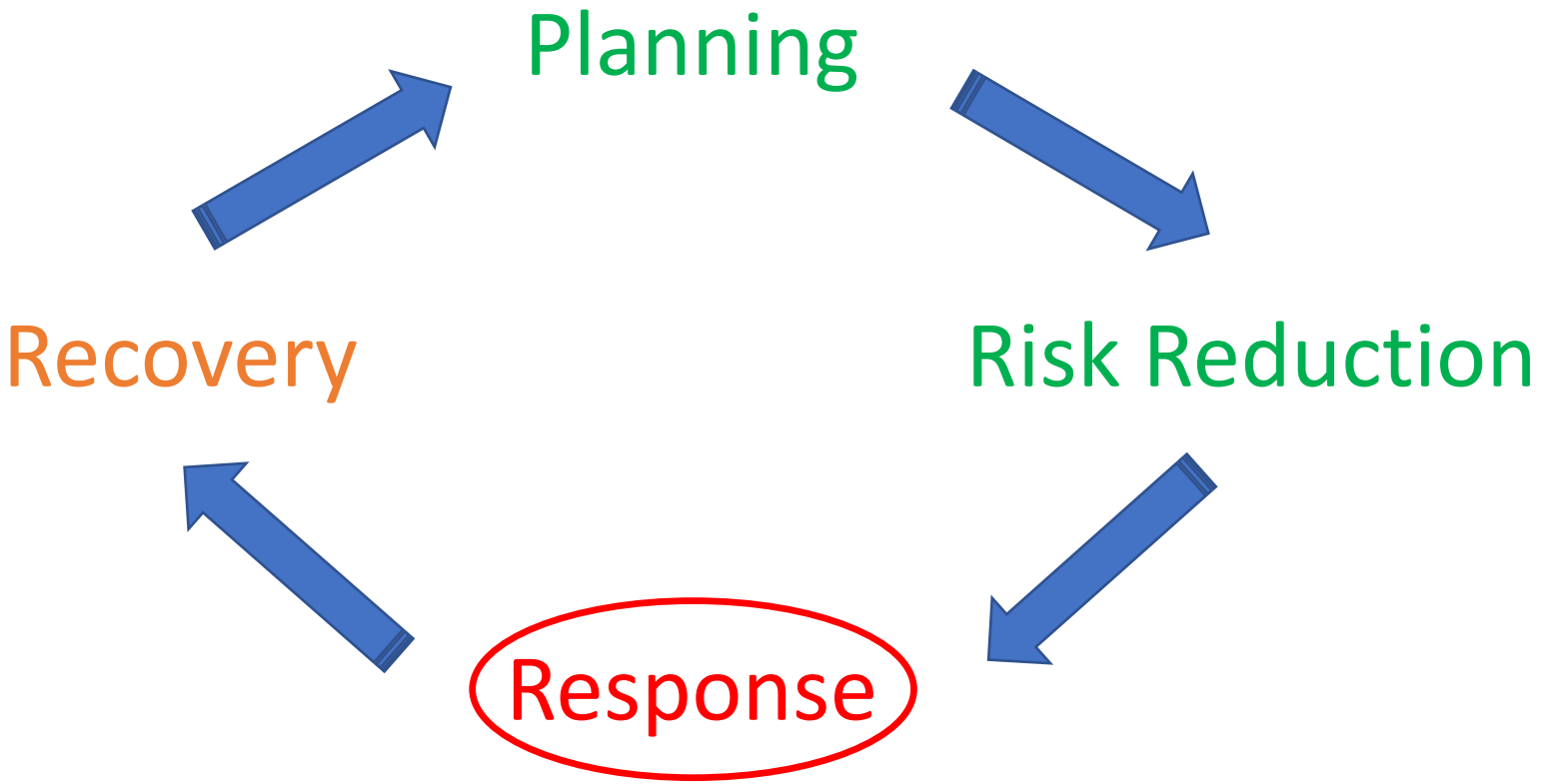
Disaster Management Cycle



Greatest Return on Investment Is Not Response

- Risk reduction activities reduce the potential impact of a disaster through policies and practices which:
  - Reducing vulnerability of at risk populations (improved building codes, limiting where construction may occur, warning systems)
  - Improving resilience (preparedness exercises, awareness of risk)
  - Research and development (new materials design, forecasting lead time improvement)
- The vast majority of disaster prone areas have limited risk reduction opportunities
  - Only so much money can be spent to reduce risk – diminishing returns (how much is a life/home worth before people should simply relocate out of a disaster prone area?)
  - Vast majority of disaster prone areas are significantly “built-out” – relocation is impossible

Recovery Opportunities Have the Highest Impact on Reducing Losses

- Recovery activities reduce the impact of disaster through policies and practice which:
  - Speed recovery thereby minimizing economic loss (maintain basic economy and prevent job/tax loss)
  - Improved disaster system throughput (transfer of care, better logistics)
  - Removal of secondary hazards prolong suffering (debris and standing water both cause secondary rounds of harm)
- Another way of thinking about disaster: successive cascading propagation of localized emergencies
  - Initial and immediate loss – crush, drowning, serious injury caused by violent disaster-related event
  - Secondary loss – disease, malnutrition, secondary injury from debris and similar caused by slow recovery

A Military Example

- For every 3 killed in action during the American Civil War, **5** additional soldier perished from disease and non-battle causes

Cases	Diseases	Deaths
75,368	Typhoid	27,050
2,504	Typhus	850
11,898	Continual Fever	147
49,871	Typho-malarial Fever	4,059
1,155,266	Acute Diarrhea	2,923
170,488	Chronic Diarrhea	27,558
233,812	Acute Dysentery	4,084
25,670	Chronic Dysentery	3,229
73,382	Syphilis	123
95,833	Gonorrhea	6
30,714	Scurvy	383
3,744	Delirium Tremens	450
2,410	Insanity	80
2,837	Paralysis	231

Disaster Deaths

Hazard	Technological	Geophysical	Hydro-meteorological	Societal	Biological
Percentage of global mortality	7%	30%	45%	13%	5%
Cause of death	Trauma Burns Poisoning	Trauma Burns Asphyxia	Drowning Trauma Malnutrition Communicable diseases	Violence Malnutrition Communicable diseases	Communicable diseases
Mortality pattern	Injuries only		Mostly injuries	Mixed - injuries and disease	Disease only

Source: Disasters.org

Stage of prevention	Disaster risk management activity	Capacity used for geological, hydrometeorological and technological hazards	Capacity for societal hazards	Capacity for biological hazards
Primary Prevention *Preventing hazards and preventing exposures after hazardous events occur* *(includes prevention and preparedness measures)*	Risk assessment	Health surveillance Injury risk assessment Hazard, vulnerability and capacity analyses	Health surveillance Disease risk assessment Security threat assessment	Health surveillance Disease risk assessment
	Hazard avoidance	Land use regulation Hazard management Preventive maintenance Engineering controls (e.g. flood barriers)	Conflict resolution Peacekeeping	Veterinary health Water quality treatment
	Hazard monitoring	Health surveillance Geo-seismic monitoring Hydrometeorological monitoring Industrial hygiene – workplace safety	Health surveillance Medical intelligence	Health surveillance Veterinary surveillance Vector surveillance
	Health exposure reduction	Public warning systems Evacuation Sheltering/settlement Security Water, sanitation and hygiene (WASH)	Public warning systems Isolation/Quarantine Social distancing Personal protective equipment (PPE) WASH	Public warning systems Weather forecasting Industrial hygiene –workplace safety Structural mitigation Building codes Evacuation Sheltering/ settlement
	Health vulnerability reduction	Health promotion Health services Public education Risk communication		

Stage of prevention	Disaster risk management activity	Capacity used for geological, hydrometeorological and technological hazards	Capacity for societal hazards	Capacity for biological hazards
Secondary Prevention *Preventing injury/disease after exposure occurs* *(includes preparedness and response measures)*	Risk assessment	Health surveillance Rapid needs assessment Exposure assessment Damage/loss assessment	Health surveillance Rapid needs assessment Security threat assessment	Health surveillance Disease risk assessment Disease early warning systems
	Health exposure reduction	Search and rescue Evacuation Sheltering/ settlement WASH Decontamination Risk communication	Evacuation Sheltering/ settlement WASH Risk communication	Isolation, quarantine Hospital infection control measures Risk communication
	Health vulnerability reduction	Emergency health services Curative health services Risk communication Psychosocial services	Vaccination Emergency health services Curative health services Risk communication Psychosocial services	Emergency health services Curative health services Risk communication Psychosocial services
Tertiary Prevention *Preventing disability/death after disease/injury occurs* *(includes response and recovery measures)*	Risk assessment	Health surveillance	Health surveillance	Health surveillance
	Health vulnerability reduction	Emergency health services Curative health services Rehabilitative health services Risk communication	Health vulnerability reduction	Emergency health services Curative health services Rehabilitative health services Risk communication

Recovery Can Be Planned

- The vast majority of disasters can be planned for based upon known risk factors – even “unpredictable” disasters like earthquakes occur in well known hazard areas
- Space-based technologies may be used to effectively plan recovery operations in advance

Examples of Space-Based Recovery Planning

- Identification of ingress routes for the provision of long-term aid
- Use of digital elevation models to calculate debris and likely areas of standing water
- Determination of at-risk populations
  - Example – lights at night are an indication of population and, when coupled with basic demographic data, can be used to predict elderly/youth population and coupled with need for dietary support, medication, and similar
  - Example – structure construction type may be used to predict collapse hazards and coupled with need for temporary long-term housing
- Means to sustain a local economy may be determined in partnership with business/government

Hypothesis:
Economic Sustainability is the #1 Predictor

- Economic recovery provides the longer-term financial basis for recovery
  - Government and NGO aid is limited in quantity and duration
  - Local economic activity provides the funds needed for longer-term recovery and sustainability
- Current means of disaster planning rely upon event damage severity and not the vulnerability of a population
  - The effects of a Category 2 cyclone on a rural village constructed from lightweight materials will be no different that those of a Category 5 storm

Conclusion

- Disaster planning activities still largely focus on marshalling resources in preparation for response and the immediate response itself
- Equal, if not greater effort, must be placed upon integration of satellite remote sensing for recovery planning
- Emphasis should be placed upon contextualizing disasters with respect to the vulnerability of populations.