How Spatial Data is Transforming Emergency Management
Harnessing the Transformative Potential of Urban Data Science and GIS
Welcome and Introduction

• Five years of Emergency Management at the county level
• Certified Urban Planner (AICP)
• Certified GIS Professional (GISP)
• R Programmer (Analytics)

• Started UrbanDataLabs, LLC in 2023 to blend Analytics, GIS, and Urban Planning for Urban Resilience

Bernardo Salazar, AICP, GISP
Presentation Outline

• Overview of Emergency Management
• GIS and Emergency Management
• Spatial Data Needs in Emergency Management
• Examples
• Questions / Comments
Overview of Emergency Management
Defining Emergency Management

Simple Definition: Emergency Management involves coordinating resources and developing strategies to prepare for, respond to, recover from, and mitigate the impact of natural and technological hazards.

Why Emergency Management?
• Threats and hazards exist
• Disaster events have a significant impact on humans, the economy, and the environment
• Success depends on how well prepared, organized, and coordinated we are
• Emergency Management principles and practices actually work to achieve successful outcomes
Emergency Management Principles

Comprehensive - all threats/hazards
Progressive - anticipate future disasters and take proactive measures
Risk-Driven - leverage risk management principles to prioritize
Integrated - unity of effort among all levels of government
Collaborative - create and develop broad and sincere relationships
Coordinated - synchronize activities of relevant stakeholders
Flexible - use creative and innovative approaches in solving challenges.
Professional - value a science- and knowledge-based approach
Emergency Management Phases

**Preparedness** - Continuous cycle of planning, organizing, training, equipping, exercising, evaluating and taking corrective action

**Response** - Save lives, protect property and the environment, and meet basic human needs during an incident

**Recovery** - Timely restoration, strengthening and revitalization of infrastructure, housing, and economy

**Mitigation** - Reduce the loss of life and property by lessening the impact of future disasters
GIS and Emergency Management
How does GIS fit Into Emergency Management?

GIS is a very useful tool for many aspects of emergency management including emergency response, planning, mitigation, exercises, homeland security, response, and recovery.

GIS has robust modeling capabilities, allowing its users to adjust data and scenarios for prediction, planning, and estimation.

GIS provides emergency management personnel and decision makers the information they need to make accurate and timely decisions.

- Emergency Management Institute, IS-922.a: Applications of GIS for Emergency Management

urbandatalabs.com
GIS for Emergency Management: Why Now?

• Most Jurisdictions have a GIS system/license
• More Publicly Available Data
• Wider Adoption Across State and Federal Partners
• Growing Public Awareness (John Hopkins COVID-19 Dashboard)
• Collaborative Technology
• Less Configuration – Out of the Box
• Easily YouTube/Google Answers
Example GIS Activities by Phase

Preparedness:
- Aids in hazard identification and risk assessment.
- Mapping potential disaster zones, identifying vulnerable populations (Social Vulnerability Index), and analyze potential.
- Map flood zones to determine where flooding is likely to occur and which properties and populations are at risk.

Response:
- Critical for real-time decision-making and communication.
- Real-time tracking, data visualization, and the ability to rapidly update and distribute critical information.
- Visualize the areas most impacted.
- Decision-makers can use this information to allocate resources, implement evacuation orders, and make other critical decisions.
Example GIS Activities by Phase

Recovery:

• In the recovery phase, GIS helps assess the damage post-disaster, aiding in recovery planning.
• Aerial imagery can be used to identify damaged infrastructure or affected areas that need immediate attention.
• GIS can also help manage recovery efforts such as debris removal or infrastructure repairs by tracking progress and identifying outstanding needs.

Mitigation:

• In the mitigation phase, GIS plays a role in planning strategies to reduce future risk and increase resilience.
• Mapping areas repeatedly affected by flooding, planners can identify the need for infrastructure changes or other mitigation strategies.
• In the longer term, GIS can support climate resilience planning, helping communities adapt to changing risk profiles due to climate change.
Spatial Data Needs in Emergency Management
Spatial Data Needs in Emergency Management

**Geospatial Data:** This type of data is crucial to map the disaster areas and carry out spatial analyses. Data sources could be satellite imagery, aerial photography, or crowd-sourced platforms.

**Temporal Data:** Emergency management requires real-time data for immediate response as well as historical data for planning and mitigation purposes.

**Thematic Data:** This refers to data relating to specific themes, such as population demographics, infrastructure, land-use, vegetation, climate, and more to provide context and deeper analysis.

**Data Management:** Managing these vast amounts of data in a systematic and accessible way is crucial. Good data management practices ensure that the right data is available to the right people at the right time.
Examples
Relevant EM Data Sources: HIFLD

Uses an ESRI Platform
Relevant EM Data Sources: ArcGIS
Hazard Vulnerability Analysis

Updated July 2022
Frisco’s Situational Awareness For Emergency Response (SAFER)

Situational Awareness For Emergency Response (SAFER), is a geospatial platform that provides Fire, Police, Dispatch, and the EOC with a common operating platform incorporating the use of real-time information to make data driven decisions while responding to incidents.

• Data Rich
• Integrated
• User Friendly
• Collaborative

urbandatalabs.com
Tracking Resources: Real-time tracking of the locations of vehicles owned by the city.
Efficient allocation of fire trucks and identification of the closest one, even across fire district boundaries, through the use of routing for fast decision-making.
Integrating and linking TIER II data, fire hydrant layers, and preplans together.
Integrating and linking TIER II data, fire hydrant layers, and preplans together.
Integrating and linking TIER II data, fire hydrant layers, and preplans together.
State of Texas Emergency Assistance Registry (STEARS) and Active Calls
Integrated school building plans and access to security cameras
Texas Division of Emergency Management’s (TDEM) iSTAT and pSTAT

- The State of Texas Assessment Tool is TDEM’s system for recording damage and tracks impacts to residences, businesses, and public infrastructure through iSTAT and pSTAT.
- iSTAT gathers Initial Damage Assessment information and assess the scope and size of an event impacting residences and businesses.
- pSTAT collects location, severity and costs associated with public infrastructure losses.
**Hydrologic Group:** Group D consists of soils with a very slow infiltration rate and high runoff potential. This group is composed of clays that have a high shrink-swell potential, soils with a high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material.
GIS Challenges

Silos / Department Structure
  • Communication/Limited Subject Matter Expertise

Smaller Jurisdictions
  • Less resources
  • Smaller staff
  • Overworked

Larger Jurisdictions
  • Overworked
  • More departments
  • Longer chains of command

Leadership may not see the value
Questions / Comments
UrbanDataLabs, LLC

Contact:
Bernardo Salazar, AICP, GISP
Urban Data Scientist
bernardo@urbandatalabs.com
(214) 810-4970

urbandatalabs.com