ROUNDTABLE

LEVERAGING GIS FOR ENHANCED EMERGENCY MANAGEMENT

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INTRODUCTION

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&

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Attendees

!

OUTLINE

Introduction & Overview

GIS Foundations for Emergency Management

EXERCISES

1: Spatial Successes & Opportunities

2: Spatial Thinking Icebreaker

3: Brainstorming GIS Solutions

4: GIS in Action: Crisis Scenarios

5: Overcoming Implementation Barriers

6: Turning Ideas into Action

7: GIS for Mitigation and Resilience Planning

Wrap-Up & Next Steps

Networking & Resources (Thank you!)

OBJECTIVES & GOALS

Enhance Spatial Awareness

Foster Collaboration

Generate Pratical Insights

Stimulate Innovation

Create Actionable Steps

TARGET AUDIENCE


ALL
DISASTERS
ARE
LOCAL

GIS Foundations for Emergency Management

What is it & why does it matter?

Geographic Information System OR **Geographic Information Science**

...is a computer system for capturing, storing, analyzing, and displaying geographically referenced information, enabling users to visualize and understand spatial patterns and relationships

... a scientific discipline that studies how geographic information can be captured, organized, analyzed, and used to understand and solve real-world problems, often involving spatial data and mapping

GIS Foundations for Emergency Management

Positions, Titles, and Roles, Oh My!

ENTRY

- TECHNICIAN
  - EM GIS TECHNICIAN
- ANALYST
  - SEARCH & RESCUE GIS ANALYST
  - PUBLIC SAFETY GIS ANALYST
  - FLOODPLAIN MAPPING & RISK ANALYST
  - CRITICAL INFRASCTRUCT GIS ANALYST
- SPECIALIST
  - WILDFIRE GIS SPECIALIST
  - HAZARD MITIGATION GIS SPECIALIST
  - DISASTER RESPONSE GIS SPECIALIST
  - REMOTE SENSING ANALYST

MID

- DATA MANAGER
  - EOC GIS LEAD
  - GIS MODELER
  - UAV/DRONE GIS SPECIALIST
- DEVELOPER
  - GEOSPATIAL INTELLIGENCE (GEOINT) ANALYST

SENIOR/LEADERSHIP

- MANAGER
  - DISASTER RECOVERY & DA GIS MANAGER
  - EM GIS COORDINATOR
  - SITUATIONAL AWARENESS COORDINATOR
  - EM GIS TRAINING COORDINATOR
- DIRECTOR
  - CHIEF GIS OFFICER FOR EM

GIS Foundations for Emergency Management

⇨ Keywords and Terminology

Layer A single set of geographic data (e.g., flood zones, road networks, shelters)	**Attribute** The data behind the map (e.g., population, shelter capacity, road status)	**Raster** Pixel-based data (e.g., satellite imagery, heat maps, elevation models)
Vector Data represented by points, lines, and polygons (e.g., roads, shelters, evacuation zones)	**Geospatial Analysis** Extracting patterns, relationships, and trends from spatial data	**Symbology** The way map features are visually represented (e.g., color-coded flood risk levels)
Heat Map A visual representation showing the intensity of data (e.g., clusters of 911 calls after a disaster)	**DEM (Digital Elevation Model)** A 3D representation of terrain elevation (e.g., modeling floodwater flow)	**Crowdsourced GIS Data** GIS data collected from the public (e.g., social media reports of road blockages during a hurricane)
Dashboard A real-time GIS interface displaying critical information (e.g., emergency shelters, power outages, flood levels)	**REST API** A web service that allows GIS applications to pull or send data (e.g., integrating real-time weather data into a dashboard)	**Feature Service** A web-based layer that allows users to view, edit, and update spatial data in real time (e.g., live updates on open/closed shelters)

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Key Spatial Concepts

NETWORK ANALYSIS

What's the best route?

SPATIAL RELATIONSHIPS

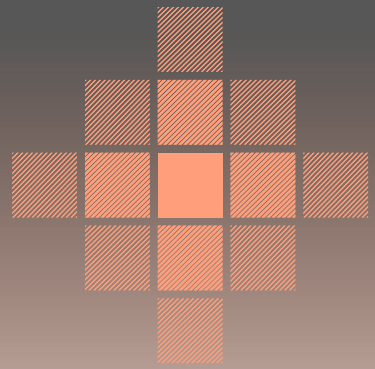
How do things interact?

BUFFERS

How much space do we need around something?

PROXIMITY

How close is it?



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⇨ Software, Platforms, & Tools

FULL-FEATURED GIS SUITE	WEB-BASED GIS	EMERGENCY SPECIFIC TOOLS	FIELD DATA COLLECTION	REMOTE SENSING & IMAGERY	CROWD-SOURCED GIS
ArcGIS Pro	ArcGIS Online	HURREVAC	Survey123	Drone2Map	OpenStreetMap
QGIS	Dashboards	GATOR (FDEM)	QuickCapture	Imagery Deep Learning Models	HOTOSM (Humanitarian OSM Team)
	Experience Builder	HAZUS (FEMA)	FieldMaps	Sentinel Hub	
	Hub Sites	WebEOC	Fulcrum	Google Earth Engine	
	Mission	ESRI Solutions: Emergency Management Operations; Special Event Operations; Watch Center; Hazard Mitigation Planning	Damage Assessment Solution		
	Mapbox				
	Google Earth				
	FEMA GeoPlatform				

GIS Foundations for Emergency Management

Data Sources

PRIVATE

WeatherSTEM - Real-time station-based weather data, forecasts, lightning detection, and environmental sensor data.

ESRI - ArcGIS Living Atlas of the World, disaster response tools, GIS solutions for emergency management.

MAXAR Open Data - High-resolution sat. imagery and data avail. during disasters, ie. hurricanes, wildfires, earthquakes, and floods.

Waze Crisis Response - Crowdsourced real-time traffic, road closures, hazards, accidents, and disaster-related disruptions.

CITIZEN

Social Media - Real-time reports of disasters, eyewitness accounts, photos/videos of damage, evacuation status, rescue needs, missing persons, and local conditions

FSU Digital Innovation & Analytics Lab (DIAL) - Uses AI & machine learning to scrape and analyze social media for early detection of emergencies before official reports.

HOT OpenStreetMap - Crowdsourced mapping of disaster-affected areas, infrastructure, and damaged buildings.

STATE

FDEM GIS Resources - Hurricane evacuation routes, disaster recovery plans, flood hazard zones, damage assessments, emergency shelters, and post-event data.

FGDL - Geospatial data on flood zones, infrastructure, transportation, land use, environmental data, and more.

FDEP Data - Environmental data, wetlands and floodplain mapping, coastal erosion, water quality monitoring.

GeoPlan Center (UF) - GIS data for disaster response, environmental monitoring, and geographic mapping for Florida.

Also - **FDOT**, **FL511**, **FDOH**, and more!!

NATIONAL

HIFLD Open Data - Critical infrastructure, emergency services, transportation, utilities, and public health facilities.

NHC - Hurricane forecasts, storm surge models, tropical storm tracking, and real-time weather alerts.

NWS - Real-time weather warnings, precipitation forecasts, severe storm alerts, and climatology data.

US Census Bureau GIS - Demographic data, social vulnerability, pop. density, housing characteristics, economic factors, & more.

CDC SVI Data - Social vulnerability data.

NOAA Data - Weather data, storm tracking, sea level rise, flood monitoring, tsunami warnings, and satellite imagery.

USGS - Sat. imagery, topography, land use, geological hazards, and real-time data on earthquakes, landslides, and volcanoes.

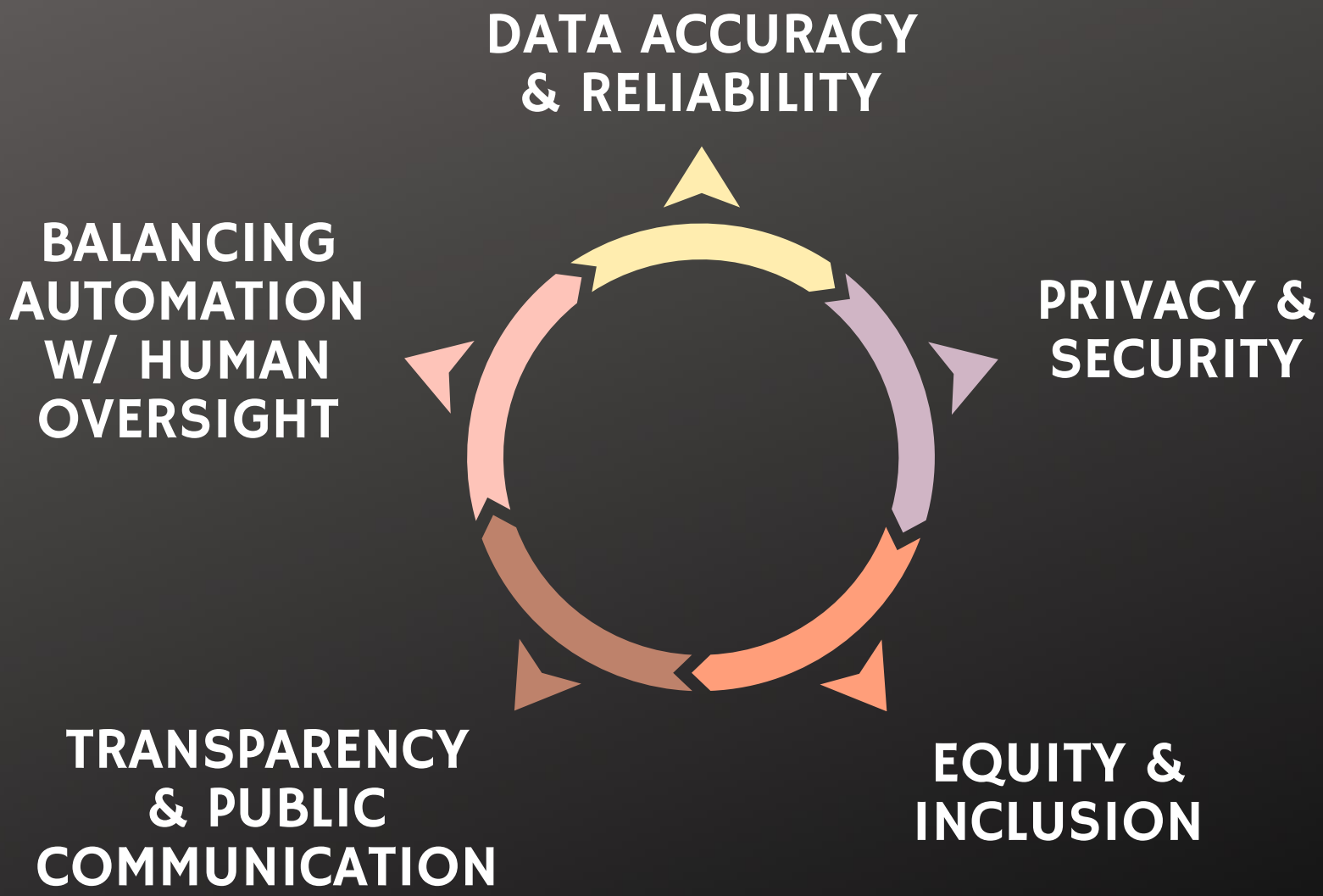
NASA - Sat. imagery, flood mapping, fire detection, disaster monitoring, and Earth observation data.

USDA - Ag. damage, flood impacts, drought monit., forest fires.

FEMA Flood Map Service Center - Flood maps used for the NFIP, detailing flood zones, base flood elevations, and risk.

GIS Foundations for Emergency Management

⇨ Ethics and Best Practices

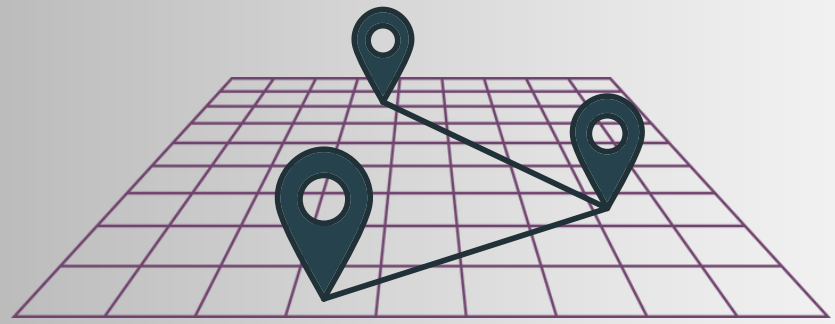


GIS Foundations for Emergency Management

Keep Learning

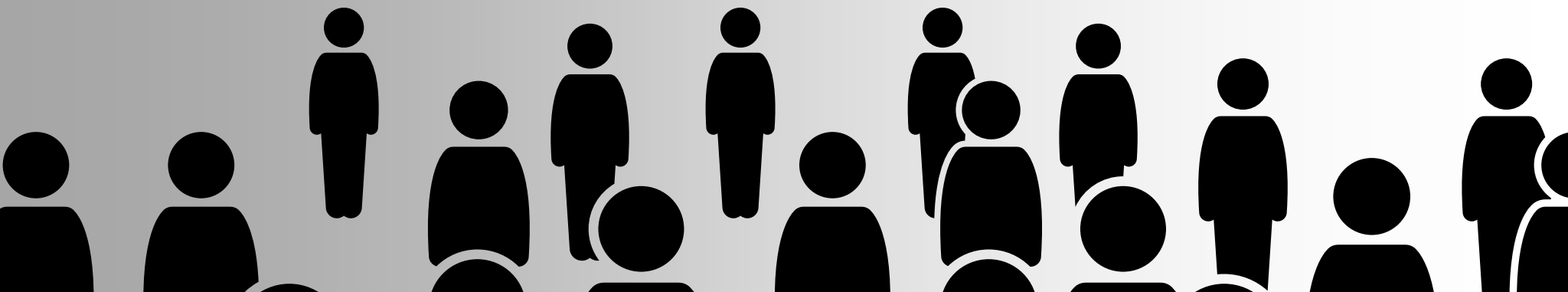
- ESRI GIS Dictionary
  - https://support.esri.com/en-us/gis-dictionary
- ESRI Training
  - https://www.esri.com/training/
- ESRI Disaster Response Program
  - https://www.esri.com/en-us/disaster-response/overview
- GISCorps - Volunteers for Disaster
  - https://www.giscorps.org/
- Emergency Management Youtube Playlist by ESRI
  - https://www.youtube.com/playlist?list=PLdVnJnpRENTlL-mQvkHU1qfvGrCSclEXv
- ESRI Emergency Management Forum
  - https://www.esri.com/en-us/webinars/industry/public-safety/emergency-management-forum-series

Exercises & Activities



Group Roles

- **Facilitator / IC**
  - Guides the group, keeps the team on task, manages time, and ensures everyone contributes.
- **Spokesperson / PIO**
  - Speaks on behalf of the group during report-outs or presentations. Summarizes decisions and strategies clearly.
- **Scribe / Doc Unit Leader**
  - Takes notes, captures key points, and ensures ideas are written on worksheets, maps, or post its.
- **Timekeeper / Ops Section Chief**
  - Monitors the clock, keeps activities moving, and alerts the group when time is running short.
- **Challenger (Devil's Advocate) / Planning Section**
  - Encourages deeper thinking by asking "what if" questions, identifying assumptions, or highlighting gaps.



1

Spatial Successes & Opportunities (15-20 minutes)

DIRECTIONS:

Create a 1 post-it note for each sheet (5 mins)

Discussion (10-15 mins)

Share a success story or positive experience where spatial thinking or mapping made an impact.

Which aspect of emergency management do you think could benefit from better spatial understanding?

2 Brainstorming GIS Solutions (20 minutes)

CONTEXT:
Groups will draw from their experiences and creativity to collaboratively discuss possible GIS solutions for their assigned topic. Record individual group GIS solutions on provided white board/poster. After 10 minutes, groups will report out for a larger class discussion.

Group work (10 mins)
Discussion (15 mins)

- Integrating Real-Time Data Streams
- Enhancing Community Engagement
- Improving ICS Operations with GIS
- Equity & Vulnerability Mapping
- Leveraging Crowdsourced GIS Data

2 Brainstorming GIS Solutions (20 minutes)

Integrating Real-Time Data Streams	...helps emergency managers make informed, rapid decisions.
Enhancing Community Engagement	...ensure preparedness efforts reach those who need them most.
Improving ICS Operations with GIS	...improves coordination, logistics, and resource allocation.
Equity & Vulnerability Mapping	...helps us prioritize vulnerable populations and distribute aid fairly.
Leveraging Crowdsourced GIS Data	...can supplement official sources, providing timely situational awareness.

3

Create Your Own Disaster (30 minutes)

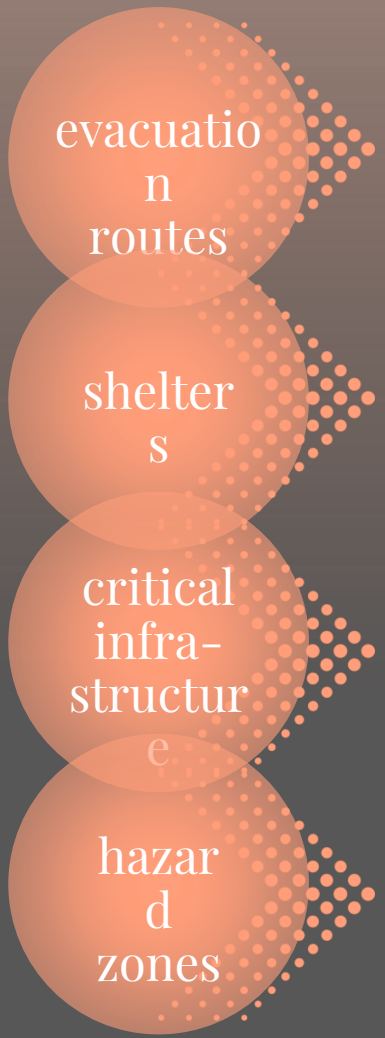
OBJECTIVE: Plan an effective disaster response and evacuation strategy using the provided map of the city and misc. supplies. (15 minutes)

Presentations & Discussion once finished (15 minutes)

- evacuation routes
- shelters
- critical infra-structure
- hazard zones

3 Spatial Thinking Icebreaker (30 minutes)

In this exercise, you applied spatial thinking—something we do instinctively in emergency management. GIS helps us take these same concepts and apply them at a larger scale, analyzing data quickly to support better decisions.

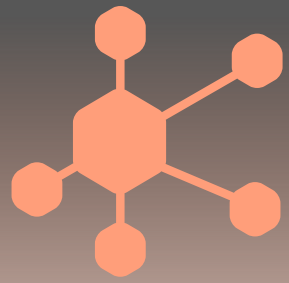


NETWORK ANALYSIS

What's the best route?

SPATIAL RELATIONSHIPS

How do things interact?



BUFFERS

How much space do we need around something?

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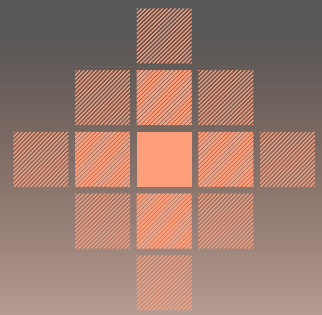


Take a
BREAK

Welcome Back!

4 GIS in Action: Crisis Scenarios (25 minutes)

Directions:

Groups will read and discuss their assigned scenario and work through specific guiding questions. Think critically to evaluate GIS applications in your emergency management scenario. Record group answers on the worksheet & chart paper. (15 mins)

Each group will present to the class their scenario, GIS-based response strategies, and key decision-making factors. (10 mins)

After all scenarios have been presented, we will do a gallery walk and vote for the ideas we feel are innovative or a good idea to implement in our organization.

4 GIS in Action: Crisis Scenarios

Which ideas from our last exercise might be the hardest to implement? Why?

What could slow down or prevent these solutions from being used in a real crisis?

5 Overcoming Implementation Barriers (25 mins)

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1. Barrier Identification (5 min)
    - Choose 2-3 key barriers that could prevent your GIS strategy from working effectively in your assigned scenario.
    - Be specific (e.g., “Data sharing restrictions between agencies” instead of just “Data access”). Refer to the sample barriers reference sheet if you need ideas.
    - Record your barriers on stickies.
2. Solution Mapping (5 min)
    - Brainstorm practical, actionable strategies to overcome the barrier(s) you identified.
    - Record your solutions on your stickies.

Pair up your barriers and solutions and place pairs on your chart paper. Place your favorite at the top.

5 Overcoming Implementation Barriers (25 mins)

Report-Out & Wrap-Up (15 min)

- Groups stick their barrier & solution pairs on a whiteboard or wall and explain the top pair
- Rapid fire reflections.

6 GIS in Action: Crisis Scenarios (35 minutes)

6 GIS in Action: Crisis Scenarios (35 minutes)

Group Work (10 mins):
Pick at least 1 response strategy, barrier solution, idea, or insight from the previous steps for your scenario and create an outline of steps for implementation, including responsible parties/depts and timelines. Use the worksheet (or large-format paper) with a clear, structured format (see below). Spend 15 minutes discussing, then groups will report out.

Report Out (10 mins):
Each group gives a brief summary of:
·The challenge
·Their action steps
·Who needs to be involved

Gallery Walk (5 mins):
Each group will hang their worksheet on the wall. Each participant gets 2–3 colored dots.

"Place your dots on the ideas, challenges, or action plans that you feel are most impactful, realistic, or urgent to implement in your own organization.

Debrief (10 mins)

7 GIS for Mitigation & Resilience Planning (25 minutes)

1. Hazard Selection & Risk Identification (First 5–7 min)
Each group selects a hazard and answers:

- What infrastructure, systems, or populations are most vulnerable?
- What past disasters or data trends show elevated risk?
- Who might be disproportionately affected (e.g., elderly, low-income, medically fragile)?

2. GIS-Based Mitigation & Resilience Strategy (Next 8–10 min)
Groups create a GIS-supported strategy by brainstorming:

- What spatial analysis could reduce risk or improve preparedness?
- What maps, dashboards, or datasets would inform decision-making?
- What partnerships or departments would need to be involved?

Ideas should touch on:

- Risk reduction (e.g., zoning, buyouts, hardening infrastructure)
- Climate adaptation (e.g., green infrastructure, cooling access)
- Social equity (e.g., targeting underserved areas for investment)

7 GIS for Mitigation & Resilience Planning (25 minutes)

Presentations & Discussion (10 minutes)

- Each group shares a summary of their strategy in 1–2 minutes.

Discussion:

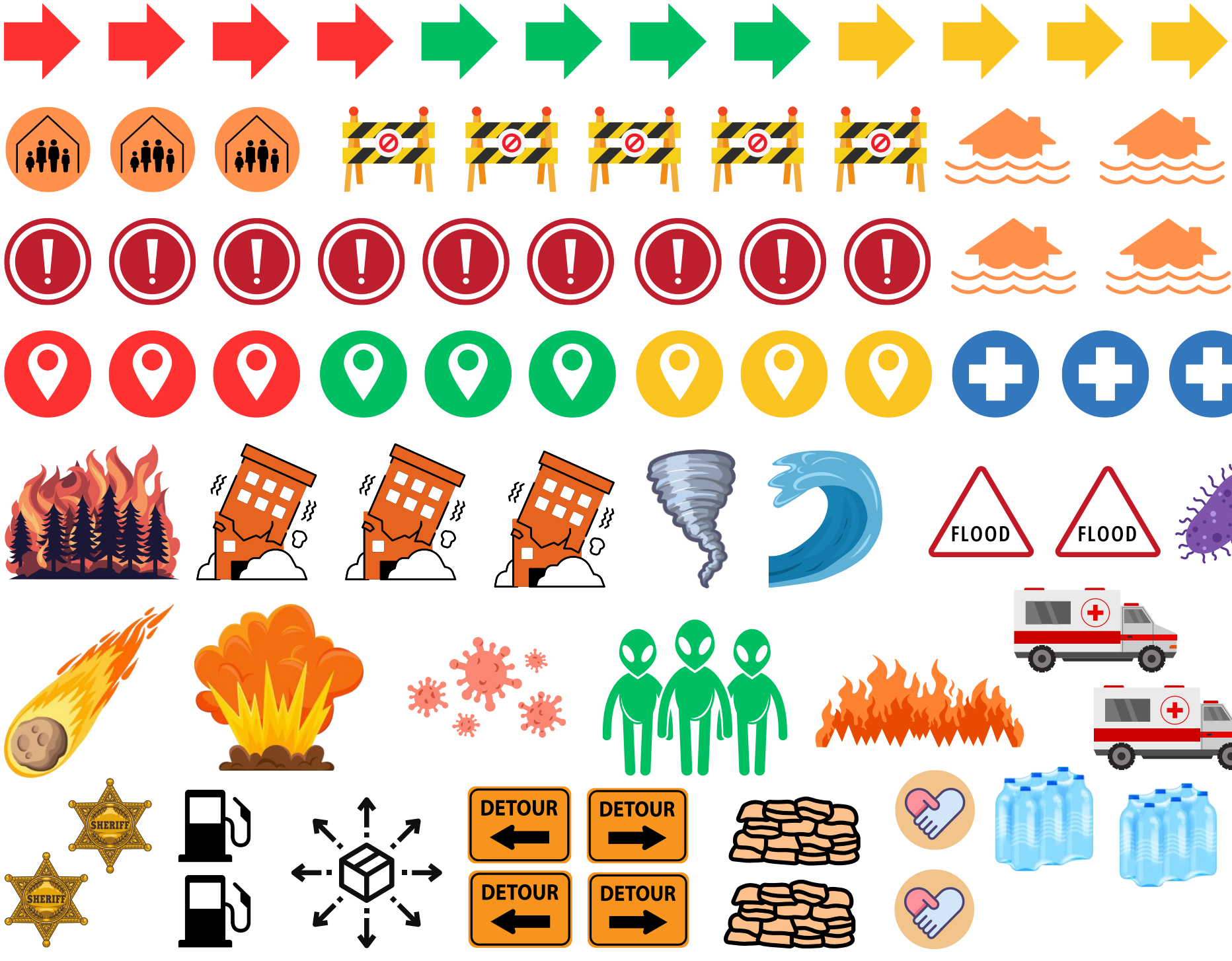
- What ideas could apply to your own jurisdiction?
- How could multiple agencies collaborate on these kinds of projects?
- How can we move from planning to action?

Wrap-Up & Next Steps

What's the one idea you're most excited to bring back to your team or organization?

- DEBRIEF
- FINAL REFLECTION STICKY
- QUESTIONS
- CALL TO ACTION
- NETWORKING
- ARTIFACTS (PICS)

THANK YOU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