

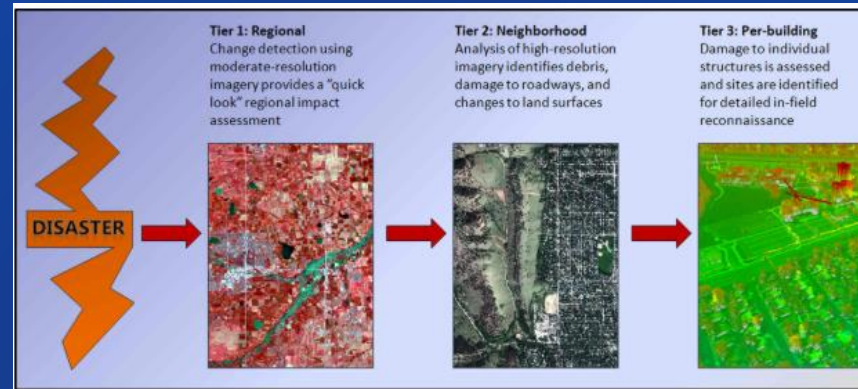
# Geospatial Platform for Disaster Management

Santanu Dutta



# Types Of Disaster

- Flood
- Landslide
- Lightning
- Cyclone
- Earthquake
- Drought
- Fire/Explosion



# Life Cycle of Disaster Management and Application

## Weather Forecasting

- Climate condition Analysis
- Flood Inundation Mapping During Flood
- Identify affected communities

## Risk Assessment

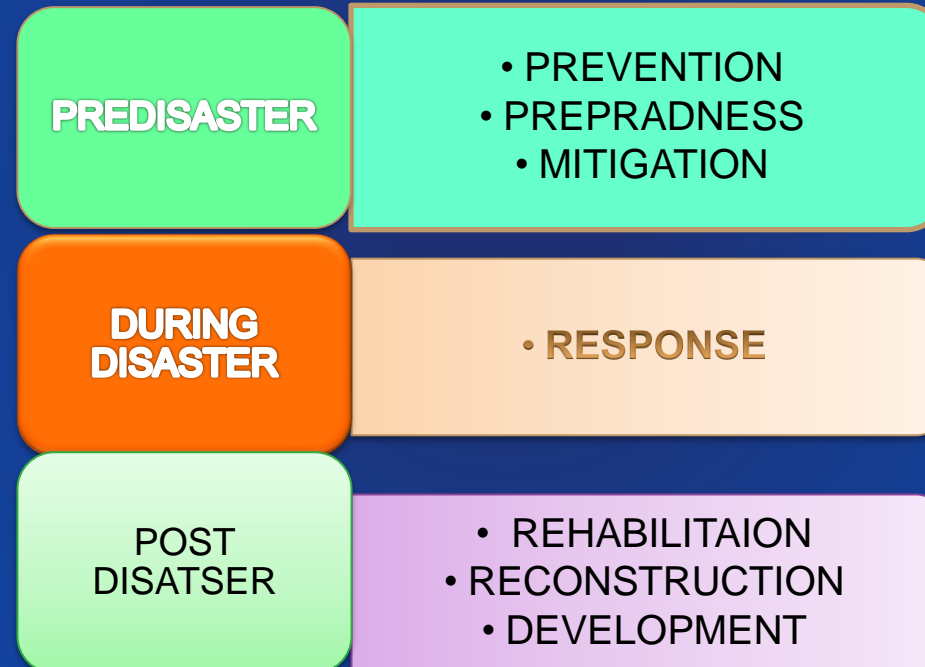
- Identifying High Risk prone areas
- Visualize the scope of disaster
- Land Use and Land Cover mapping
- Human, Livestock, Crops and buildings at higher risk

## Disaster Monitoring and Evaluation

- Damage Assessment
- Evacuation routes and Alternate / Best route for sending relief
- Availability of shelter facilities

## Pre-Disaster Planning

- Relief shelter mapping
- Emergency Building mapping
- The risk of event & vulnerabilities
- Possible Impact of the event

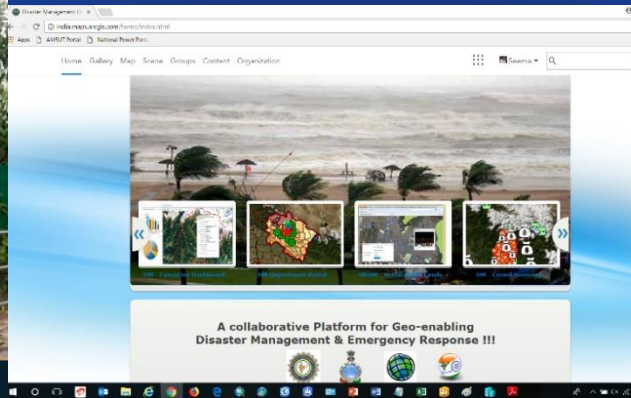




# Geo-spatial Disaster Management Platform

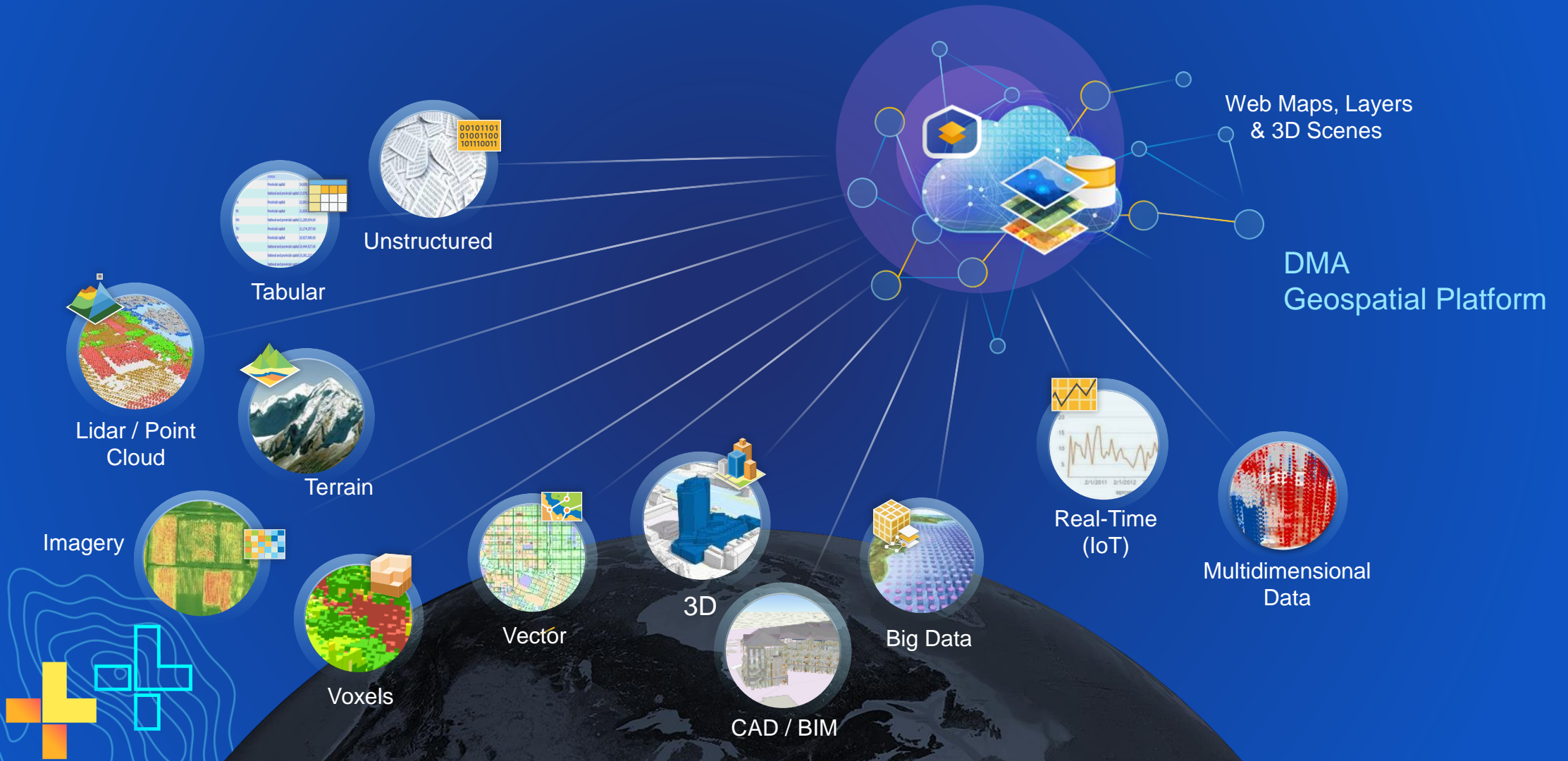
The key objective is to provide a **Common Operational Platform** for:

- **Integration of MIS & GIS.**
- Perform **Advanced Geospatial Modeling**
- Generate **Early Warning Alerts**
- Integrating **Live Feeds** from disparate sources.
- **Empowering Departments & Stakeholders for collaborative decision making**
- **Connecting** Government, Citizen and other Stakeholders
- **Enhancing overall efficiency and effectiveness of Disaster Management & Emergency Response**





# Integrating all Type and Format of Geospatial Data ... Making Them Directly Usable as Services



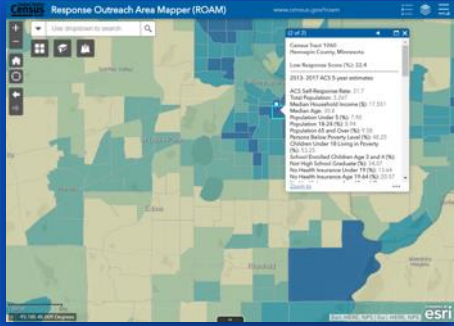
# Have a collaborative Platform to meet all GIS requirements ! During any emergency...





# One System for Disaster ▶ Organizations Are Increasingly Collaborating

## Planning



Desktop

Web

Device



## Key Department Systems & Feeds

DMS (Incidents, Resources, Shelters), Weather, Live Traffic, Cameras



Portal



## Monitoring



Emergency management team

Active Directory, SAML

## Operation



Authoritative "GIS" Data

Server



Commercially Available Online Content & Services

## Decision Management





# ArcGIS Includes Ready-to-Use Content

Base maps, Demography, Street Maps, Elevation, Topography, Imagery

## Living Atlas



- Expanded POIs
- Better OSM Integration
- Global Demographics
- Enhanced Imagery
- New Content
  - Landcover Forecast
  - Biodiversity
  - Air Quality
  - Global River Flow
  - ...

- Millions of Maps, Layers and Datasets
- Billions of Requests Daily

*Global Geographic Data . . .  
About Everything*



# Integrated Global Live Feeds For Early Warning

Indicators

Natural Disasters

Monitoring Climate

Environmental Threats

Ecosystem Health

Humans at Risk

## ArcGIS LIVING ATLAS - INDICATORS OF THE PLANET

### Air Quality

Today  
**969**  
locations with  
poor air quality

Increased 14.97%  
in 24 hours

OpenAQ

### Drought

This week  
**18.9%**  
of agricultural areas

Decreased -137,444 sq km  
in a week

NOAA

### Wildfire

Today  
**56,353**  
thermal detections

Decreased -7,186 fires  
in 24 hours

NOAA/NASA

### Conservation

This month  
**54,734,053**  
sq km  
land & ocean area protected

Increased 327,537 sq km  
in a month

UNEP/IUCN

### Deforestation

Last week  
**2,172**  
sq km  
forested area lost

50,160 sq km lost  
this year

Global Forest Watch

### COVID-19 Cases

Last 24 hrs  
**12,910,357**  
confirmed cases

14 day trend is increasing

JHU/Esri

### Earthquakes

This week  
**86**  
major earthquakes

5.7 magnitude  
largest event this week

USGS

### Cyclones

Today  
**1**  
active storms

34 storms this year

NOAA/JTWC

### Arctic Sea Ice

Last month  
**-10.03%**  
of normal extent

#3 lowest June  
since 1979

NSIDC

### Coral Bleaching

This week  
**25**  
locations  
at risk of bleaching

Increased 5 locations  
in a week

NOAA

### Global Temperatures

Last week  
**0.95**  
Deg C  
above 20th Century average

#1 warmest May  
since 1880

NOAA

### Women in Parliament

Last month  
**25.0%**  
of national  
representatives

Increased 207 members  
in a year

IFU

### Sea Level Rise

This week  
**2.96**  
millimeters  
average global increase

Decreased 1.96 mm  
from a year ago

NOAA

### El Niño

This month  
**0.28**  
ENSO Index

Neutral conditions  
in the Pacific

NOAA

### Carbon Dioxide

Last month  
**412.88**  
parts per million

Increased +2.77 ppm  
from a year ago

NOAA

### Ocean Health

This year  
**70.58**  
global average score

Decreased -0.09 points  
in a year

CI

### Piracy

This month  
**8**  
events that threatened shipping

Decreased -26 events  
in a month

NGA/ONI

### Armed Conflict

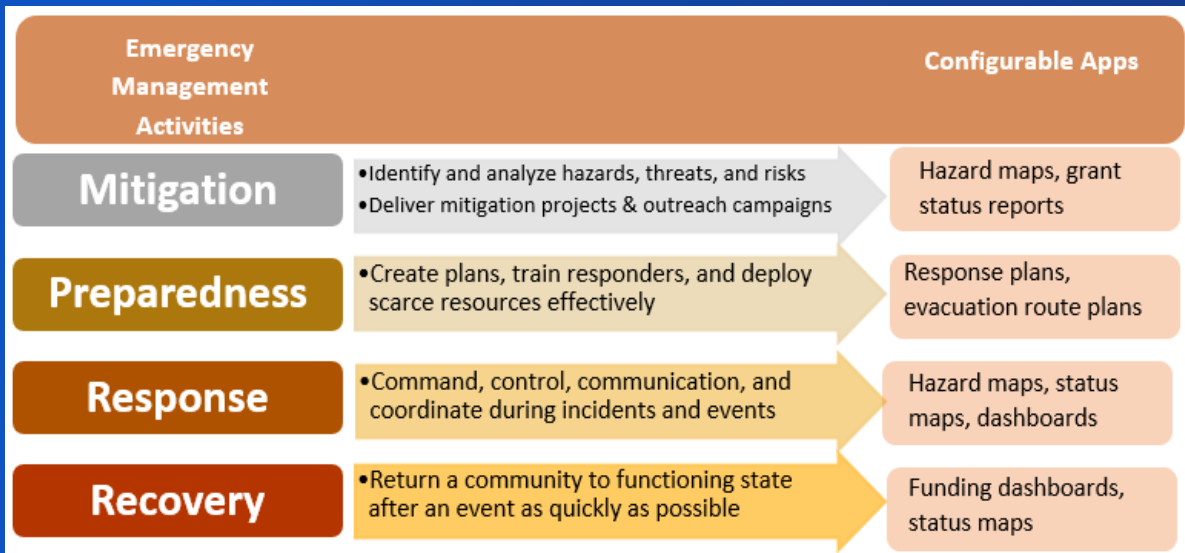
This week  
**3,432**  
events

Increased 1,443 events  
in a week

ACLED



# Readily configurable, Device independent, Emergency Support Function



Emergency Management Operations Gallery

Search [ ] Menu [ ]

Situational Awareness Viewer

Public Information

Operations Response

Incident Status Dashboard

Incident Briefing

Damage Assessment Dashboard

Boulder Damage Assessment: Residential Buildings

Emergency Management Agency Business Unit Gallery

Sort by [ ] Layout [ ] Sign Out [ ]

Emergency Management Business Units

A group to highlight all of the Emergency Management Business Units

Tags

- Daily Operations Director Executive exercise Grant Grants Group IT Logistics Mitigation Preparedness Public Information Recovery Response Training

<b>Training and Exercises Group</b> Web Mapping Application	<b>Response Group</b> Web Mapping Application	<b>Recovery Group</b> Web Mapping Application	<b>Public Information Group</b> Web Mapping Application
<b>Preparedness Group</b> Web Mapping Application	<b>Mitigation Group</b> Web Mapping Application	<b>Logistics Group</b> Web Mapping Application	<b>Information Technology Group</b> Web Mapping Application
<b>Grant Management Group</b> Web Mapping Application	<b>Director's Office Group</b> Web Mapping Application	<b>Daily Operations Group</b> Web Mapping Application	

Near Real Time Dashboard

- Detected on 9/8/2020, 9:45 PM with 39 % Confidence
- Detected on 9/8/2020, 2:00 PM with 56 % Confidence
- Detected on 9/8/2020, 1:55 PM with 62 % Confidence
- Detected on 9/8/2020, 1:55 PM with 40 % Confidence
- Detected on 9/8/2020, 12:15 PM with 34 % Confidence
- Detected on 9/8/2020, 10:50 AM with 54 % Confidence
- Detected on 9/8/2020, 10:50 AM

Extreme Rainfall Warning, Earthquakes, Shake intensity and Fire pixels

Soil Moisture (of Past 1 week)

No of Fire Incidents **14** (Detected)  
Burnt Area **350** Hectares  
Weather Stations **45**

Stations

- Chittagong (Cv/M), Bangladesh
- Sukkur, Pakistan
- Mandalay, Myanmar/Burma, Myanmar
- Gauhati (In-Af), India
- Indira Gandhi/De, India
- Rombaw/Java, India

Calcutta/Dum Dum **84.2 °F**

Rainfall-Accumulated of past 48 hrs



# Configurable Flood and other Disaster Management Tools

<p><b>Flood Risk Viewer</b> Flood Risk Map</p>	<p><b>Food Stage &amp; Weather Viewer</b> WebMap for the stream gauge information application</p>	<p><b>Gate Inspection Map</b> Gate Inspections Gate Inspection Map</p>	<p><b>Groundwater Wells Dashboard</b> Groundwater Well Dashboard</p>
<p><b>Groundwater Well Construction Permits</b> Groundwater Wells Construction Permits Map</p>	<p><b>GW Well Construction Permit Viewer</b> Groundwater Wells Construction Permits Viewer</p>	<p><b>Groundwater Well Application</b> Groundwater Well Viewer</p>	<p><b>Res &amp; Com Damage Assessment</b> Individual Assistance Program ... Modesto Commercial &amp; Residential Damage Assessment Map for the individual assistance program</p>

<p><b>3D Flood Viewer</b> Application to view flood inundation layers in 3D over custom elevation surfaces</p>	<p><b>Flood Management Story Map</b> ArcGIS for Water Resources - F... ArcGIS for Water Resources Flooding Storymap</p>	<p><b>DFIRM &amp; FEMA Viewer</b> DFIRM Viewer ESRI Water Resources DFIRM viewer webmap</p>	<p><b>Flood Collection Map</b> Flood Collection Map for ArcGIS Collector</p>
<p><b>Flood Information Map</b> Simple map for displaying flood information</p>	<p><b>Flood Information Viewer</b> Simple map for displaying flood information</p>	<p><b>Flood Inundation Viewer</b> Flood Inundation Levels</p>	<p><b>Flood Management Map</b> Flood Response Planner Webmap for flood emergency planning</p>

<p><b>Know Your Zone</b> Emergency Management</p>	<p><b>Flood Impact Analysis</b> Emergency Management</p>	<p><b>CAMEO Data Management</b> Emergency Management</p>
<p><b>Road Closures</b> Emergency Management</p>	<p><b>Special Needs Registry</b> Emergency Management</p>	<p><b>Debris Reporting</b> Emergency Management</p>



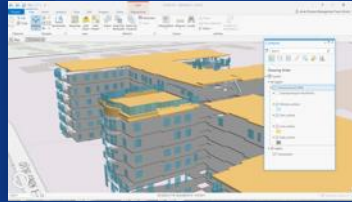
# Spatial Analysis For Hazard Impact Assessment





# 3D Analysis For Hazard Impact Assessment

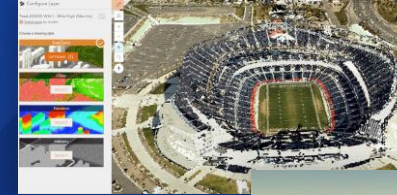
I3S OGC  
Community  
Standard



BIM



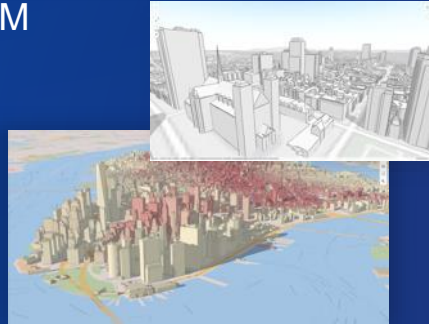
Rich 3D  
Symbols



Massive  
Point  
Clouds



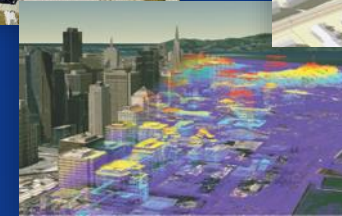
3D Mesh



Edge  
Rendering



Textures



Lidar



3D Mobile Apps



Augmented  
Reality / VR

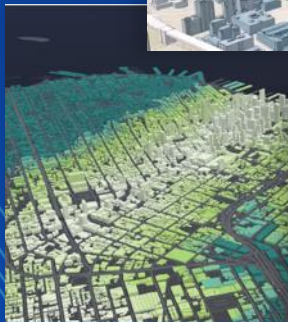


Mobile

Smart Mapping



Visual Variables



Urban



Global Scenes



# Command Centre for integrated State EOC

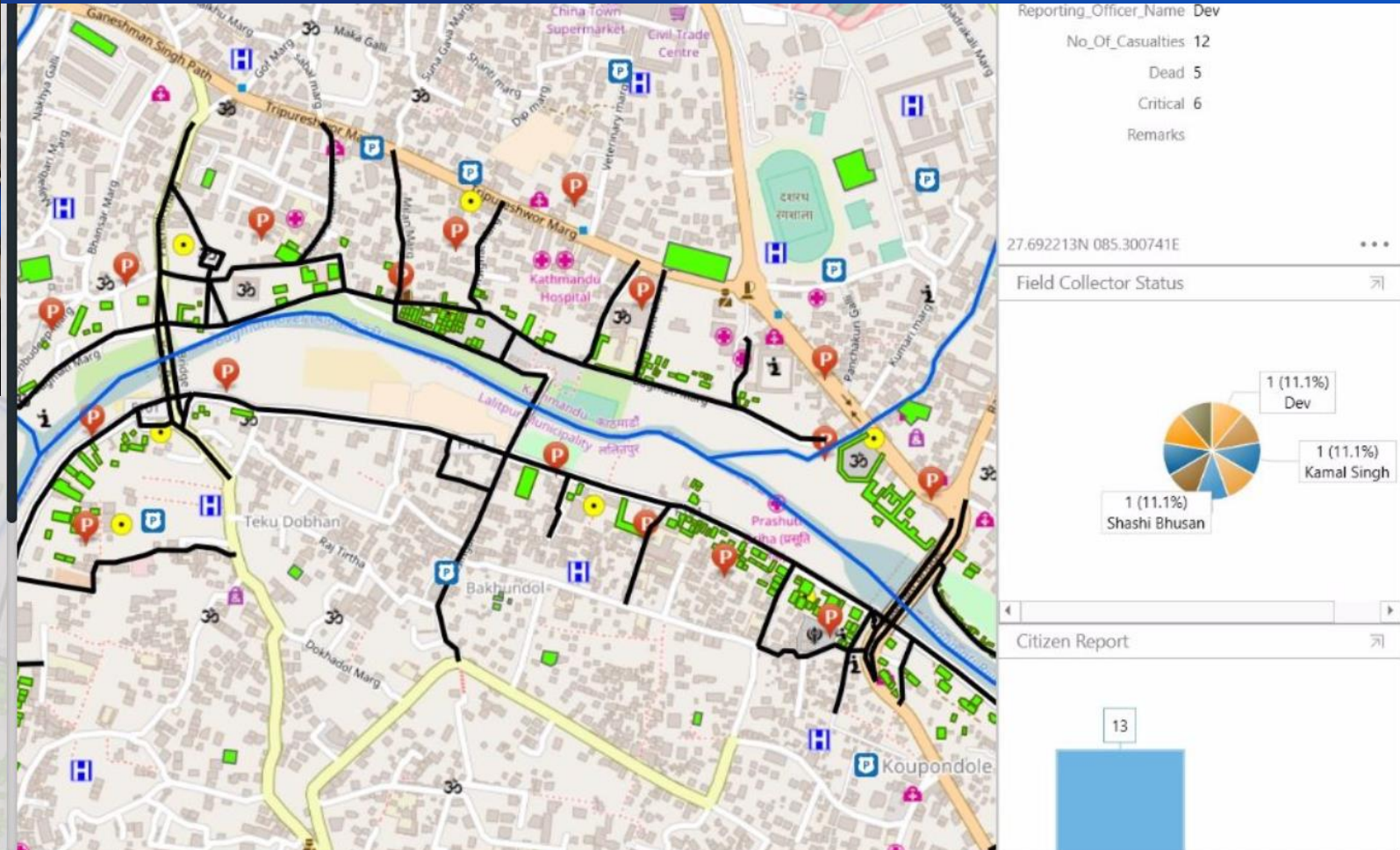


## Common Operational Picture (Operation Dashboard)

A dashboard at the Illinois Emergency Management Agency shows the status of Mission Ready Packages and Essential Elements of Information for preparedness and response.

GIS has become a foundational, mission-critical technology for homeland security and emergency preparedness and response missions. The creation of the web map format, coupled with the deployment of web GIS, was a game changer. Now, homeland security and emergency management professionals have unprecedented capabilities to obtain, share, make sense of, and use information in increasingly more effective ways.

Bring together a common view of the systems and resources you manage. Monitor real-time data feeds for large-scale







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