NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

TRB Webinar: Improving Data Sharing in Disaster Response with Geospatial Data and AI

July 8, 2024

1:00 – 2:30 PM

PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at TRBwebinar@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.

ENGINEERING
RCEP
REGISTERED CONTINUING EDUCATION PROGRAM

AICP Credit Information

1.5 American Institute of Certified Planners Certification Maintenance Credits

You must attend the entire webinar

Log into the American Planning Association website to claim your credits

Contact AICP, not TRB, with questions

Purpose Statement

This webinar will offer timely insights into transformational tools for emergency management through enhanced data interoperability and situational awareness. These tools empower stakeholders to make more informed, collaborative decisions in critical scenarios.

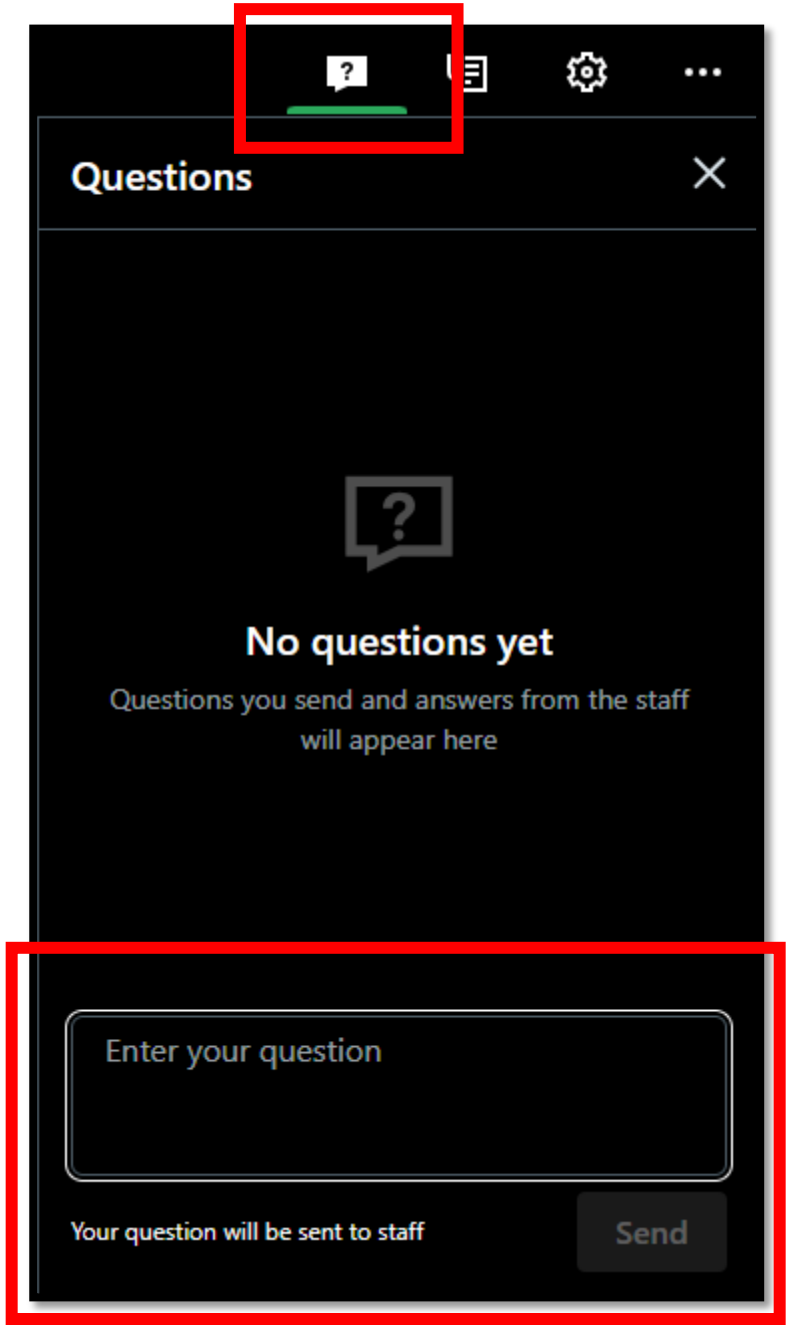
Learning Objectives

At the end of this webinar, you will be able to:

- Identify the barriers and opportunities in leveraging interoperable geospatial data and AI for enhancing disaster response and climate change adaptation strategies
- Evaluate the applications and benefits of emerging technologies in improving situational awareness and privacy-compliant disaster vulnerability assessments
- Implement best practices and lessons learned from past major disasters to develop more effective emergency management solutions

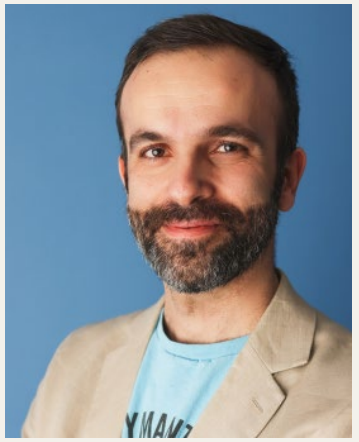
Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



Today's presenters

Hari Sripathi
Hari.Sripathi@VDOT.Virginia.gov
Virginia Department of Transportation



Antonio Correas
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Open Geospatial Consortium

NATIONAL ACADEMIES *Sciences Engineering Medicine*

DATA SHARING AND EMERGING TECHNOLOGY

TRB Webinar

Hari Sripathi, P.E.

July 8, 2024

Overview

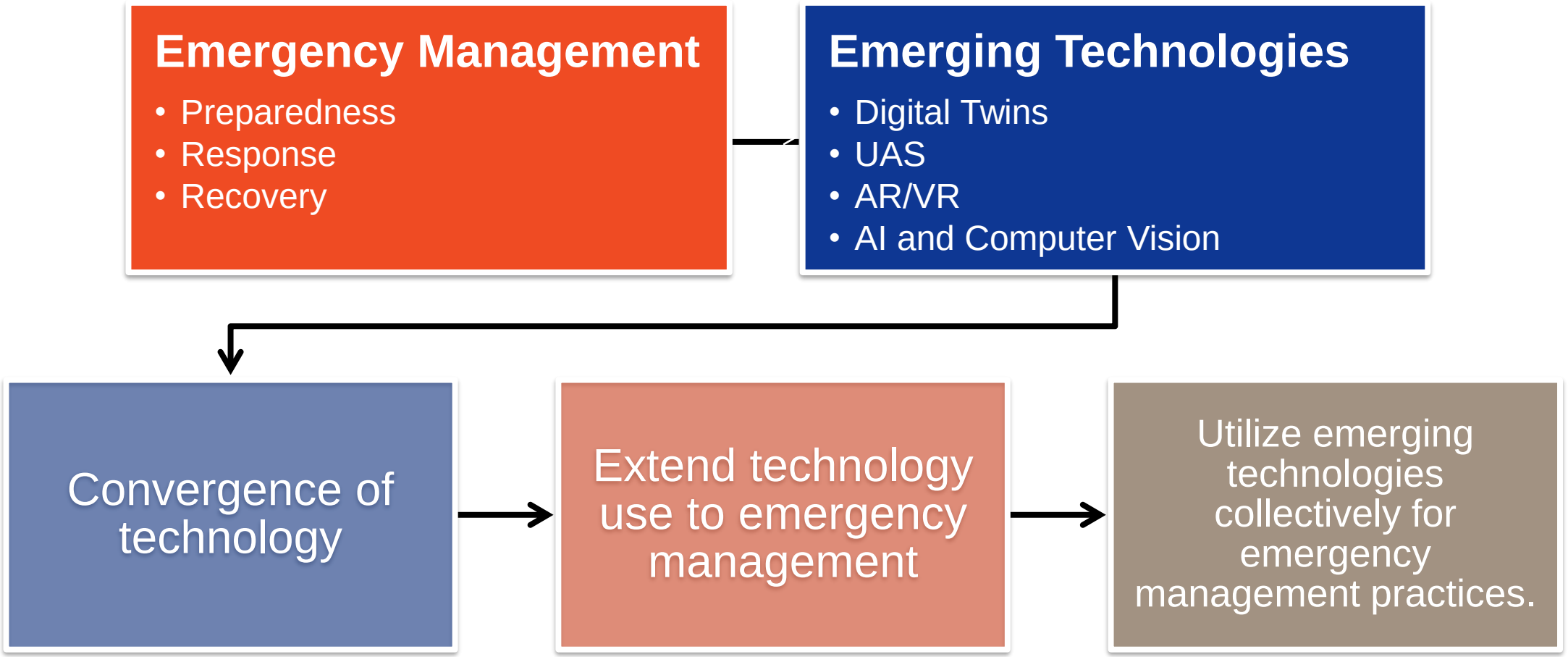
- Where are we?
- Emerging technologies
- Applications
- Opportunities
- Q & A

This presentation is a combination of a general DOT perspective and examples of VDOT pilots, practices, and industry opportunities. It does not necessarily represent exactly what VDOT has or will deploy.

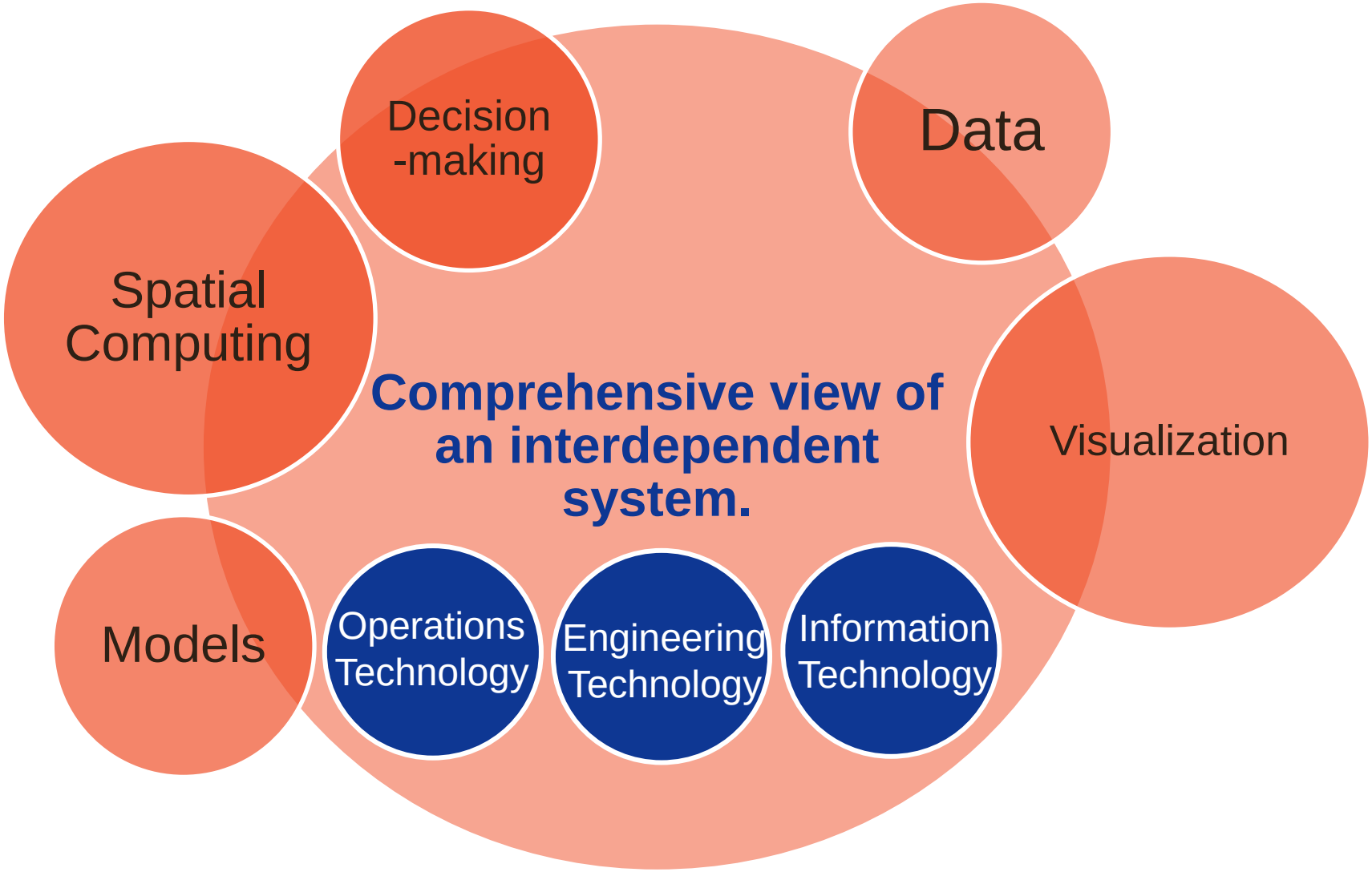
Adopting Emerging Technologies

Intentional effort must take place to address all these areas collectively.

Converging


Emergency Management
• Preparedness
• Response
• Recovery
Emerging Technologies
• Digital Twins
• UAS
• AR/VR
• AI and Computer Vision
Convergence of technology
Extend technology use to emergency management
Utilize emerging technologies collectively for emergency management practices.

Technology Convergence



Digital Twins for Data Sharing

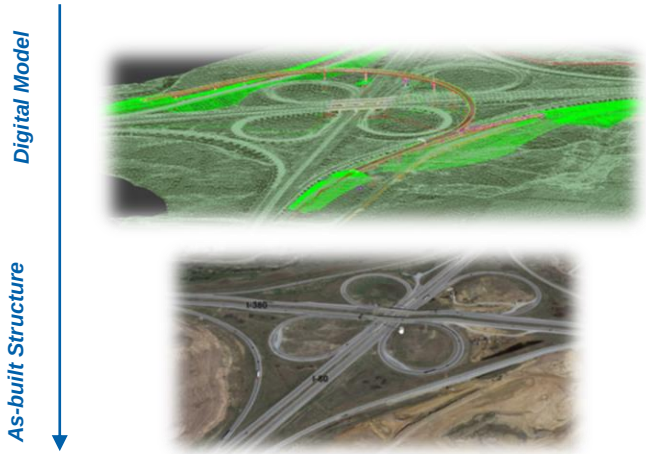
BUILDING INFORMATION MODELS

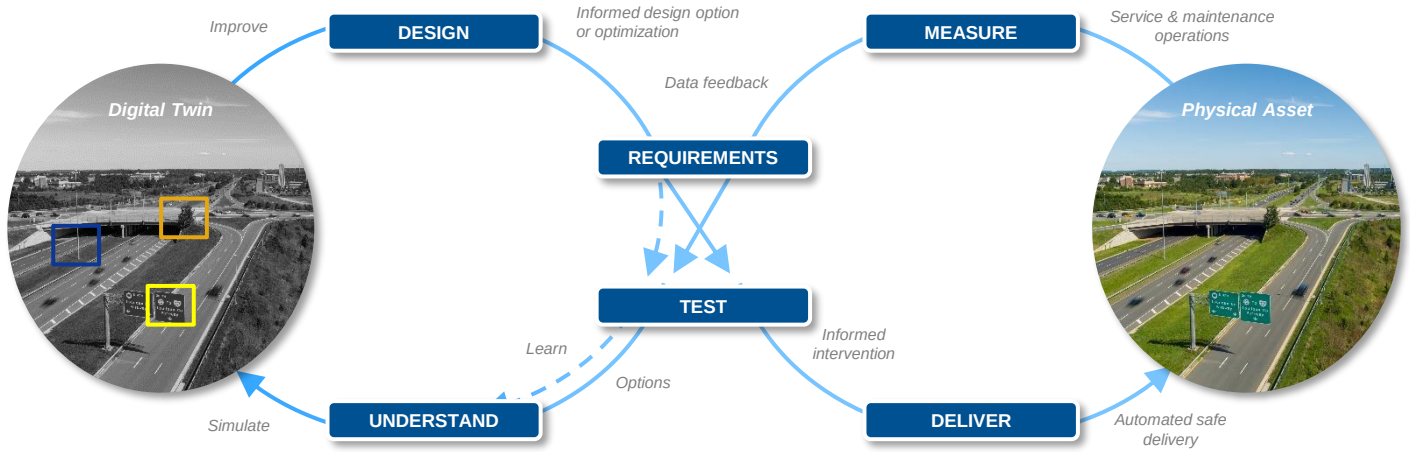
DIGITAL TWINS

Design

Construction

Maintenance & Ops.



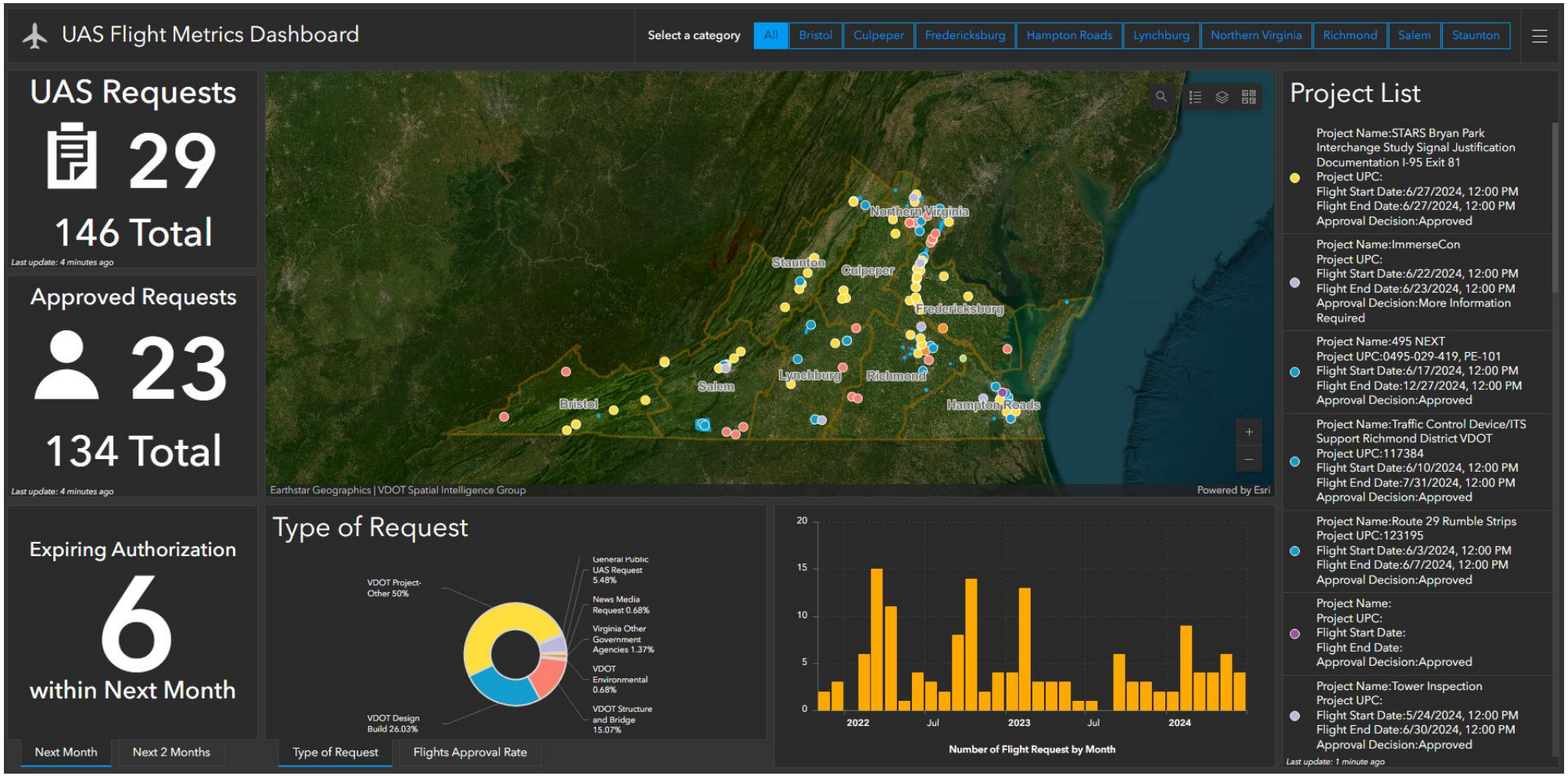


Building Information Models (BIMs) are digital reconstructions of a physical space used for visualizing the design and construction of an asset. BIMs do not represent assets in real-time.

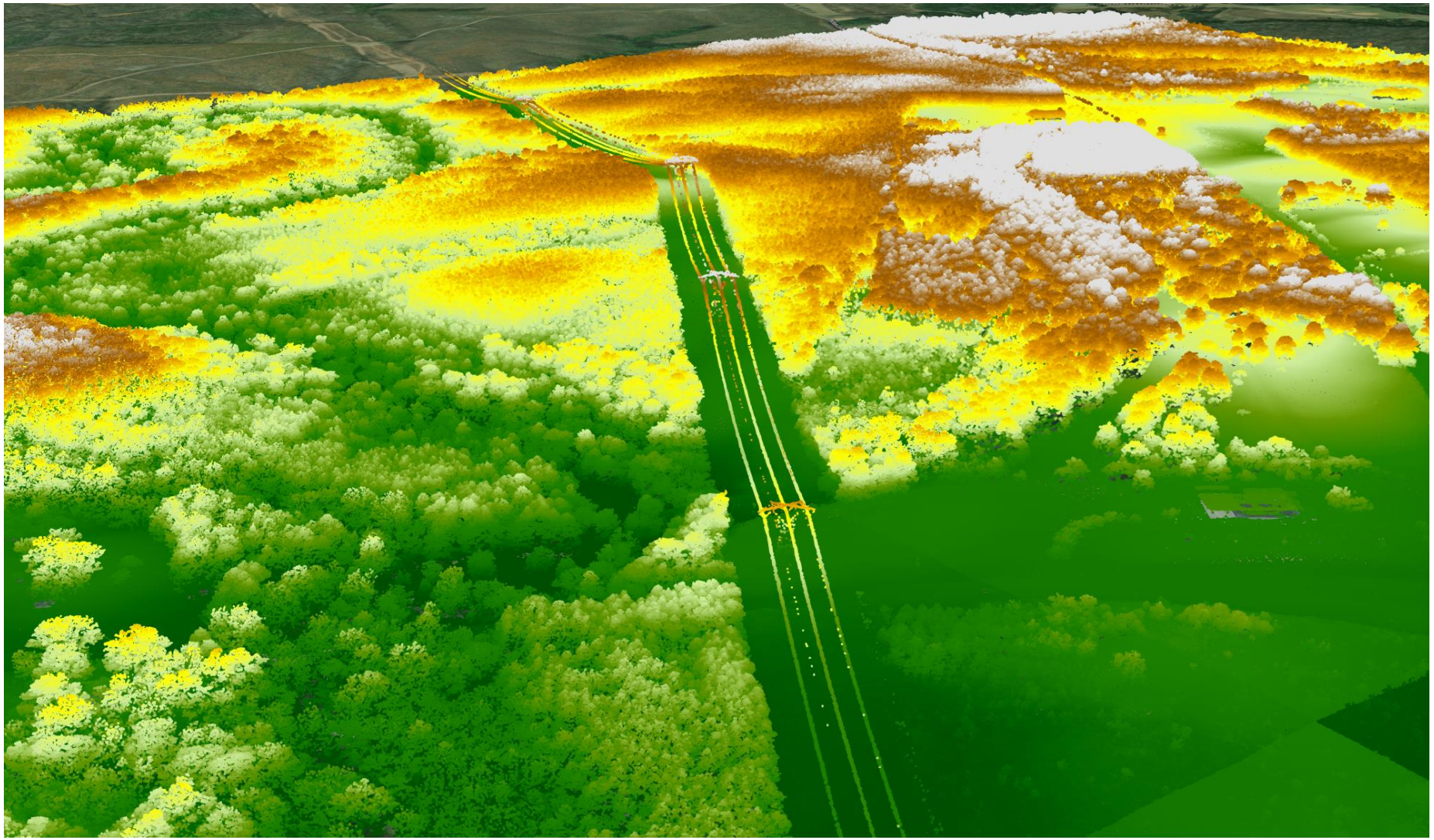
Digital Twins are virtual representations of physical assets across their life cycle meant to develop and enhance processes and technologies that improve decision-making.

The key difference between BIMs and Digital Twins lies in how each technology is used.
Digital Twins are best used for maintenance and operations while BIM is best used for construction and design.

UAS (Drone Data)



LiDAR



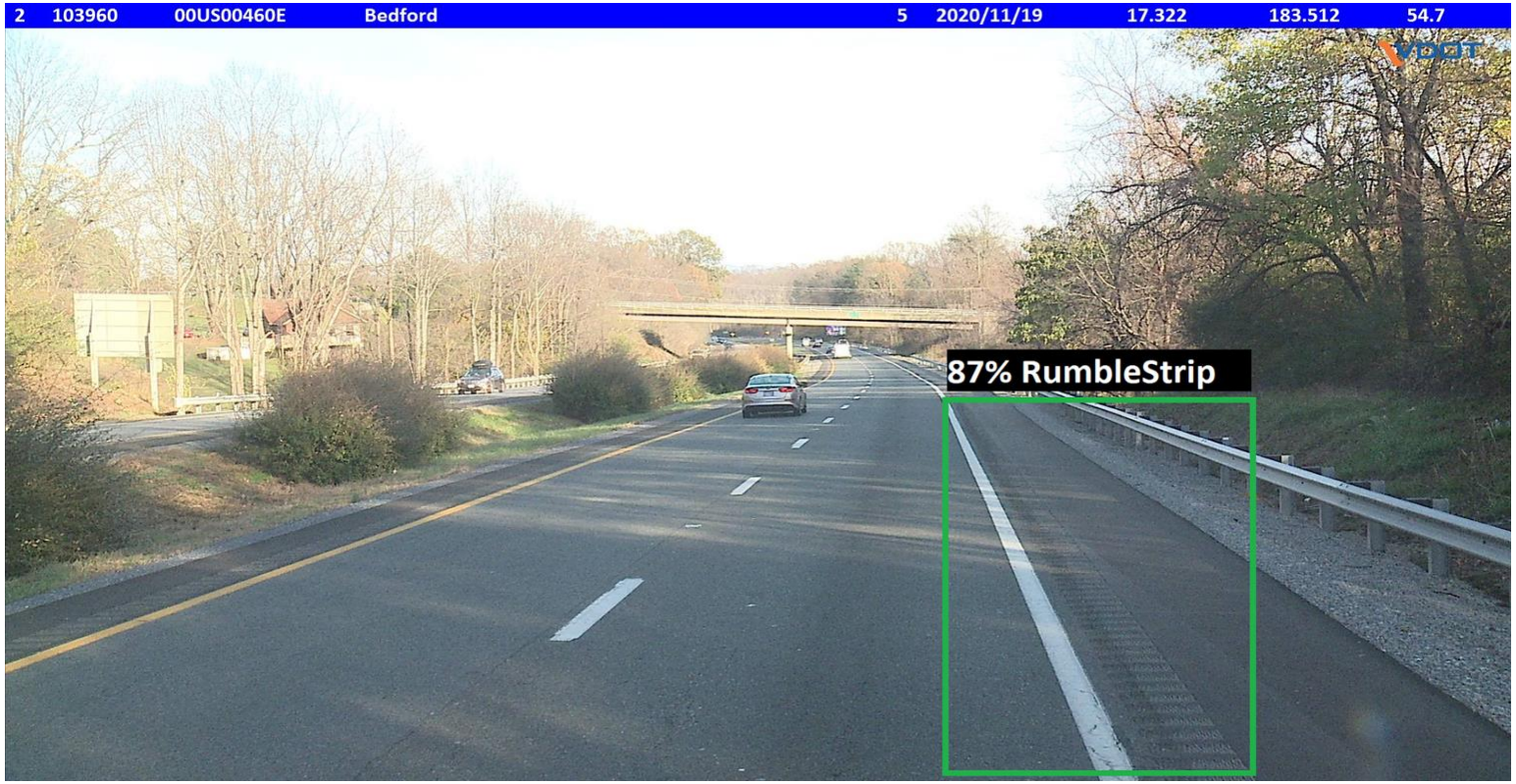
AR/VR Potential

- Virtual situation room
- Visualize anomalies and patterns
- Conduct and visualize spatial computing
- Training in immersive/virtual world
- Scenario planning and preparation

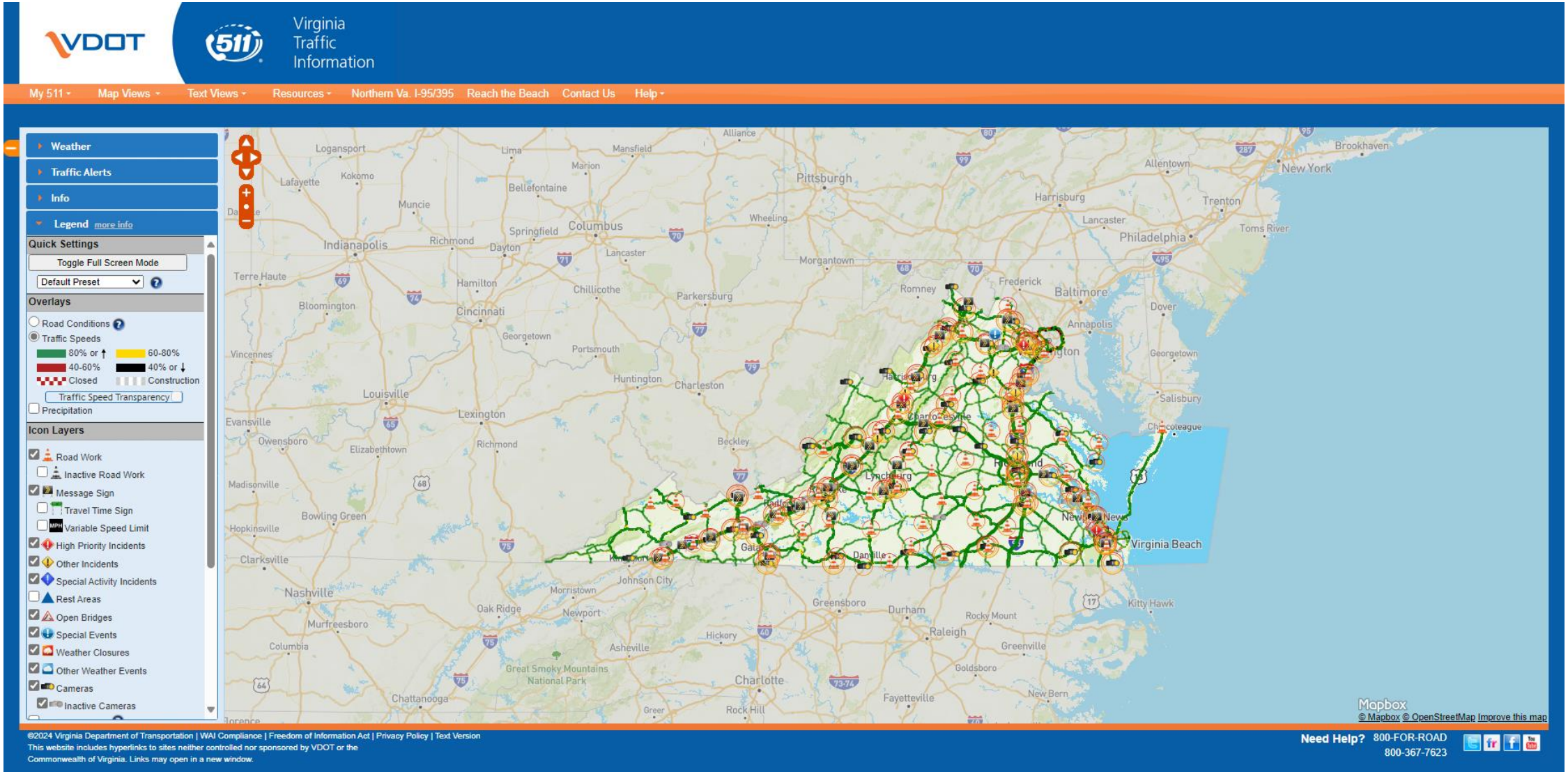
Computer Vision

Image and LiDAR-based Asset Inventory and Condition Detection

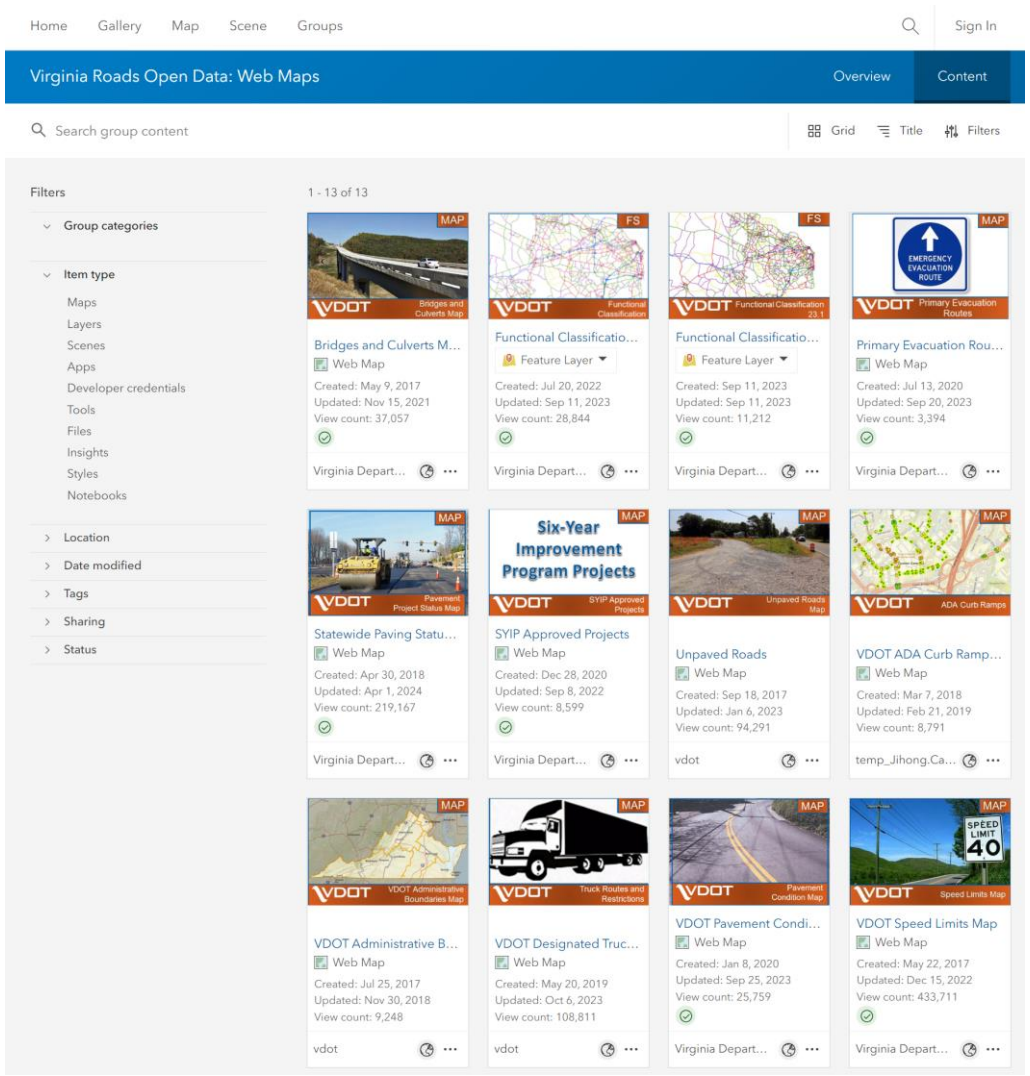
- Leverage Existing Imagery
- Models can detect any object visible
- Products available in the market
- Developing a strategy to put into practice
- Data driven maintenance, emergency response



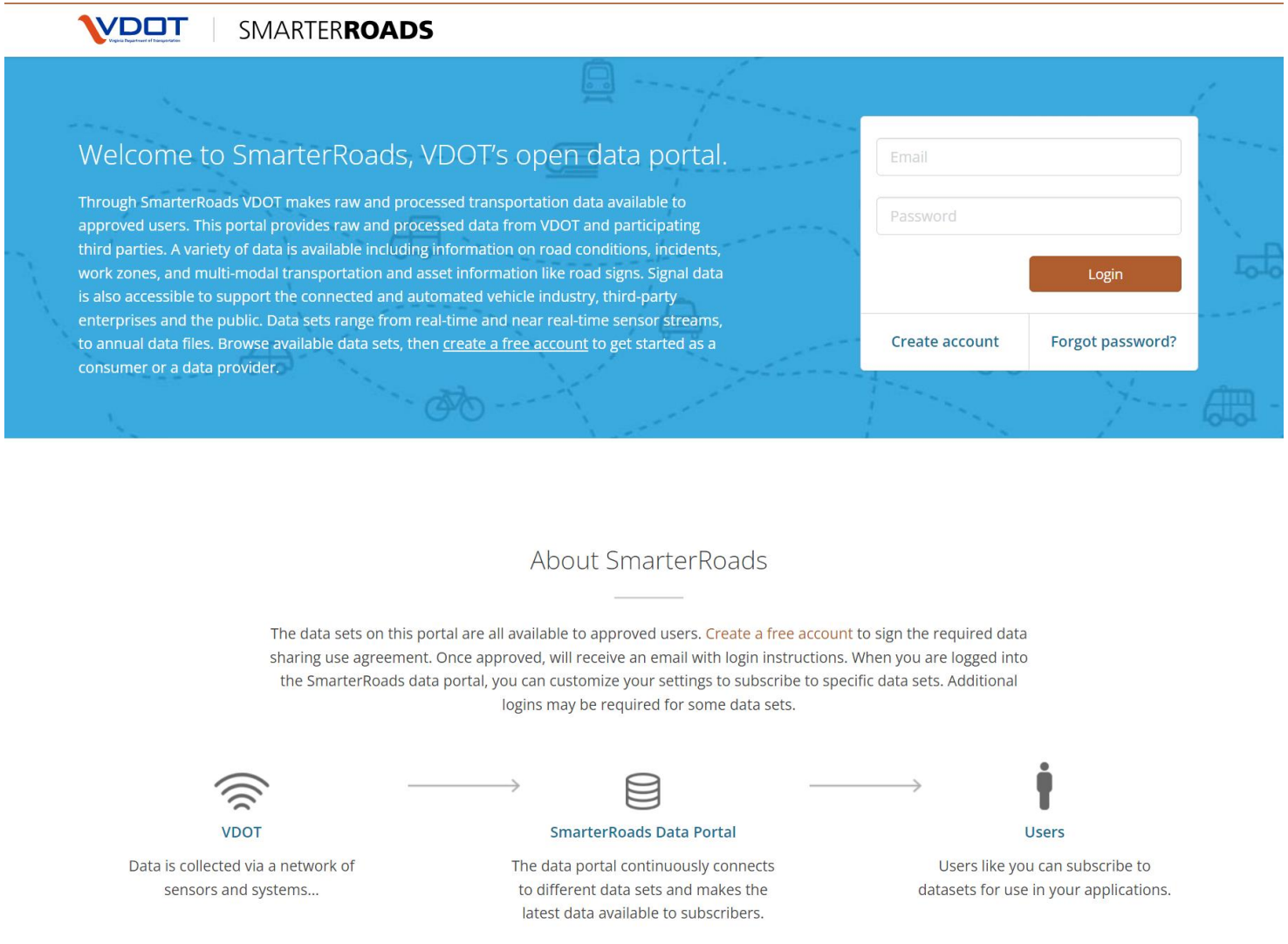
Data Sharing



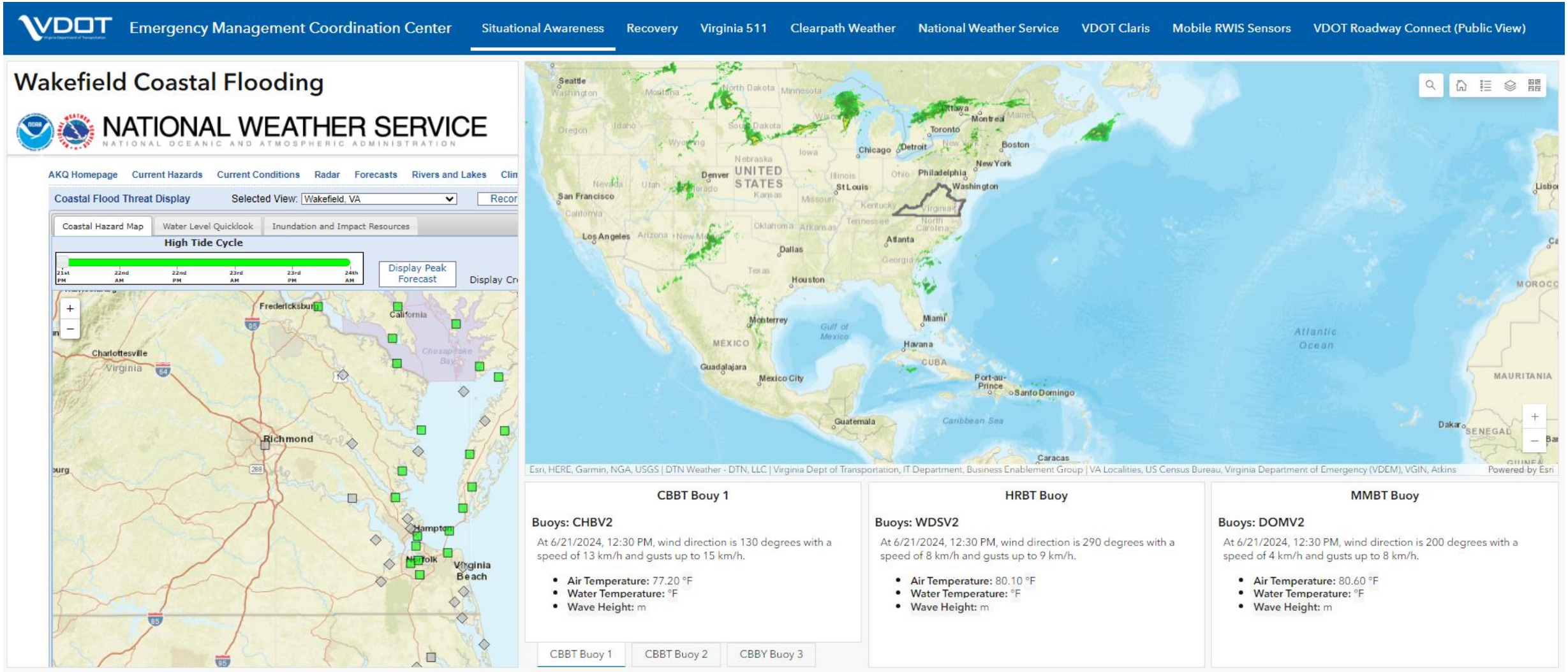
VirginiaRoads.org



Smarterroads.org



Data from Others

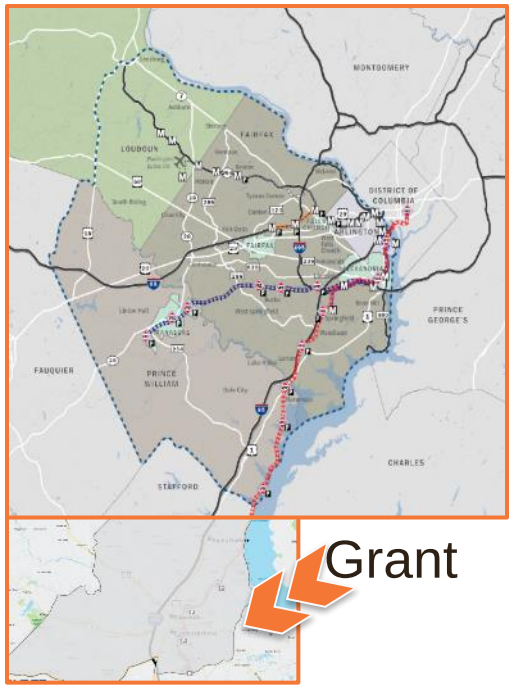


Regional Multi-Modal Mobility Program (RM3P)

- ❖ **A piece of the digital twin puzzle**
- ❖ **Future opportunity for use in emergency response**

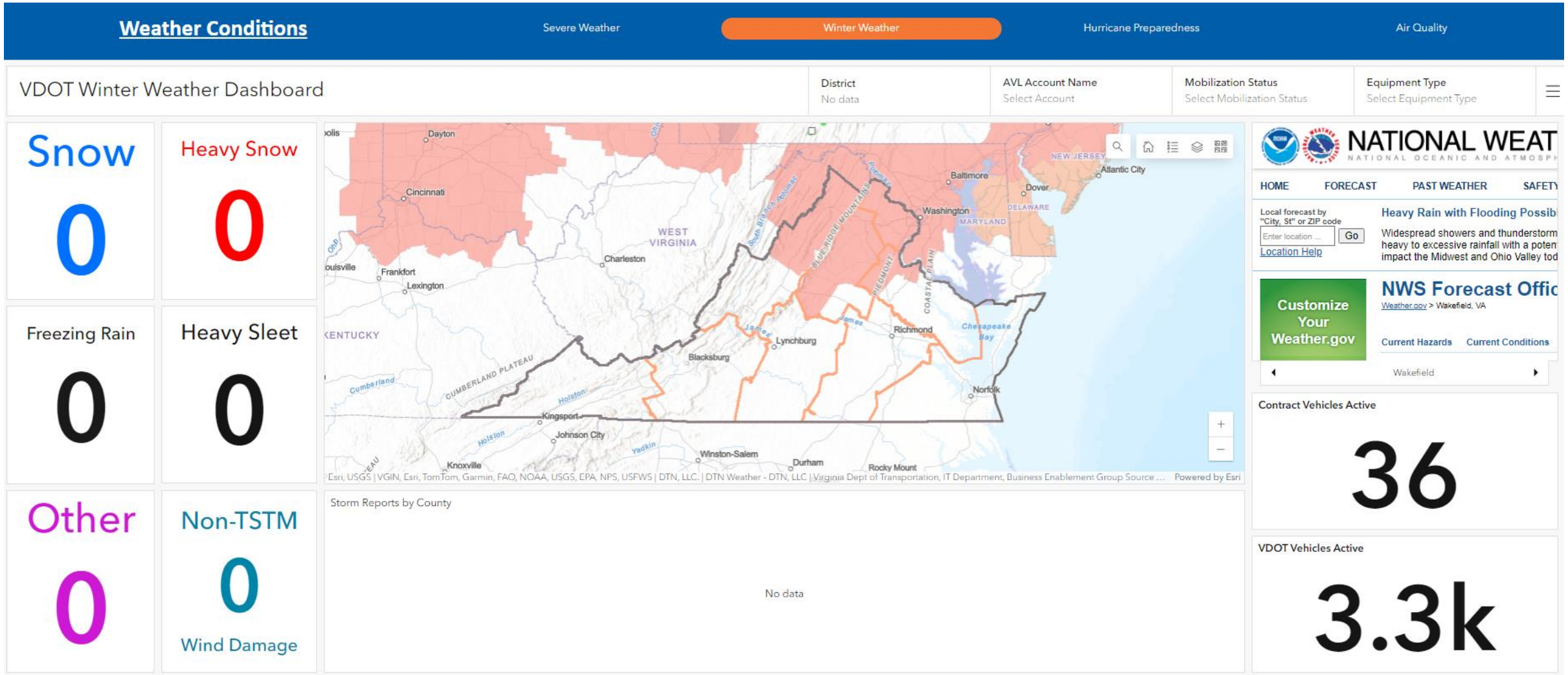
- ❖ **Collaborative use of real-time data by Virginia's public and private sectors in Northern Virginia**
  - Improve safety, reliability + mobility
  - Provide tools to make more informed travel choices
  - Advance four activities
    - **Data Exchange Platform** – Implemented (See rm3p.ritis.org)
    - AI Decision Support System – In Development
    - AI Commuter Parking System – UNDER PROCUREMENT
    - Dynamic Incentivization – In Development

RM3PVirginia.org



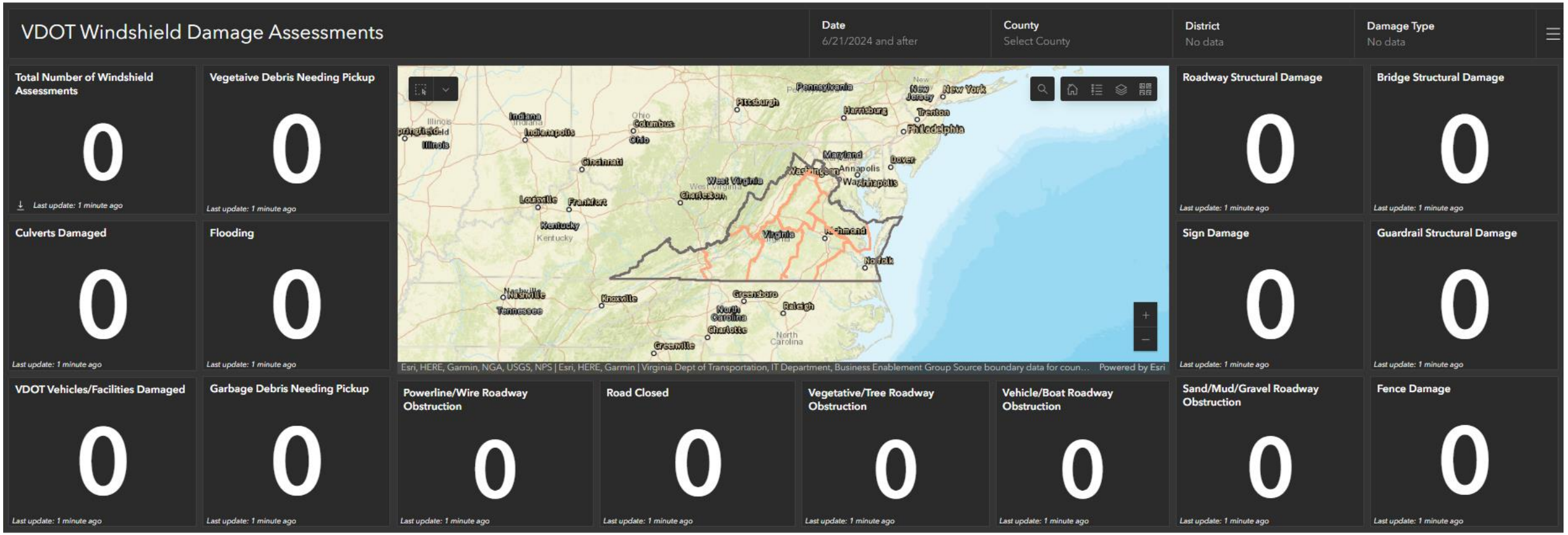
Opportunity for AI Use

Winter Weather Preparation and Response



Damage Assessment and Recovery

DAMAGE ASSESSMENTS



Potential Opportunities and Takeaways

- Inventory and condition assessments
- Automating paperwork
- Scenario planning and coordinated response
- Data quality improvements and sharing
- Connecting data in various formats easily
- Patterns and anomaly detection
- Extending existing technology to emergency response
- Recognize compounding effect of converging technologies

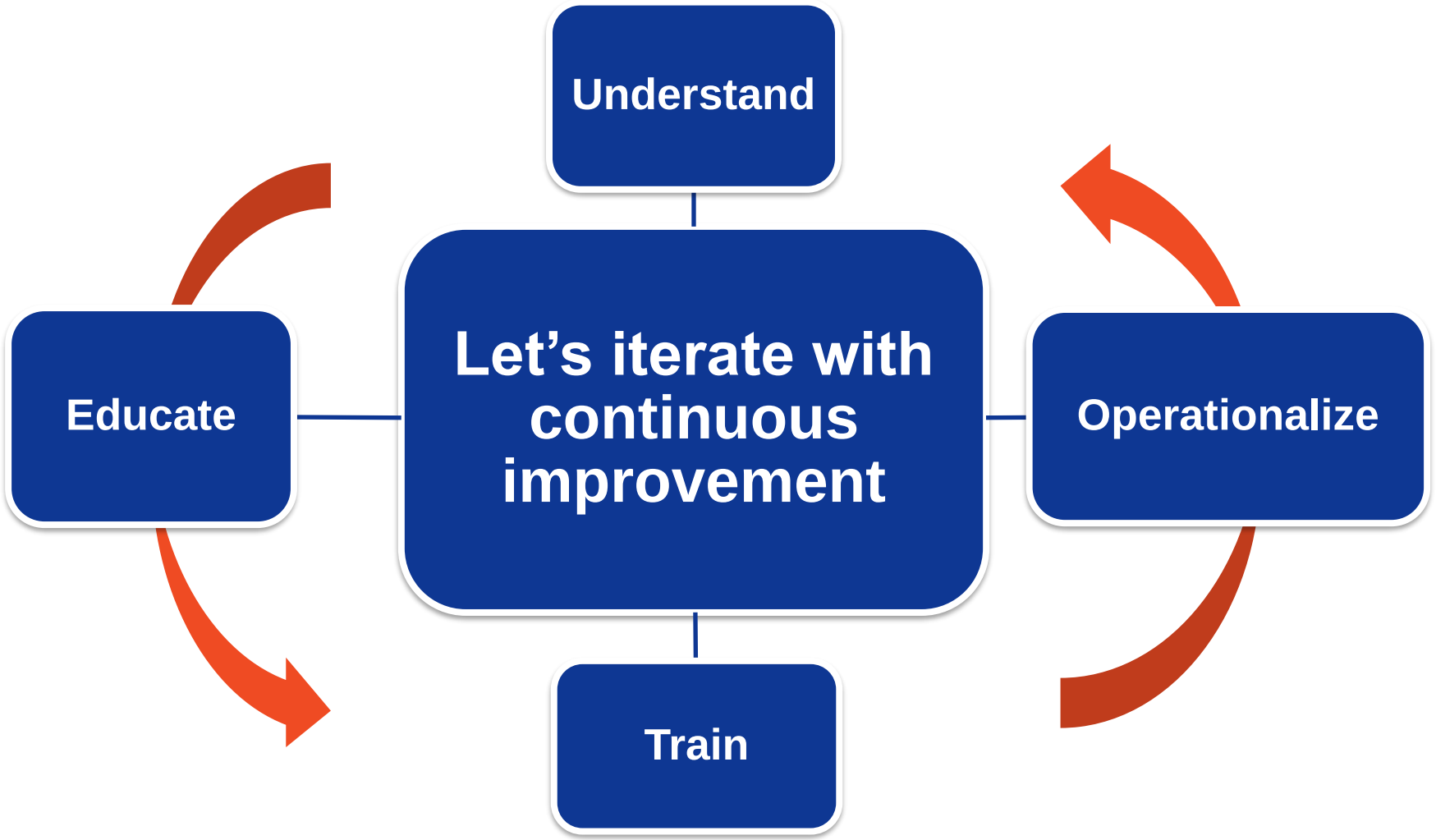
Path Forward

Process

People

Technology

Culture



Q & A

Questions?

A.I. and the Use of Precision Data for Large Scale Disaster Preparedness and Response

We have entered a new stage of disaster and large-scale operations management

Disaster Response Requires Artificial Intelligence Tools For Real Time Situational Awareness to Support:

- Incredible volumes of raw data
- dozens of agencies
- hundreds of field teams
- thousands of personnel
- millions of residents
- billions of dollars of infrastructure/property

A.I. To Support: Rapid and Persistent Data Collection, Analysis, and Distribution Across the Disaster Area

- **Find and Extract Raw Data From Sources**: Thousands of potential sources of data: How to pick and choose, how to integrate. From satellite to sensor to human observations and hum-int
- **Data Analysis and Decision Support**: Each of dozens of analytic threads must be initiated and sustained. What are the best analytic methods. How to identify the most valuable intelligence for each operation for all ESFs.
- **Communications Across the Response Community**: How to selectively distribute customized data and analysis to individuals and teams.
- **Responder to Citizen/Victim "Synapse"**: Maintain communications between citizens within the disaster area on a continuous basis, with responder teams in their area.
- **Common Operating PictureS** for all ESFs, and a Central COP to synthesize the most important information and intelligence needed by everyone.

World Trade Center 9/11

EOC Maps: Reconnaissance Photos

NYC Emergency Mapping and Data Center (EMDC)

100+ GIS Personnel Working 24X7 From 6+ Centers

Map request tracking application

At Peak Operations: 100's of map requests daily, >3,000 maps total

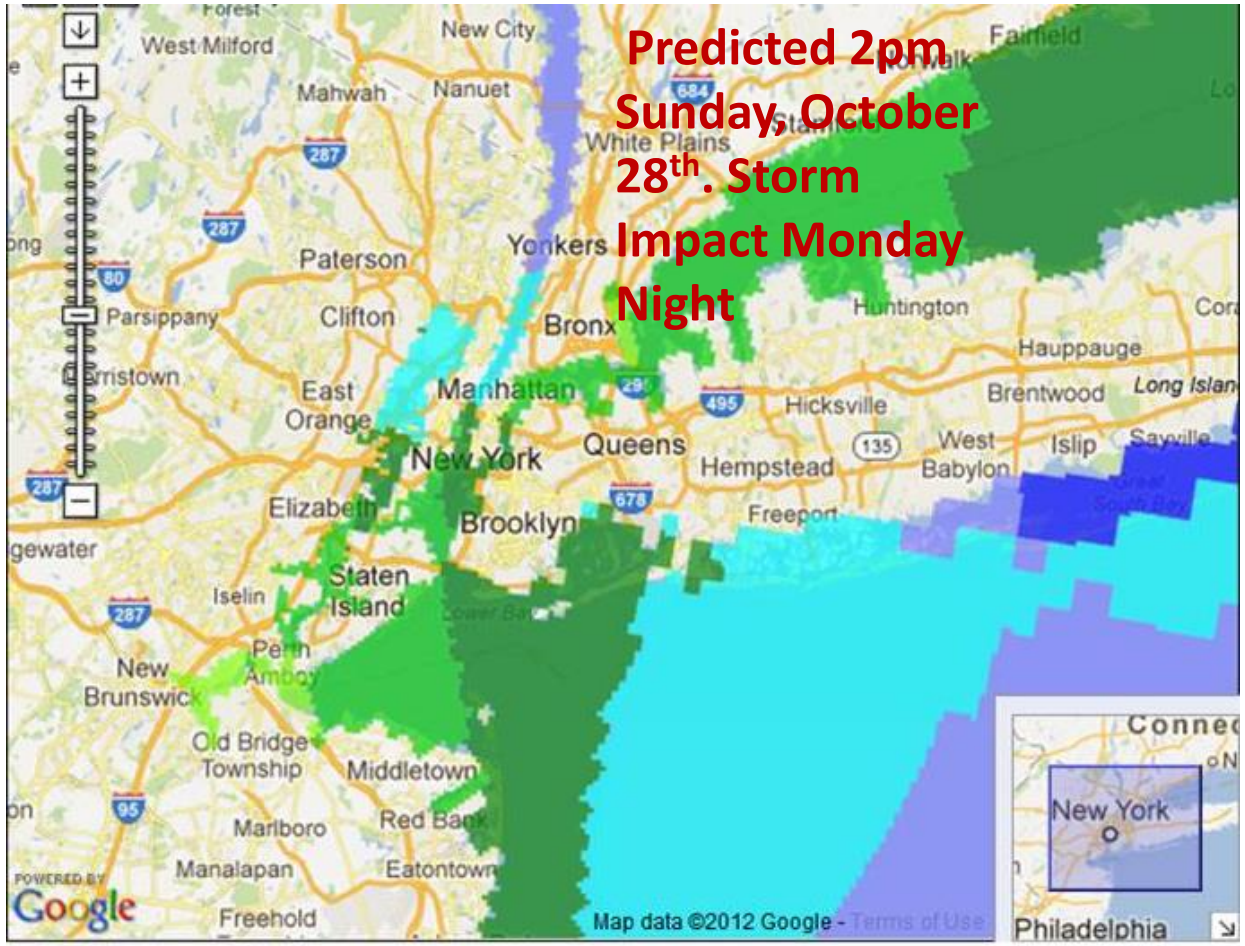
	EmployeeID	OrderDateTime	HoursUntilDelivered	Agency	Government Level	Requestor	TelephoneNum	Description
2	0	9/16/01 8:50 AM	14.4	NYS Fire	2	Dickinson	646-756-3163	Map Lower Manhattan showing restriucted areas
3	0	9/16/01 9:40 AM	8.8	HPD	1	Mullings	646-756-3105	# 13, 20
4	0	9/16/01 9:30 AM	14	Port Authority	2	Lt. Sheehan	0	Scan picture & print E size copies
5	0	9/14/01 10:30 PM	0	Coast Guard	3	Coast Guard	0	#1, 2, 3, 4
6	0	9/15/01 12:10 AM	0	FEMA	3	FEMA	0	Rand McNally map, Area of Attack
7	0	9/15/01 12:40 PM	0	Time Warner	7	Time Warner	0	#2, 4
8	0	9/15/01 9:20 AM	0	Attorney General	2	Annie	0	LION file
9	0	9/15/01 9:25AM	0	FEMA	3	Charles Ridgeway	0	Latest update of use maps
10	0	9/15/01 9:45AM	0	Army Medical Group	3	Mark Tedesco	0	LION with symbol & title at Chambers & West College: College Medical Facility. Pier 61 DMAT Staging Area.
11	0	9/16/01 10:50 PM	.7	US Coast Guard	3	BMS Merideth Conky	646-756-3130	Print Sign.doc from attached floppy disk to poster size
12	0	9/14/01 10:00pm	0	MTA	2	Dan Mc Hugh	0	Subway data & Utility outages
13	0	9/15/01 12:10 AM	0	OEM	1	OEM	0	ESRI Street map
14	0	9/15/01 11:15 AM	0	DOITT	1	Radio group	0	Ortho-Photos pre- and post-attack
15	0	9/15/01 12:55 AM	0	OEM	1	Insp Erenat (from Tim McKane)	0	Worth St and South, structure & lots
16	0	9/15/01 2:05 AM	0	Amtrak	3	Amtrak	0	#18 & #2
17	0	9/15/01 12:05 AM	0	FDNY Fire Dept	1	Kevin for Captain George	646-756-3169	FDNY Oblique photography. Aerial Photos from 9/12, 13
18	0	9/15/01 12:25 AM	.1	OEM	1	Henry Jackson	0	EOC Parking sign
19	0	9/15/01 12:00 pM	8.5	OEM	1	Sam Benson (for Mr. Mignone of U	0	Temporary mortuary sites: Find sites greater than 10,000 sq ft witl concrete floor & easy truck access below Canal Street
20	0	9/15/01 12:45 AM	2.25	OEM for E-Team	1	Troy	0	#5 & #11 as Shape files. Zip & email to E-Team
21	0	9/15/01 12:40 AM	.1	OEM	1	Brian Cohen	0	Sign for "DOITT Radios & cells"I [Original Map Request # 4]
22	0	9/15/01 12:45 AM	.3	DOITT	1	Alan Leidner	0	Signage: Emergency Mapping Center to Emergency Mapping and Data Center
23	0	9/15/01 1:00 PM	.1	NYPD	1	Kroll Kennedy	0	Restricted Areas map
24	0	9/15/01 1:05 PM	0	DCAS	1	Comm. Diamond	0	#10 - 2 large, 2 small
25	0	9/15/01 1:20 PM	.1	FDNY	1	0	0	Enlarge photos C,D,E
26	0	9/15/01 1:15 PM	0	OEM	1	Sean Nolan	646-756-3020	25th - 70th streets with all open spaces - 5 copies. To be used to ID potential parking areas [Original Map Request #11]
27	0	9/15/01 1:30 PM	0	OEM	1	Marianne Marrocollo	0	Maps of debris boundaryI [Original Map Request #12]
28	0	9/15/01 1:35 PM	0	FDNY	1	0	0	Diskette with imagery for laptop
29	0	9/15/01 1:38 PM	0	OEM	1	Tim Kane	646-208-2764	#14 with changes per request
30	0	9/15/01 1:40 PM	1.3	FEMA	1	Ed Kneatsey - Angie Thompson	Pier 90	#5 Presentation size with changes
31	0	9/15/01 1:45 PM	1.3	OEM	1	Tylon Thomas	0	Mayor's OEM sign
32	0	9/15/01 1:50 PM	5	OEM	1	Mike Miller	0	Lower Manhattan & Subway Station closings
33	0	9/15/01 2:45 PM	4.2	SEMO	2	Robert Breen	0	#11
34	0	9/15/01 2:50 PM	0	OEM	1	Peter McQuilan	646-756-3001	#5 & #2
35	0	9/15/01 3:00 PM	4	OEM	1	Susan	0	Street centerline S. of Canal St
36	0	9/15/01 6:00 PM	0	FDNY	1	Kevin	0	#25 & #1 & #5
37	0	9/15/01 6:30 PM	0	Port Authority	2	John Paczkowski	0	#3 & #4
38	0	9/15/01 6:45 PM	0	OEM	1	Sean Nolan	0	Church & Franklin + 4 Blocks & #4
39	0	9/15/01 5:10 PM	0	FEMA	3	Mark Gallagher	0	#8, #5, #3
40	0	9/15/01 7:00 PM	0	Dept of Sanitation	1	Supt. Byrnes	0	Imagery - Print out of chopper photos
41	0	9/15/01 8:30 PM	0	US Coast Guard	3	Lt. Martinez	646-756-3130	Respiratory protection area
42	0	9/15/01 8:35 PM	2.9	US Public Health Service	3	Mark Russo	240-401-2186	#5 & Battery Pk. W. Street names
43	0	9/15/01 9:05 PM	0	HPD	1	Vincent Ruiz	0	Downtown Manhattan
44	0	9/15/01 9:20 PM	0	DOT	1	Ken Wales	0	Imagery before blast
45	0	9/15/01 9:40 PM	.3	CDC	3	Ken Archer	646-756-3056	#1 & #12
46	0	9/15/01 9:43 PM	0	US Army Corps of Engineers	3	Gary Lee	314-630-6298	#12
47	0	9/15/01 9:45 PM	0	PATH	2	Lt. Brudner	0	Imagery
48	0	9/15/01 10:00 PM	7	US Public Health Service	3	Donald Draggen	401-640-4815	Respiratory protection area & Imagery

Hurricane Sandy: October, 2012

Image from the lower east side of Manhattan near the Battery

Wave heights in NY harbour at 31+ feet: Billions of $$$ in Infrastructure Damages

NOAA Storm Track and Surge Heights for Superstorm Sandy



Lat: 40.5848 Lon: -73.3749

Legend

Height above NGVD-29 (feet)

0 to < 2	11 to < 13	23 to < 25
2 to < 3	13 to < 15	25 to < 27
3 to < 5	15 to < 17	27 to < 29
5 to < 7	17 to < 19	29 to < 36
7 to < 9	19 to < 21	
9 to < 11	21 to < 23	

Disclaimer

Historical Data:
NHC this storm
NHC all storms
MDL

Hurricane Sandy GIS Working Group: FEMA & HIFLD

Impossible to Properly Coordinate!

1	Barlow, Roger	USGS
2	Bausch, Douglas	FEMA
3	Anest, Stephen	Federal Protective Services
4	Balakrishnapillai, Santhosh	Suffolk County FRES
5	Baucom, Kathy	NGA
6	Bethel, Glen	FEMA
7	Bishop, Beth, Lt. Col.	NYS National Guard
8	Callahan, Patrick	FEMA
9	Chan, Terri	FEMA Region II
10	Christiano, Mark	Nat'l Park Service, Gateway Park
11	Colwell, Jonathan	FEMA Nassau EOC
12	Cornell, Ian	FBI NYC Office
13	Costello, Scott	NJ OHSP
14	Daly, Jim	Suffolk County IT Dept
15	Darby, Christopher	City of Newark
16	Donovan, Sean	FEMA IMT to NYS EOC
17	DosSantos, Jose	FEMA Region II
18	Duffy, Brendan	Long Island Railroad
19	Ed Eisenstein	Nassau County IT
20	Faison, Kendrick	FEMA GIUL, Nat'l IMAT - Blue
21	Faught, Ray	NYS DHSES GIS Nassau EOC
22	Fiumano, Frank	USCG
23	Freehafer, Douglas	USGS NY Water Science Center
24	Galloway, Stewart	NYS National Guard
25	Gerkin, Hayley	NGA Support Team for FBI NYC O
26	Hicks, Patty	NJ State Police ROIC/EOC
27	Holland, Ben	NJ State Police/ROIC Fusion Cente
28	Hughes, Cody	FEMA Suffolk GIS POC
29	Hunt, Kevin	GIS Mgr, NYS DOT
30	Ilir, Tota	Westchester County GIS
31	Johnson, William	DHSES NYS GIS
32	Jones, Brenda	USGS IRSCC
33	Kim, Pyung Ho	LIRR
34	King, David, LTC	DoD JSLCC
35	Kotapish, Richard	Ohio IMT at Suffolk EOC
36	Kovacs, Steve	NJ National Guard
37	Kreyer, Mark	DHS IP PSCD
38	Leasure, Ashley	DHS IP PSCD
39	Leidner, Alan	DHS IP/HIFLD
40	Lopez, Rudy	NYC Planning Department
41	Loweff, Jules	MTA
42	Lynch, Connor	Westchester County GIS
43	Mallamo, Aidan	Huntington, LI
44	McBride, William	NJ National Guard
45	McConnell, James	OEM NYC GIS
46	McDevitt, Stephen J.	USACE
47	McHugh, Dan	NYCTA
48	Melsek, Rodney	FEMA
49	Morris, Dale	Erie County/Buffalo/Niagara
50	Morris, Jennifer	FEMA R2/NY State EOC
51	Mumford, Kathleena	US Army North, San Antonio
52	Neidig, Craig A.	USGS

50	Morris, Jennifer	FEMA R2/NY State EOC
51	Mumford, Kathleena	US Army North, San Antonio
52	Neidig, Craig A.	USGS
53	Newman, Glen	NJ Transit
54	O'Brien, Dan	NYS DHSES EOC GIS
55	OBrien, Julia	FEMA Region II
56	Ohlson, Kristen	NYC Infragard/FBI
57	Opalack, Thomas (Major)	CAP Liaison, FEMA R2
58	Osterman, Kurt	DHSES NYS IP
59	Parker, Deborah	Westchester County GIS
60	Peterson, Kevin	DHS IP PSCD
61	Pokrzywka, Dennis	NYS DEC
62	Ponte, Tom	FEMA GIS\GIU Specialist
63	Postel, Michael	Suffolk County FRES
64	Poulsen, Erika	Port Authority NYNJ
65	Quodomine, Richard D.	NYS DOT
66	Rafferty, Tom	NJ State Police ROIC/EOC
67	Rainey, Steven	Newark NJ
68	Raymond, Mary	DHS IP PSCD
69	Reilly, Colin	NYC DOITT GIS Director
70	Reiser, John	NJ National Guard
71	Richardson, Harold	DoD JSLCC
72	Rogers, Williams	USACE
73	Rowan, Andrew T.	OIT NJ GIS
74	Ruhren, Tim	NYS GIS
75	Ruhren, Tim	NYS DHSES GIS Nassau EOC
76	Schauffler, Rick	Federal Fish and Wildlife Service
77	Schuetz, Douglas	Rockland County
78	Seirup, Lynn	NYC OEM
79	Shevlin, Robert	NYCTA
80	Shumon, Brian	FEMA Region II
81	Slevin, Jim	Nassau County GIS
82	Smith, Grace J.	EPA US Region 2
83	Soucie, Eric	FEMA in NJ ROIC Parking Lot
84	Spall, Michael	Con Edison
85	Springsteen, Thomas	HIFLD/FEMA Liaison
86	Stenson, Albert	DHS IP PSCD
87	Stockstill, Laura	Regional CPT
88	Stokes, Jim	GeoEye (supporting NJSP)
89	Tadrick, Joe	DHS IP PSCD
90	Thomas, George	NGA
91	Tiao, Andy	Con Edison
92	Timander, Linda	EPA US Region 2
93	Toala, Julio	DoD JSLCC
94	Wear, Sam	Westchester County GIS
95	Westfall, Frank	DHS IP PSCD
96	Winters, Frank	NYS DHSES GIS
97	Witcoski, Jon	DHS IP PSCD
98	Worden, Michael	NYS Dept of Public Service
99	Workman, Nate	FEMA NRCC GISUL
00	Wright, Brian K.	DHSES NYS IP
01	Zumstein, Christian	DHS IP PSCD RGA

East 14th Street Power Plant & Substation: Avoidable

NYU Medical Center: $1B+ in Flood Damage: Avoidable

Subway Flooding in Lower Manhattan: Avoidable

DAILY NEWS

Avoidable

Hurricane Sandy's 21 most serious fires caused by sea water hitting electrical systems: FDNY

Breezy Point's blaze consumed 122 homes when rising sea water set a single house ablaze, says the New York City Fire Department.

BY BARRY PADDOCK / NEW YORK DAILY NEWS

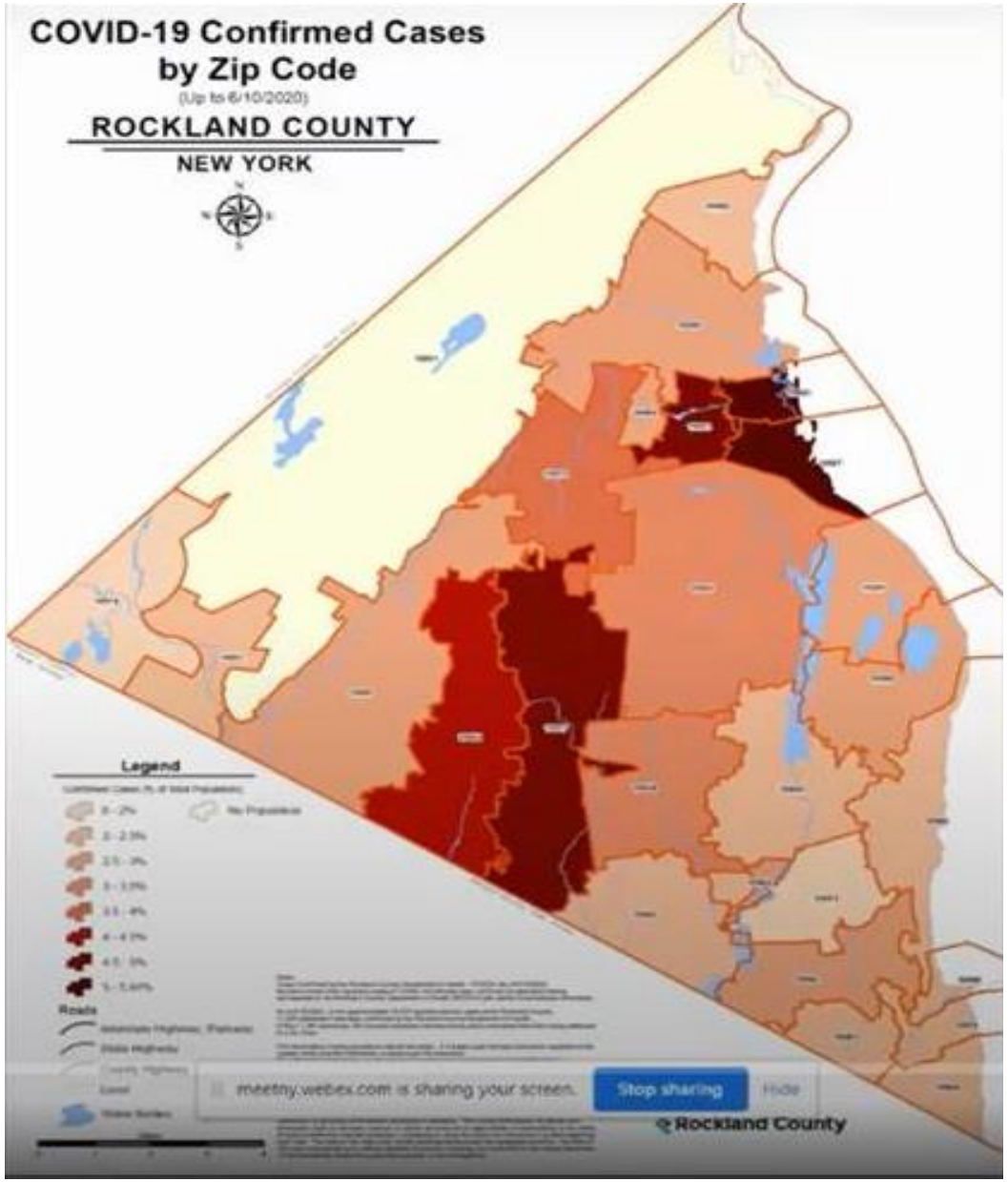
MONDAY, DECEMBER 24, 2012, 6:25 PM

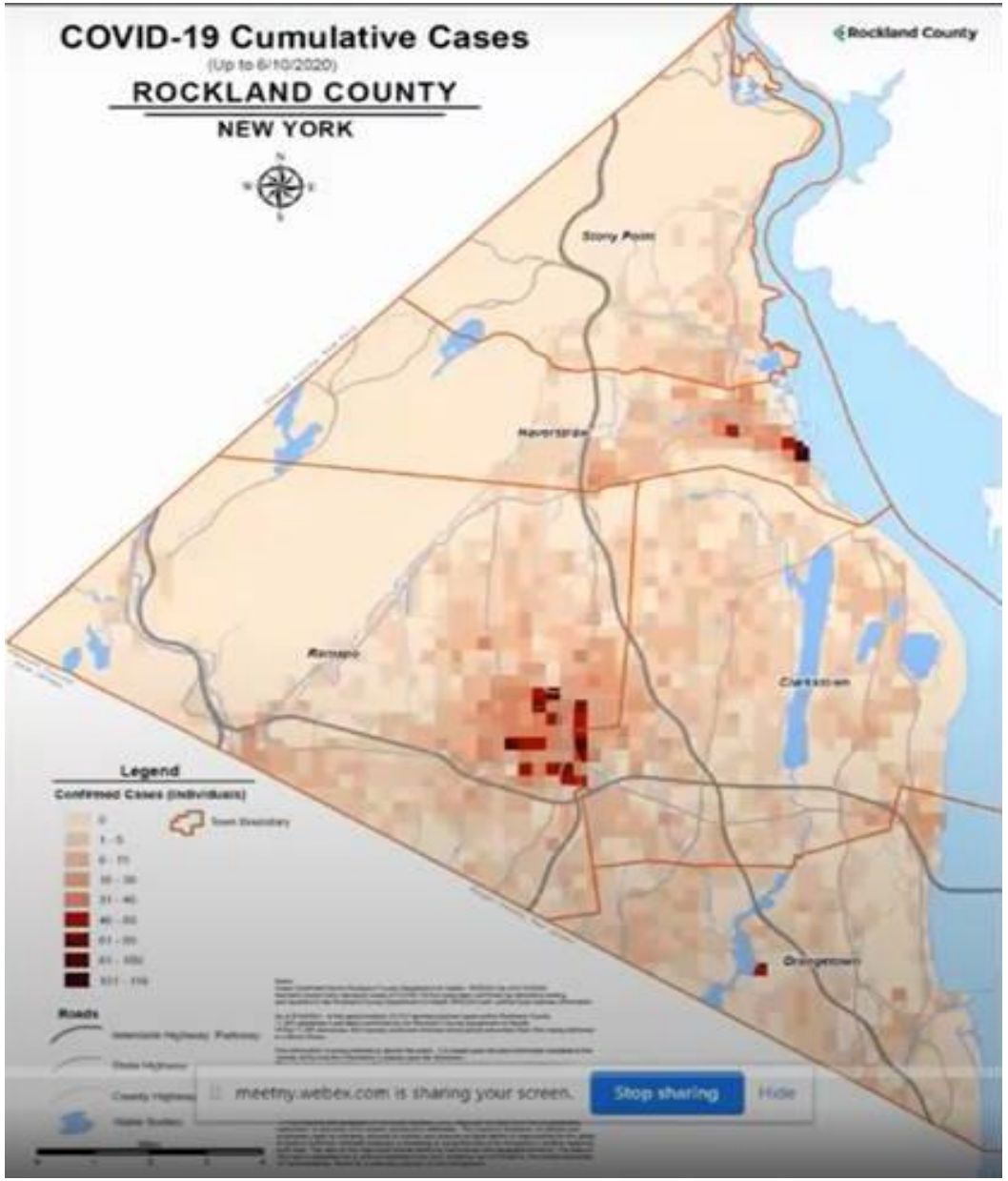
Types of NYC Deaths: Mostly Drownings of Elderly Trapped in Low Lying Waterfront Homes on Staten Island: Avoidable

Drowned	Montalto, Leonard	Fox Beach Avenue	SI	M	53	Basement
Drowned	Suber, Frank	Broad Street	Manh.	M	54	Basement
Drowned	Dresch, George	Tottenville	SI	M	55	Outdoors
Drowned	Narh, Anthony	92 Laight St	Manh.	M	57	Garage
Drowned	Sullivan, Henry	Beach 136 St/Rockwy Pk	Queens	M	57	Basement/Gas
Drowned	Toussant, Eden	Beach 69 St/Rockwy Pk	Queens	M	58	Basement Apt
Drowned	Bevan, Patricia	Hunter Ave/Midland Beach	SI	F	59	Home
Drowned	Sammarco, Andrew	Mills Ave/South Beach	SI	M	61	Home
Drowned	Gesso, Anna	Naughton Ave/Dongan Hills	SI	F	62	Basement
Drowned	Unidentified	Olympia Blvd/Midland Bch	SI	M	62	Home
Drowned	Maxwell, David	Mapleton Ave/Midland	SI	M	64	Home
Drowned	Paterno, John	Midland Beach	SI	M	65	Home 1 story
Drowned	Contrubis, Eugene	Kiswick St/Midland Beach	SI	M	67	Home
Drowned	Gold, Richard	Beach 133 St/Rockaway Pk	Queens	M	67	Basement
Drowned	Krins, Richard	Sheepshead Bay	Bklyn	M	67	Home
Drowned	Gotthelf, David	Rockaway Park	Queens	M	72	Home
Drowned	Schoenfeld, Cy	Sheepshead Bay	Bklyn	M	72	Home
Drowned	Rispoli, Anastasia	Grimsby St	SI	F	73	Home
Drowned	Unidentified	Olympia Blvd/Midland Bch	SI	F	74	Home
Fall	McSwain, Albert	Rockaway Beach Blvd	Queens	M	77	Stairs
Fall	McKeon, William	Shore Front Pkwy/Rockaway	Queens	M	78	Stairs
Drowned	Spagnuolo, Beatrice	Grimsby St	SI	F	79	Home
Fall	O'Regan, George	New Lane Senior Hsg	SI	M	79	Dark
Drowned	Faggiano, Rose	Howard Beach	Queens	F	85	Home
Drowned	Rossi, James	Quincy Ave/Dongan Hills	SI	M	85	Backyard
Drowned	Colborne, Marie	Tennyson Dr/Nelson Ave	SI	F	86	Outdoors
Drowned	Hua, SenPo	Coney Island	Bklyn	M	87	Living Rm
Drowned	Colborne, Walter	Tennyson Dr/Nelson Ave	SI	M	89	Outdoors
Drowned	Norris, Ella	Buel Ave/Dongan Hills	SI	F	89	Home
Drowned	Gore, Lorrane	Coney Island	Bklyn	F	90	1st Floor
Drowned	Stathis, George	Beach 121 St/Rockwy Pk	SI	M	90	Basement

COVID: ID and Address Not Captured at Test Sites For Real Time, Precise Data Updates

Precision Mapping of COVID Cases Enables Better Situational Awareness and Interventions

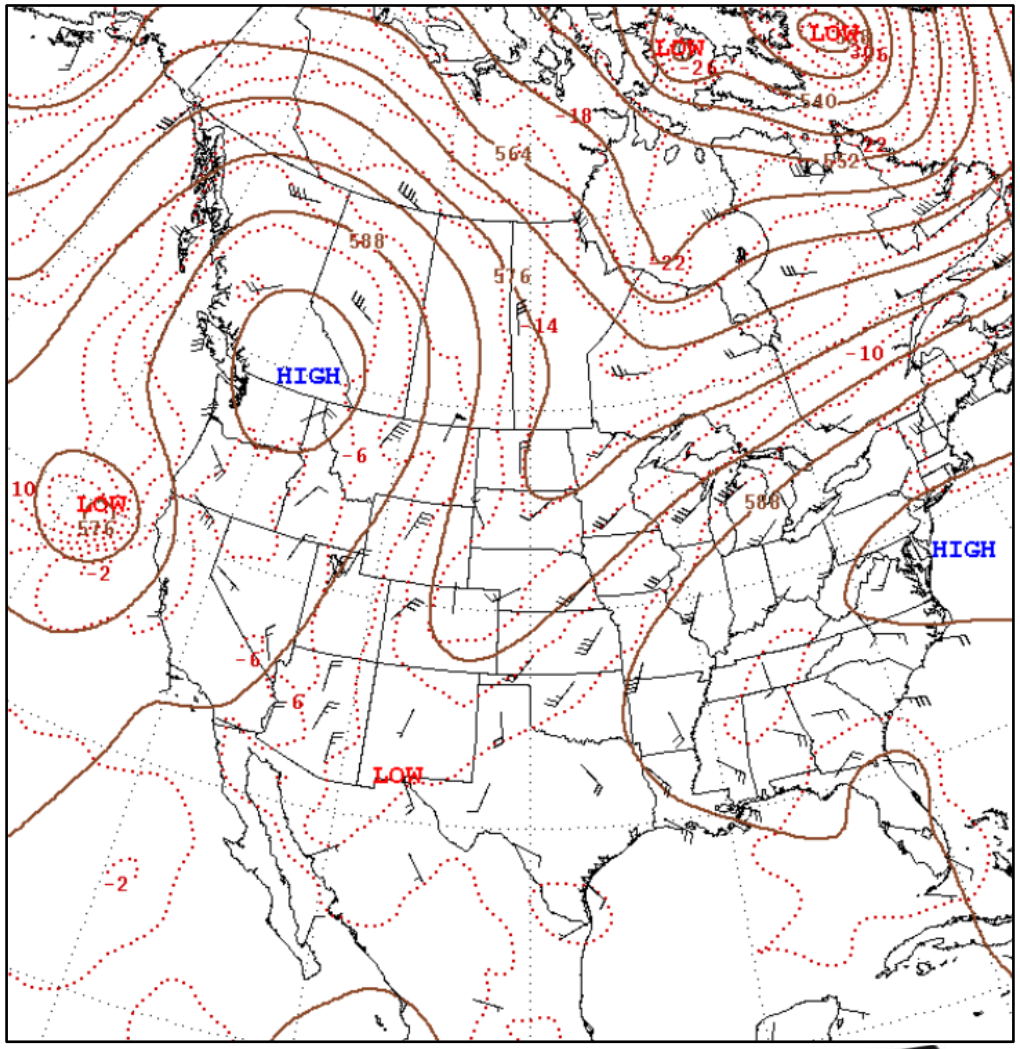




Extreme Heat: Heat Dome Formation

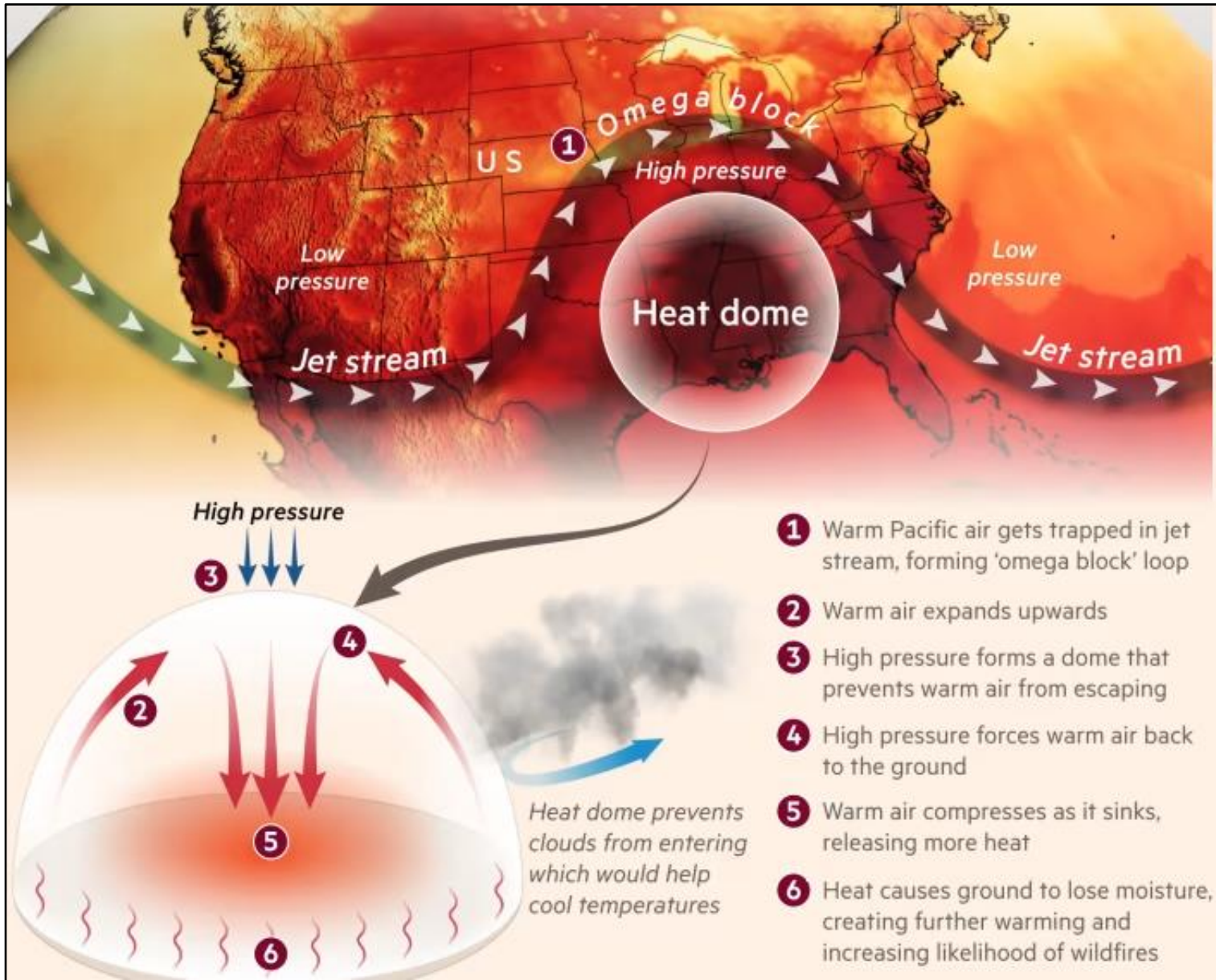
[Climate graphic of the week: Deadly 'heat dome' takes toll on US south and Mexico]

Also see: [A July of Extremes (nasa.gov)]



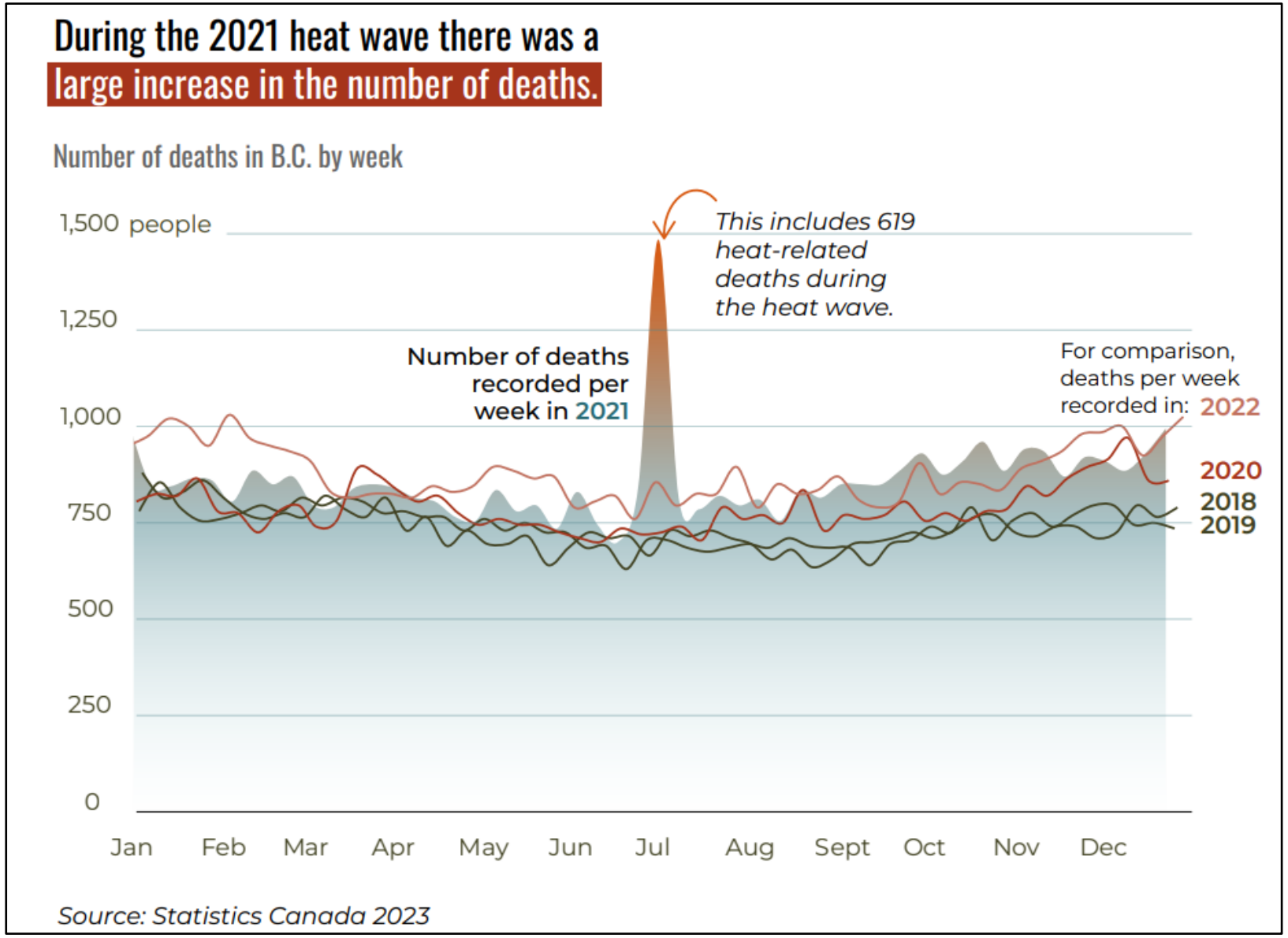
[500-mb pressure chart 2021-06-28]

[700EST Heat dome Pacific NW - Heat dome - Wikipedia]



Excess Deaths in Vancouver BC During 6/25 to 7/1 Heat Wave

619 Deaths, 675,000 Population: Rate 92 Deaths/100,000



[The case for adapting to extreme heat: Costs of the 2021 B.C heat wave (climateinstitute.ca)]

Excess Hospitalizations During Vancouver Heat Wave By Illness Type

The case for adapting to extreme heat: Costs of the 2021 B.C heat wave (climateinstitute.ca)

Is the ratio of hospitalizations and other medical interventions compared with deaths about 2 to 1?

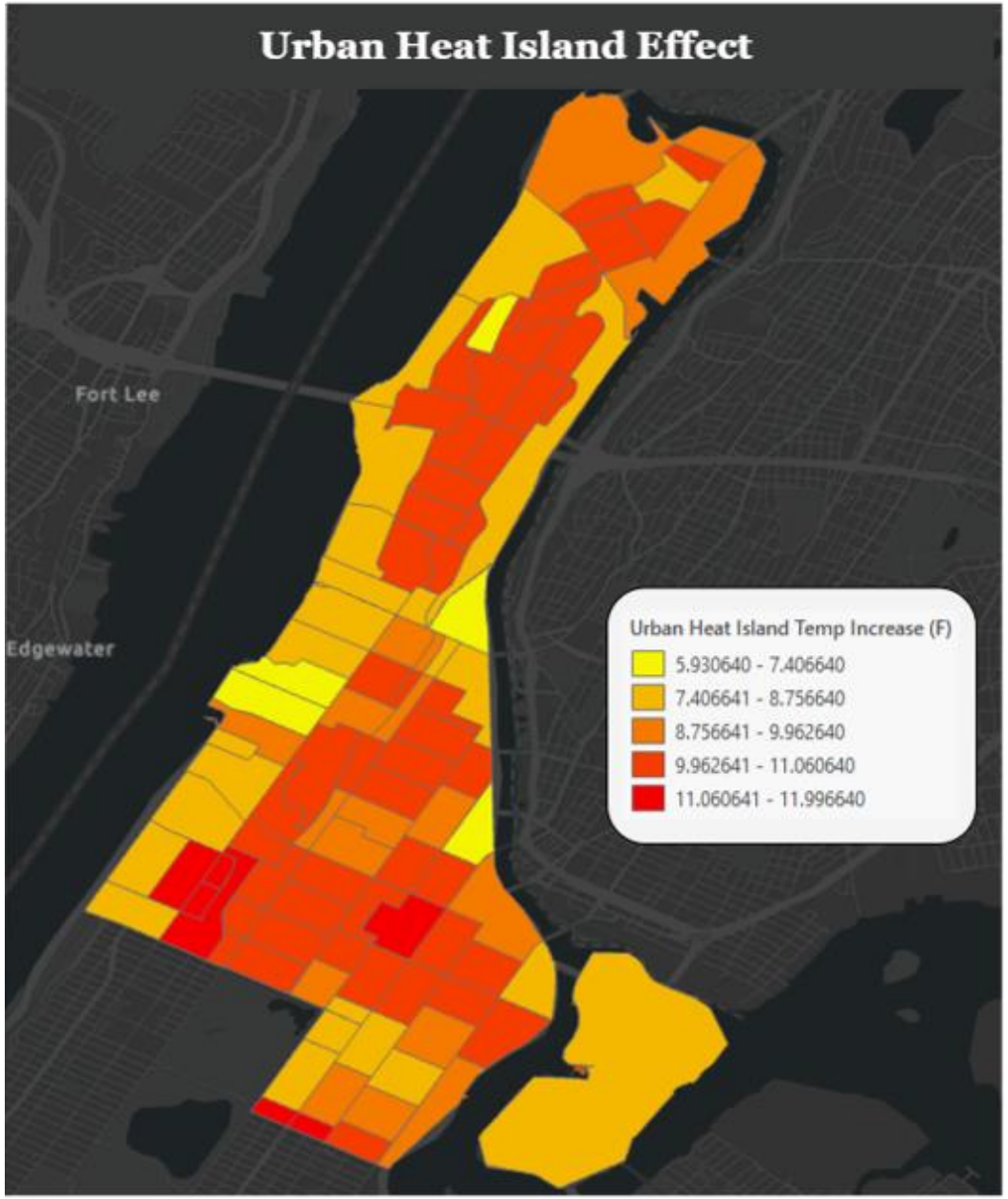
During intense heat sickness spikes emergency calls are likely to overwhelm response agencies.

Illnesses requiring hospitalization that increased during the heat wave[10]

Illness	Per cent change from baseline (number of excess hospitalizations for B.C.)	Average acute bed length of stay (days)		Average cost of hospitalization per patient
Dehydration	136% increase (88)	3.8	38/88/50	$4,892
Acute kidney failure	45% increase (147)	6.4	101/147/46	$9,183
Diabetic ketoacidosis with coma	285% increase (4)	5.3		$5,739
Neurocognitive disorders*[11]	33% increase (94)	12.7	71/94/13	$14,513
Pneumonia	25% increase (40)	6.0	32/40/8	$8,718
Hepatorenal syndrome	170% increase (5)	7.9		$10,458
Heatstroke	16,876% increase (511)	5.8	3/511/508	$10,317

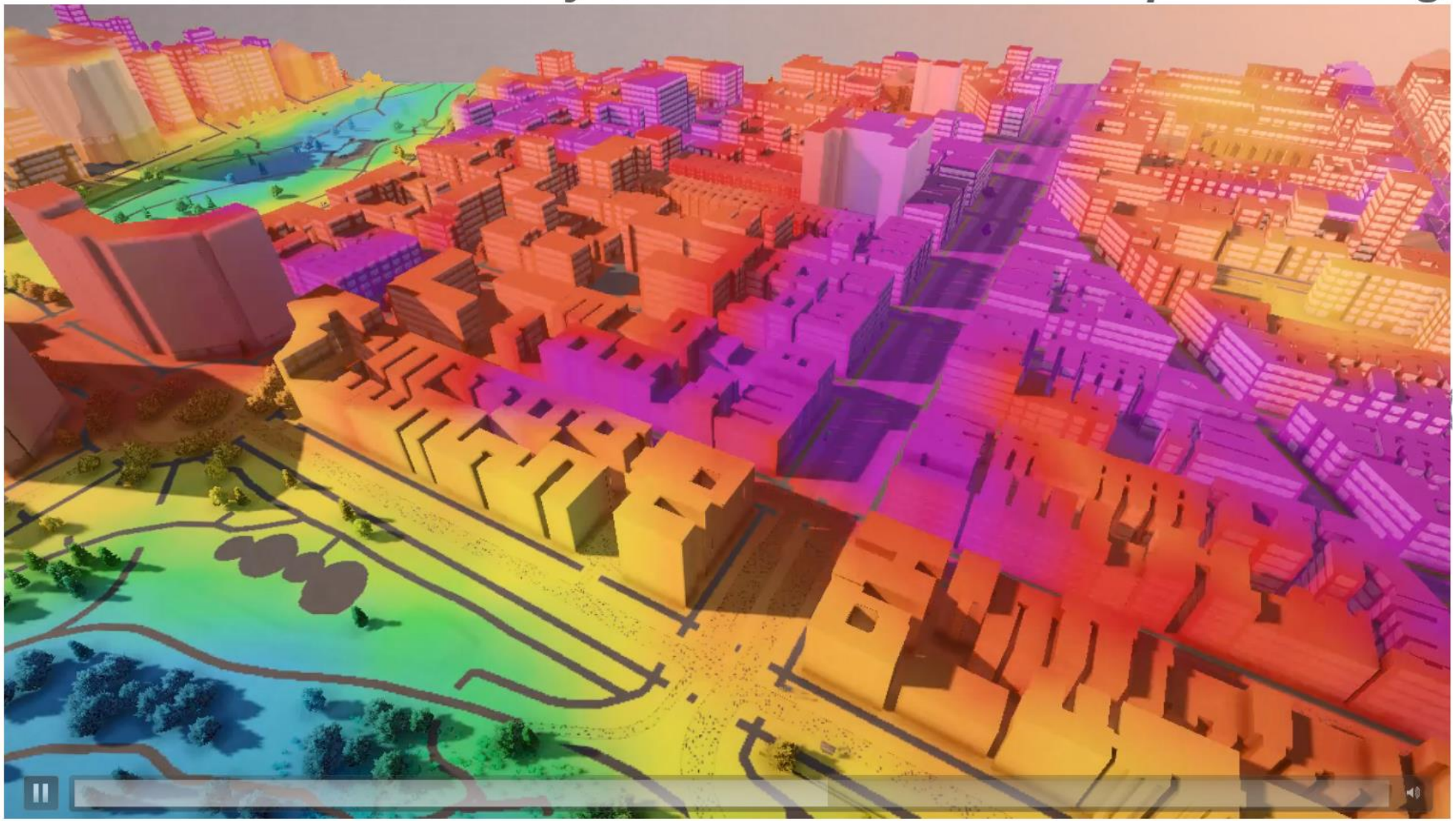
Baseline/Actual/Excess

Climate Central Urban Heat Island Computations



Heat Grid Depiction for Central Harlem

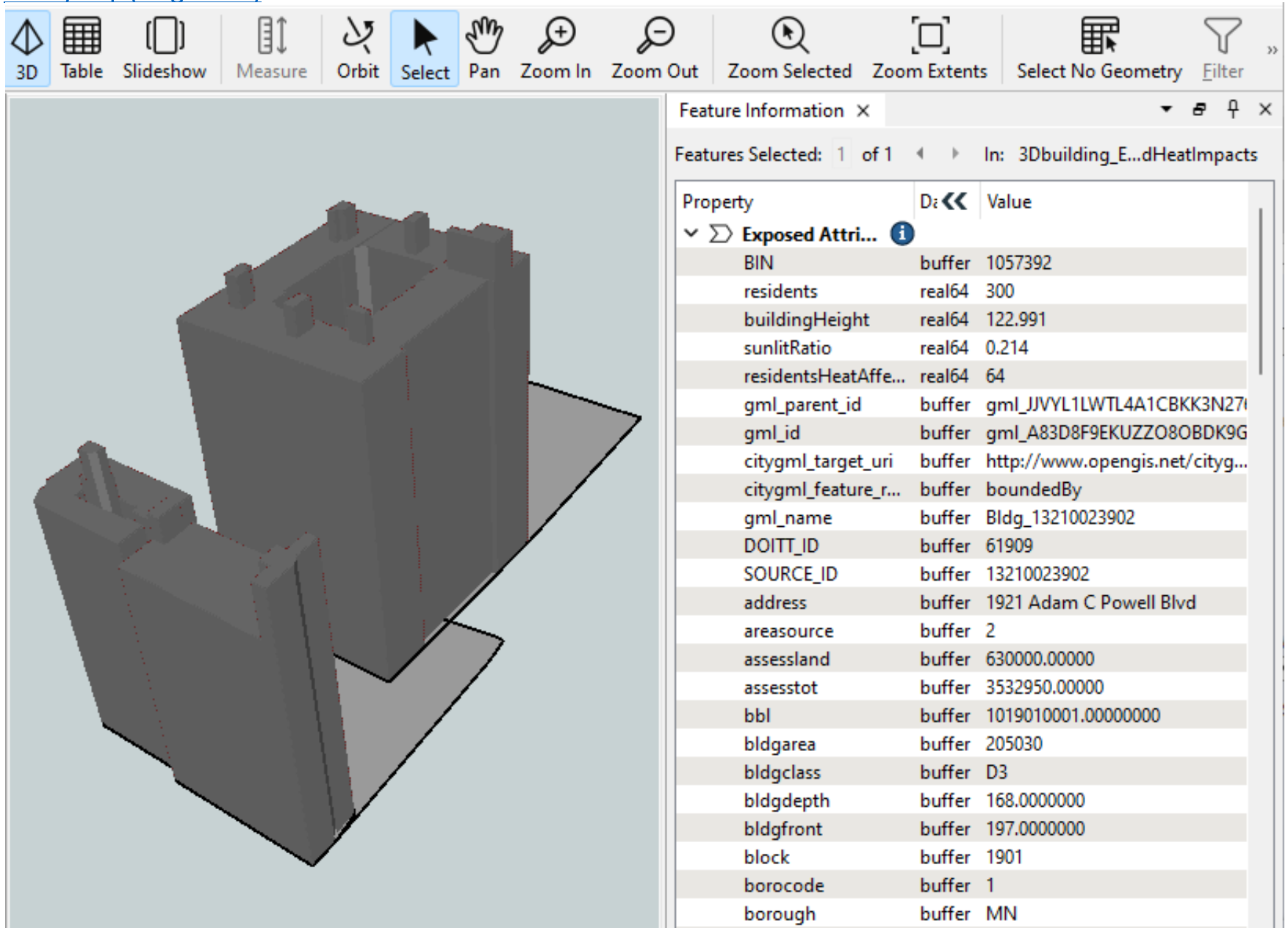
UHI Grid ARD Scaled by Observed Heat Island Temperature Range



Estimated UHI delta: 12 hour daytime cycle animation by Navteca using UHI ARD

3D Building Heat Model for 191 West 116th Street

NYCityMap (arcgis.com)



Sun Insolation / Shadow Analysis at 3pm

- Total residents: 300
- Sunlit ratio: 0.214
- Estimated heat affected residents: 64

Next Steps:

- Assess multiple times / day
- Evaluate aspect, surrounding vegetation
- Analyze full street, census block

The Citizen/Responder "Synapse"

9-1-1 Operations can be Overwhelmed by Large Scale, Highly Dynamic Disaster Events, Where Seconds Count

OGC Disaster Pilot

Task D-113, Citizen Science

Effect of Drought on Recreationally Related Businesses

ELLA: Emergency Location and Language Application

Team Manitoba

Ryan Ahola

Mai Gagujas

Krista Olafsson

Natural Resources Canada

Team GISMO/ELLA

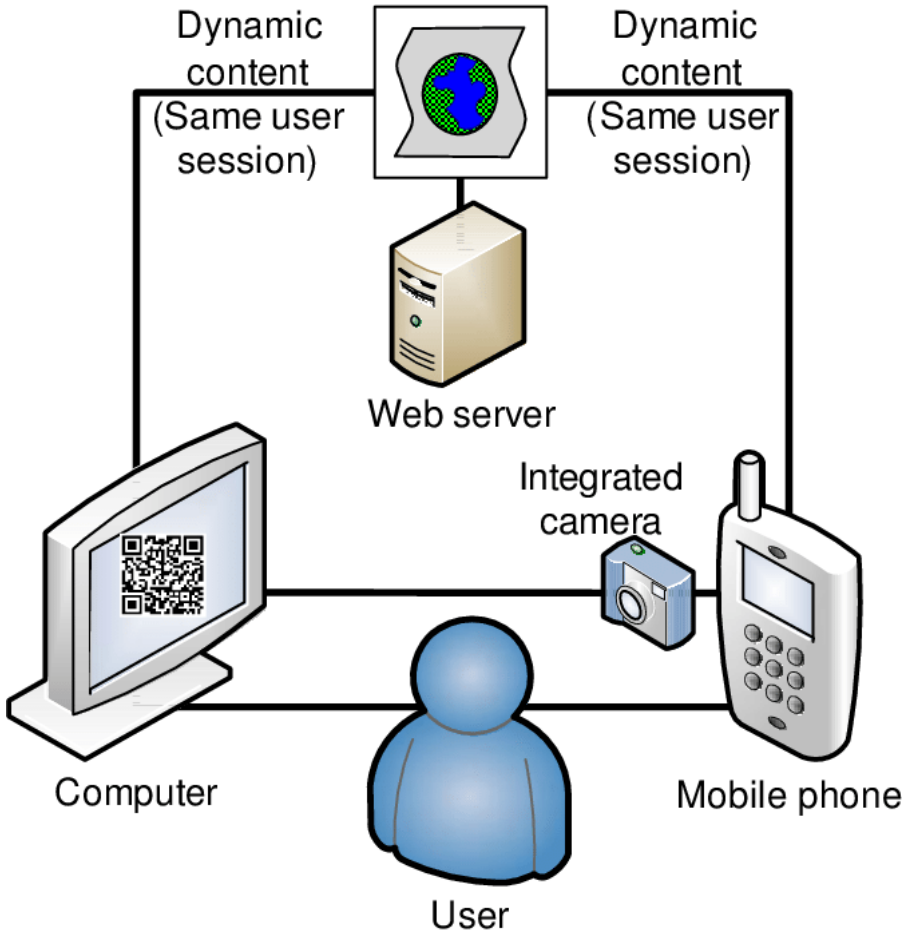
Jiin Wen

Theo Goetemann

Amy Jeu

Alan Leidner

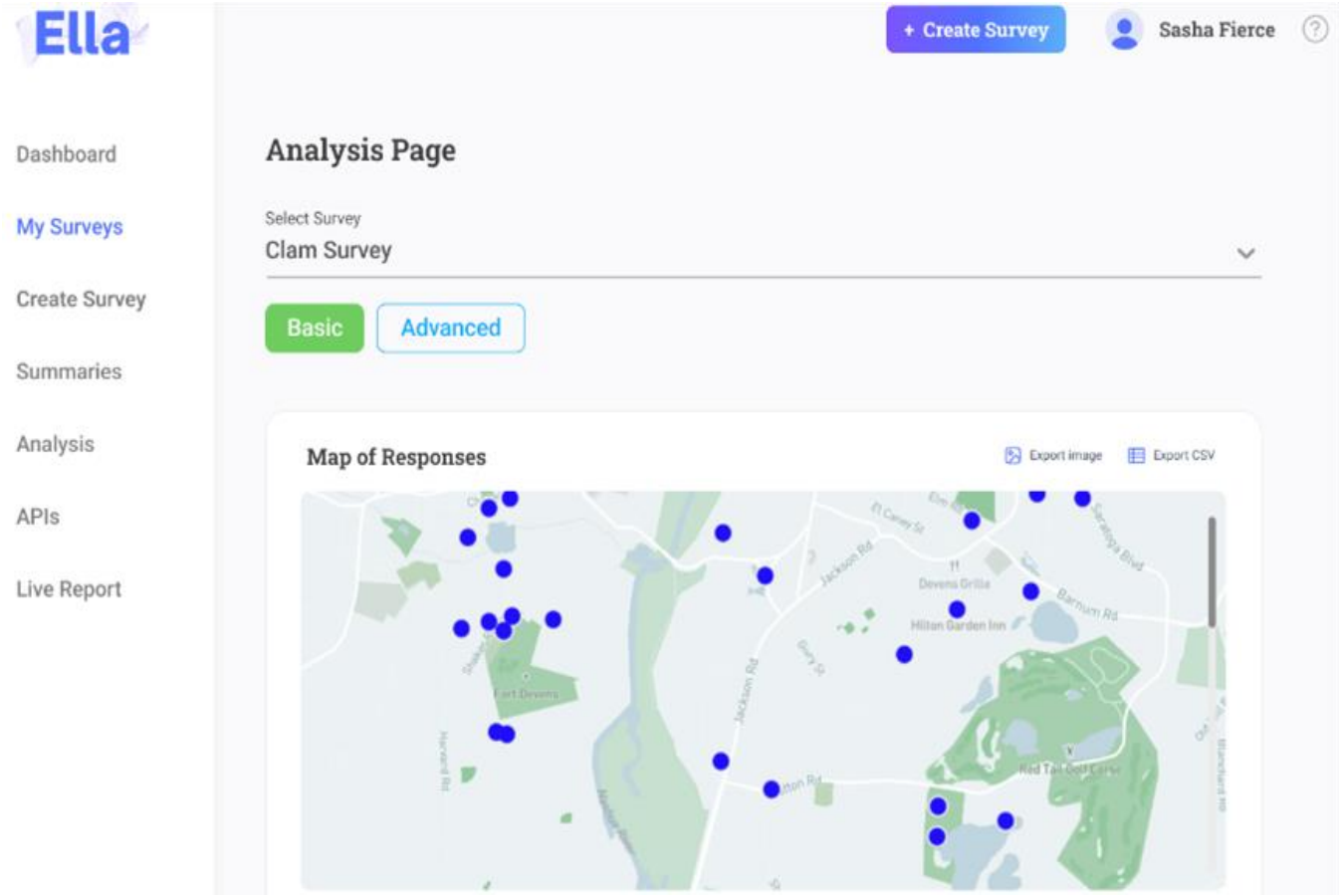
Networks of Smartphones Connect Responders with Citizens During a Disaster

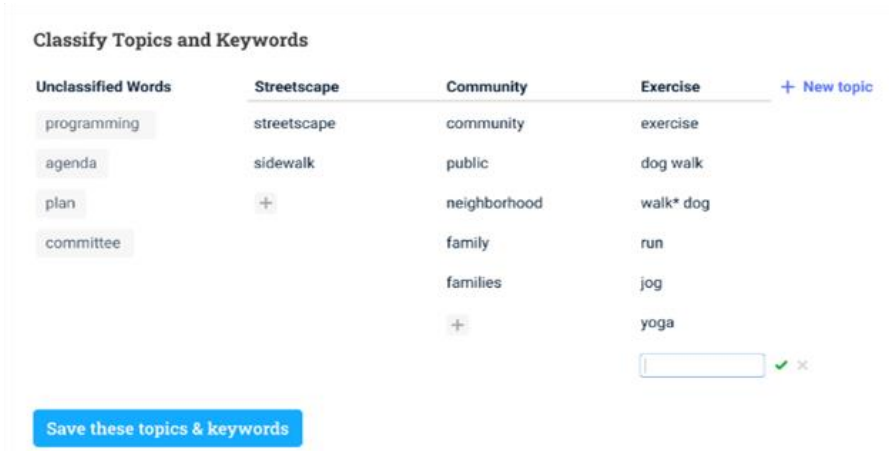


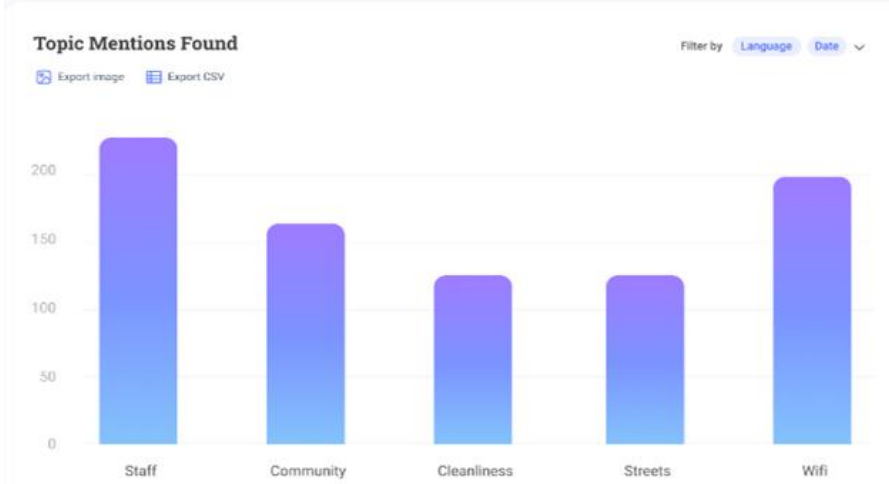
1,587 Many People Using Cell Phones Images, Stock Photos, 3D objects, & Vectors | Shutterstock

Examples of ELLA Use of Multi-Step A.I.

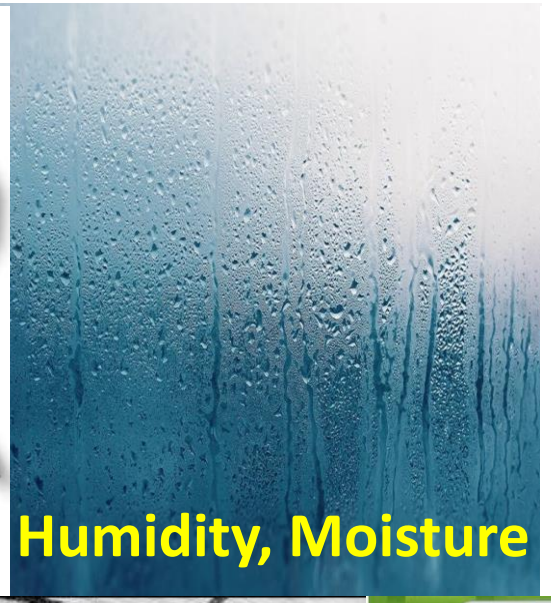
Digitize spoken speech, **translate** into common language
Categorize, analyze, rank words/phrases; **distill** meaning
GeoCode location information and map; **Pattern** analysis
Prioritize by urgency and **connect** to local response teams



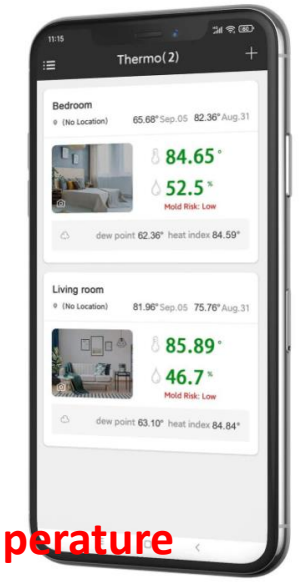




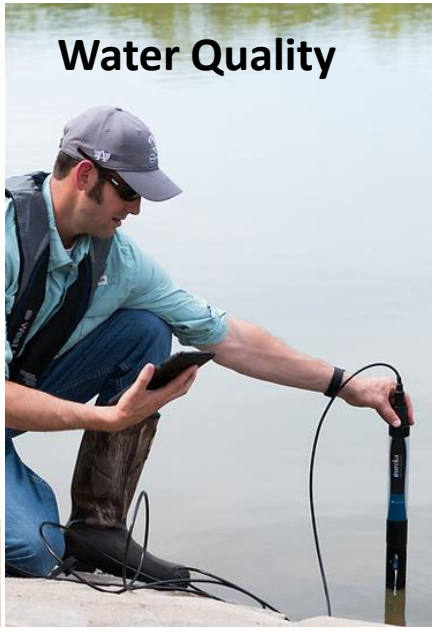
Potential Additions To ELLA Data Capture Options



Heart, BP, Blood Oxy, etc.

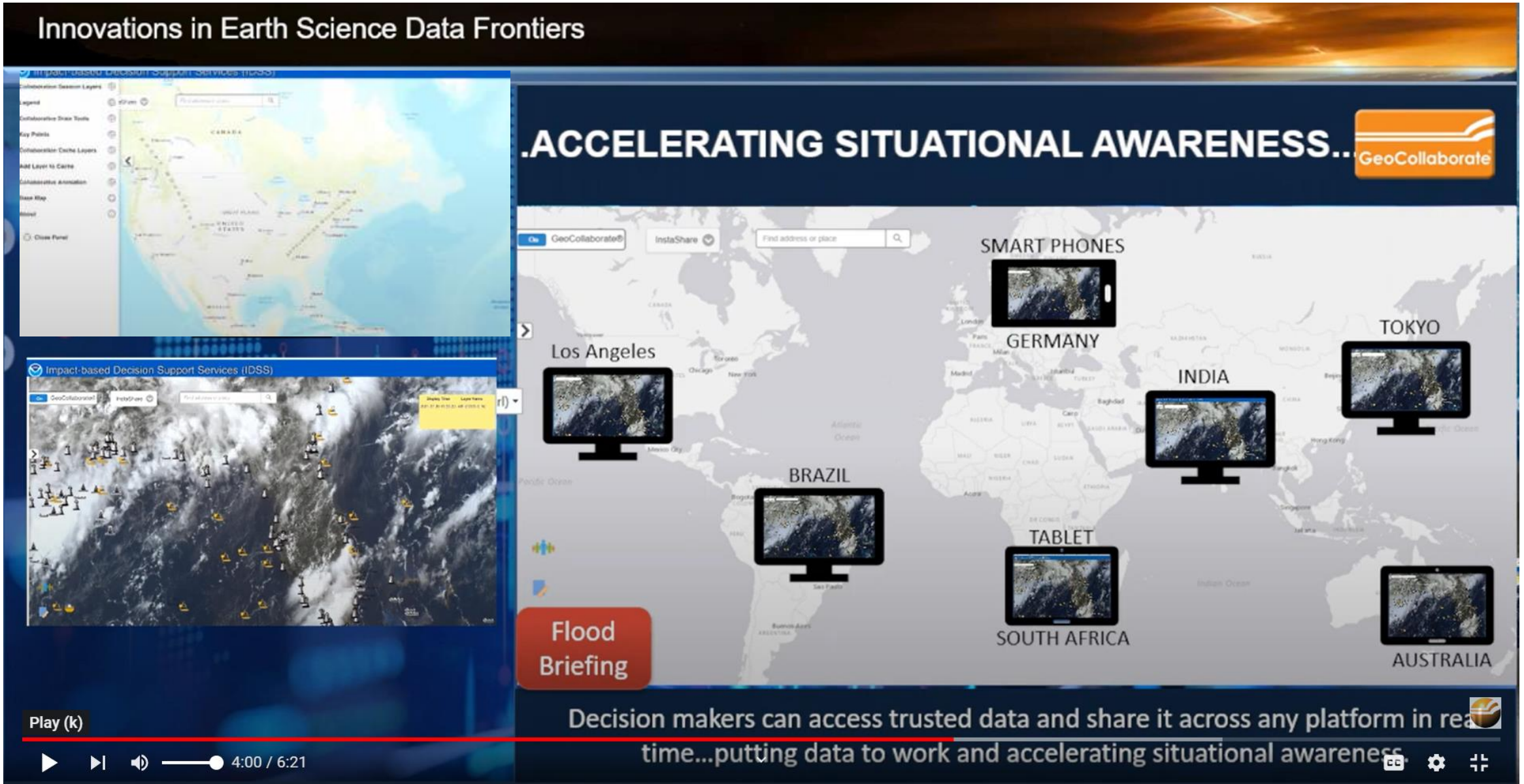


Outside Temperature



StormCenter's GeoCollaborate & Compusult' s WES SW

Matching Data & Analysis to Response Complexities



If Properly Trained, A.I. Can Help Manage Complex Events - Greatly Enhancing Human Capabilities

Find and integrate data inputs **customized** by task and location (ARD)

Rapidly and **continuously monitor** a large scale disaster scene

Distribute intelligence products when and where needed (DRI)

Maintain **continuous contact** between response community and citizens

Support and connect each ESF and each responding agency/organization

Predict single points of failure and the threat of cascading effects

Free up responders from admin overhead for response and rescue work

But Design and Development Will be Challenging.

Privacy compliance in disaster vulnerability assessment: AI and synthetic data

Antonio Correas

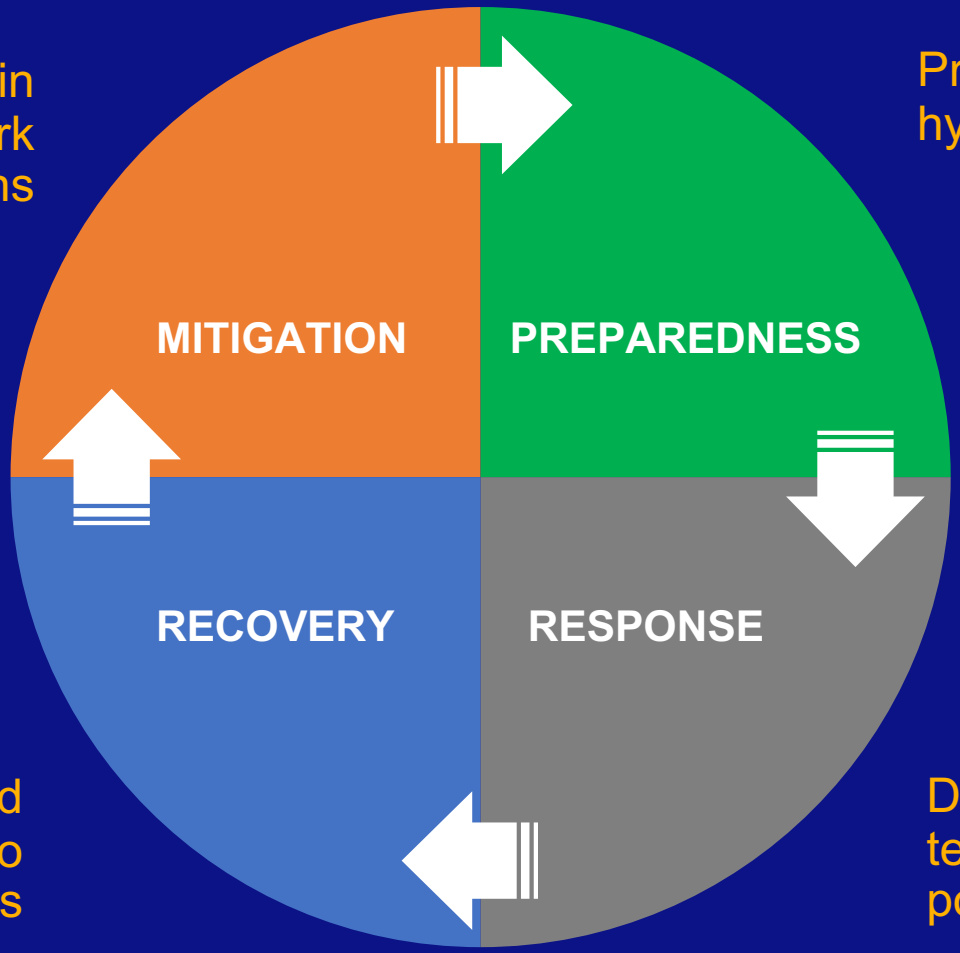
TRB webinar – Improving Data Sharing in Disaster Response with Geospatial Data and AI

07/08/2024

The data supporting disasters management

Address breaking points in the transportation network during mass evacuations

Practice tabletop exercises in hypothetical disaster scenarios



Distribute water, food, and healthcare supplies to affected communities

Dispatch evacuation and EMT teams to high-vulnerability population exposed

The data supporting disasters management

NOT OWNED, NOT PRIVATE

- Geography
- Topology
- Meteorology
- Climate

OWNED, NOT PRIVATE

- Transportation
- Traffic rules
- Healthcare and shelter
- Food and water

OWNED, PRIVATE

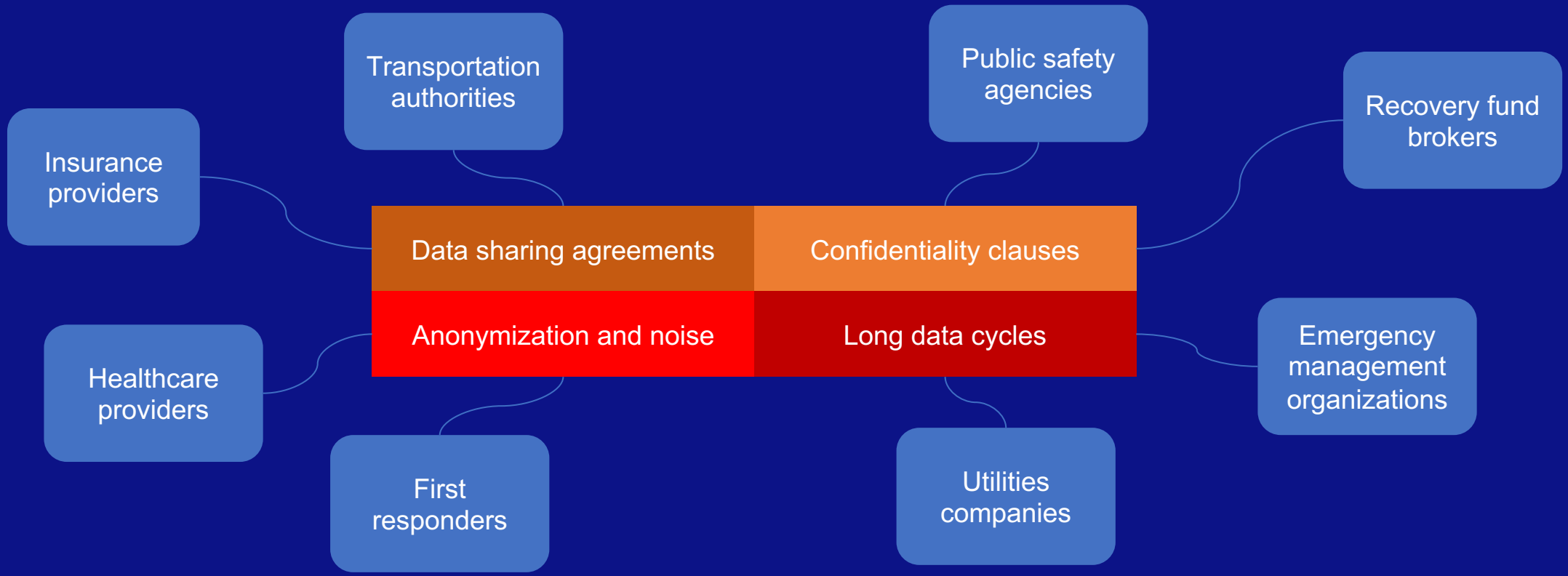
- Demographics
- Health records
- Socioeconomics
- Movement patterns

ACCESS AND USAGE RESTRICTIONS

The data privacy issue

Personal Identifiable Information (PII) and Protected Health Information (PHI) – data that permit to infer identification of an individual

Consequence: fragmented picture, artificial data scarcity



AI and synthetic data

Due to this, disaster data has:

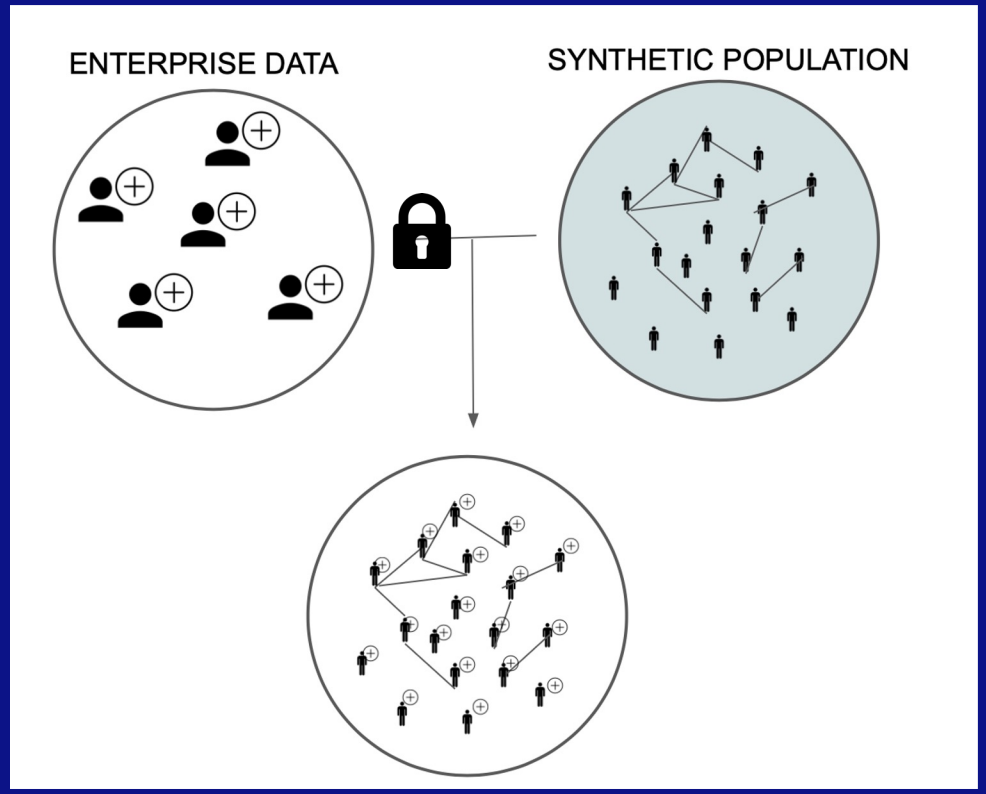
- Reduced scope (e.g., local traffic behavior data)
- Reduced resolution (e.g., aggregate health incidence statistics)

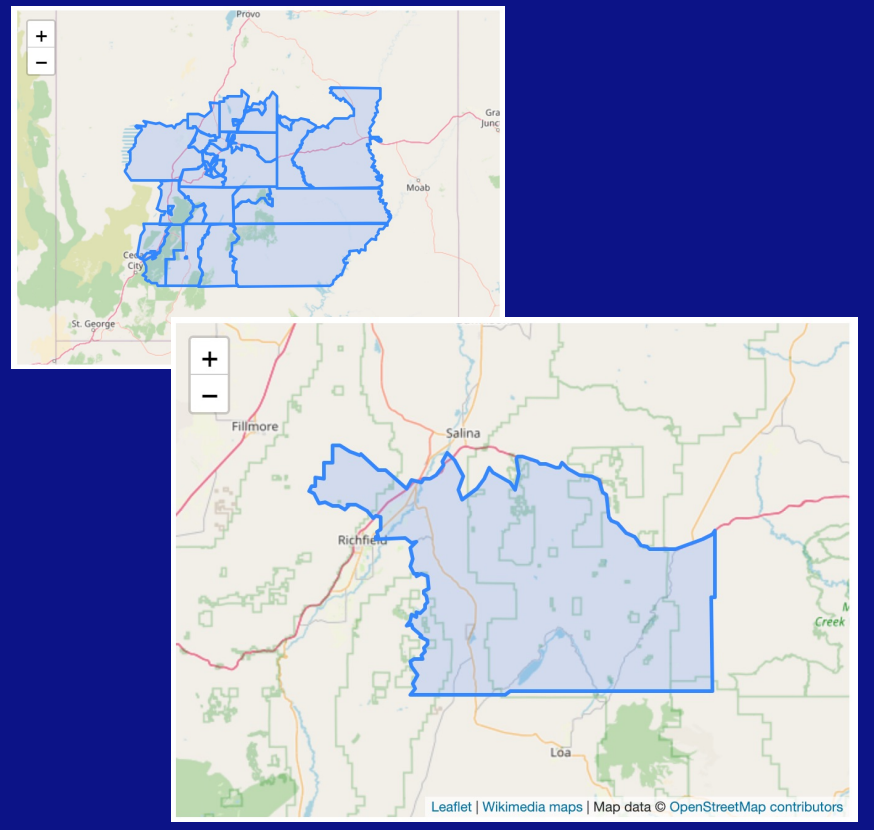
What if instead we let AI "mimic the real world" and synthesize data? What do we get?

- Data privacy
- Full dimensionalization of attributes
- Discrete event simulations
- Hypothetical scenarios

AI and synthetic data

Use case: synthetic population vulnerability dataset supporting discrete event simulations of wildfire evacuation

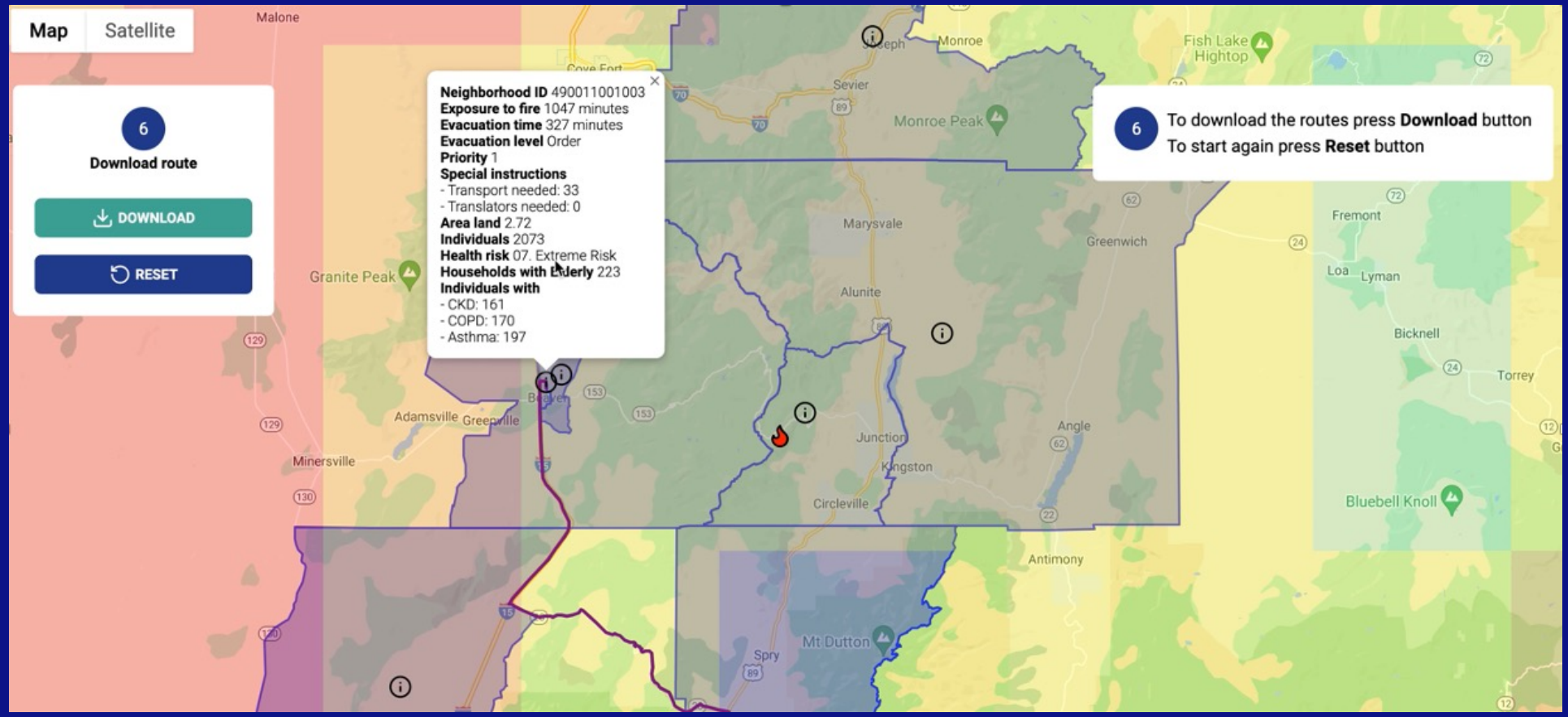




Property	Value
id	490419752001
country	USA
stateCode	49
countyCode	041
tractCode	975200
areaLand	2332.28
areaWater	18.58
households	395
individuals	1140
vehicles	1000
percOver65	30
percDis	26
percCOPD	20
percAsthma	25
percCKD	21
percPOV150	17
percUnemp	13
percNoCov	16
percNoEng	0
percNoVeh	2
percMHHT	10
percNoHSchl	1
healthRiskCode	5
healthRisk	05. Medium to High Risk

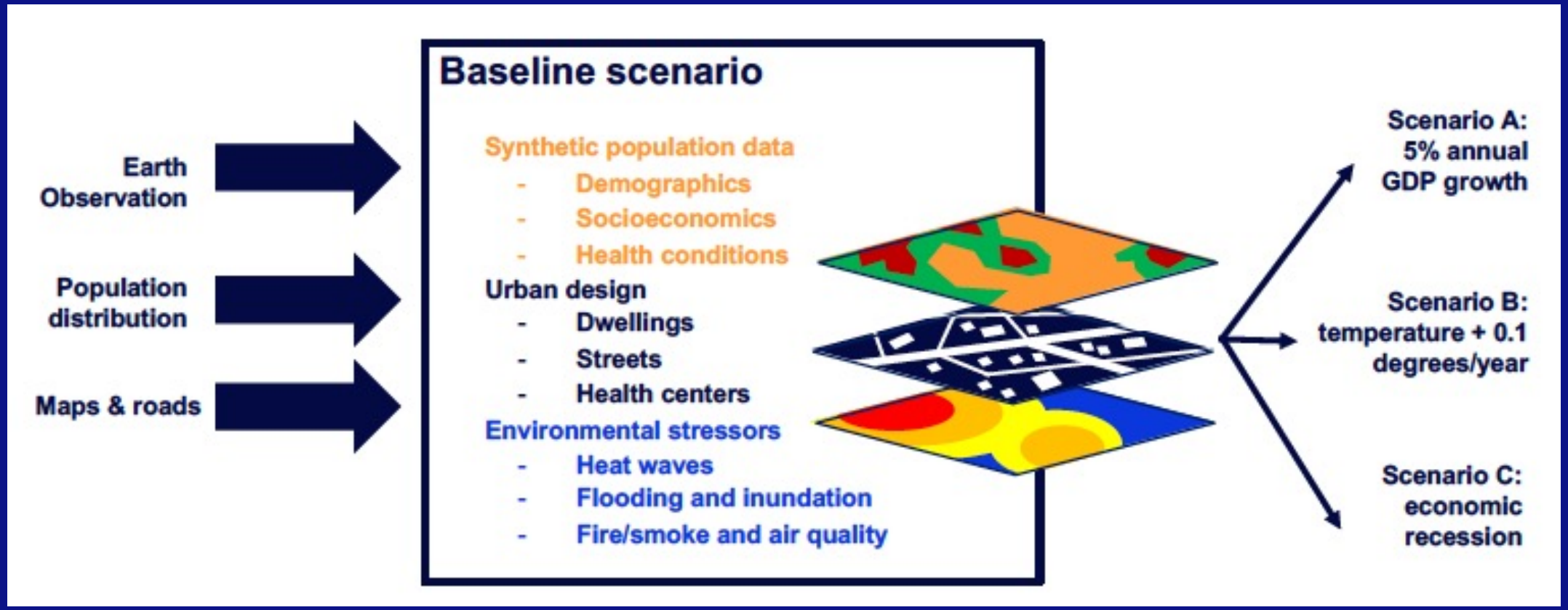
AI and synthetic data

Use case: synthetic population vulnerability dataset supporting discrete event simulations of wildfire evacuation (OGC Disaster Pilot 23)



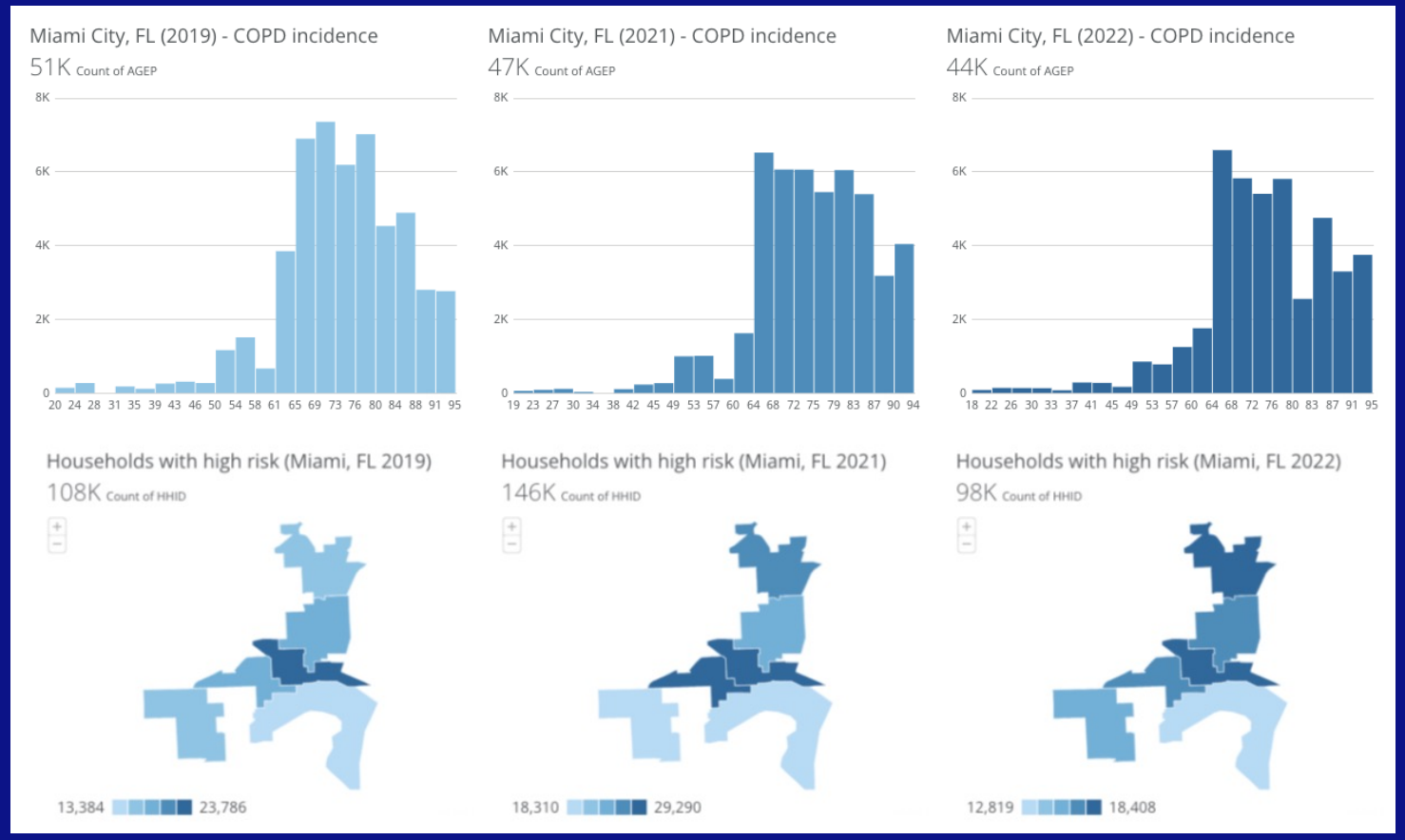
AI and synthetic data

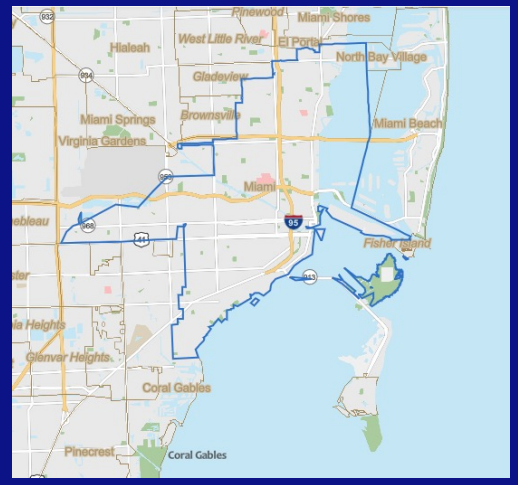
Use case: synthetic digital twin to forecast future scenarios of disaster vulnerability evolution

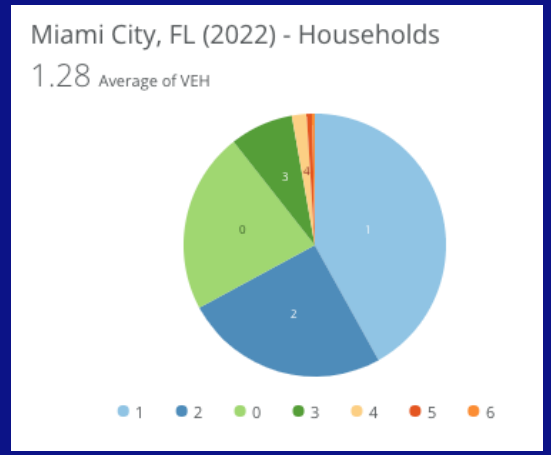


AI and synthetic data

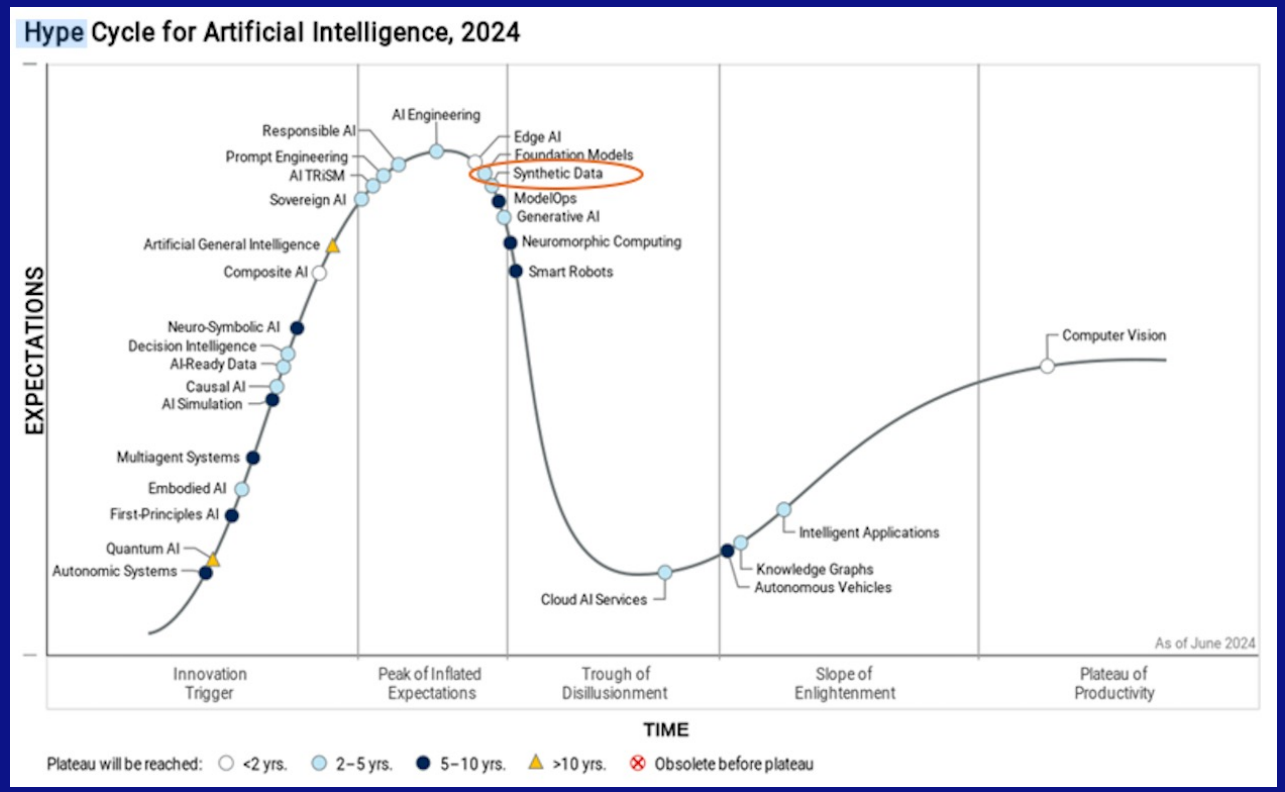
Use case: synthetic digital twin to forecast future scenarios of disaster vulnerability evolution (Miami City, FL)







Quantifying the value trend



Synthetic data achieving productivity plateau in <5y

Mature use cases in healthcare and finance

High ROI expected by reduction of data debt (data security costs, governance complexity, untapped value)

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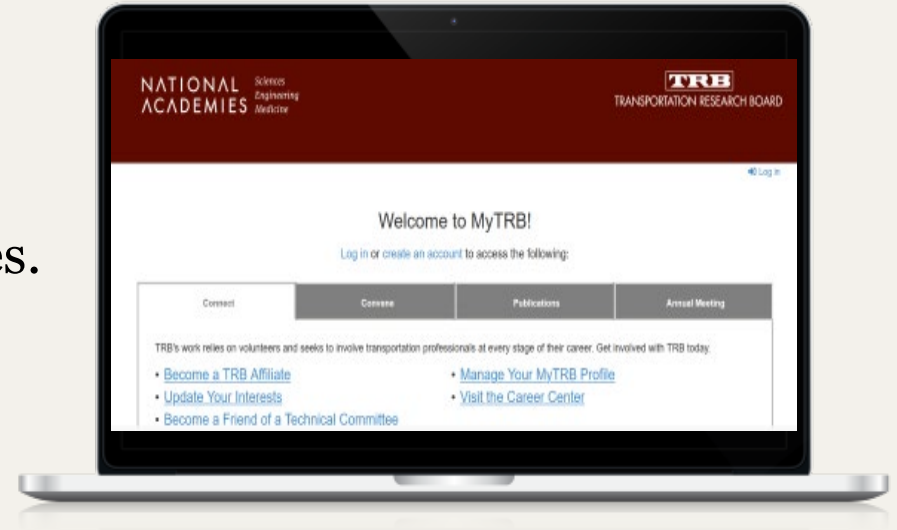

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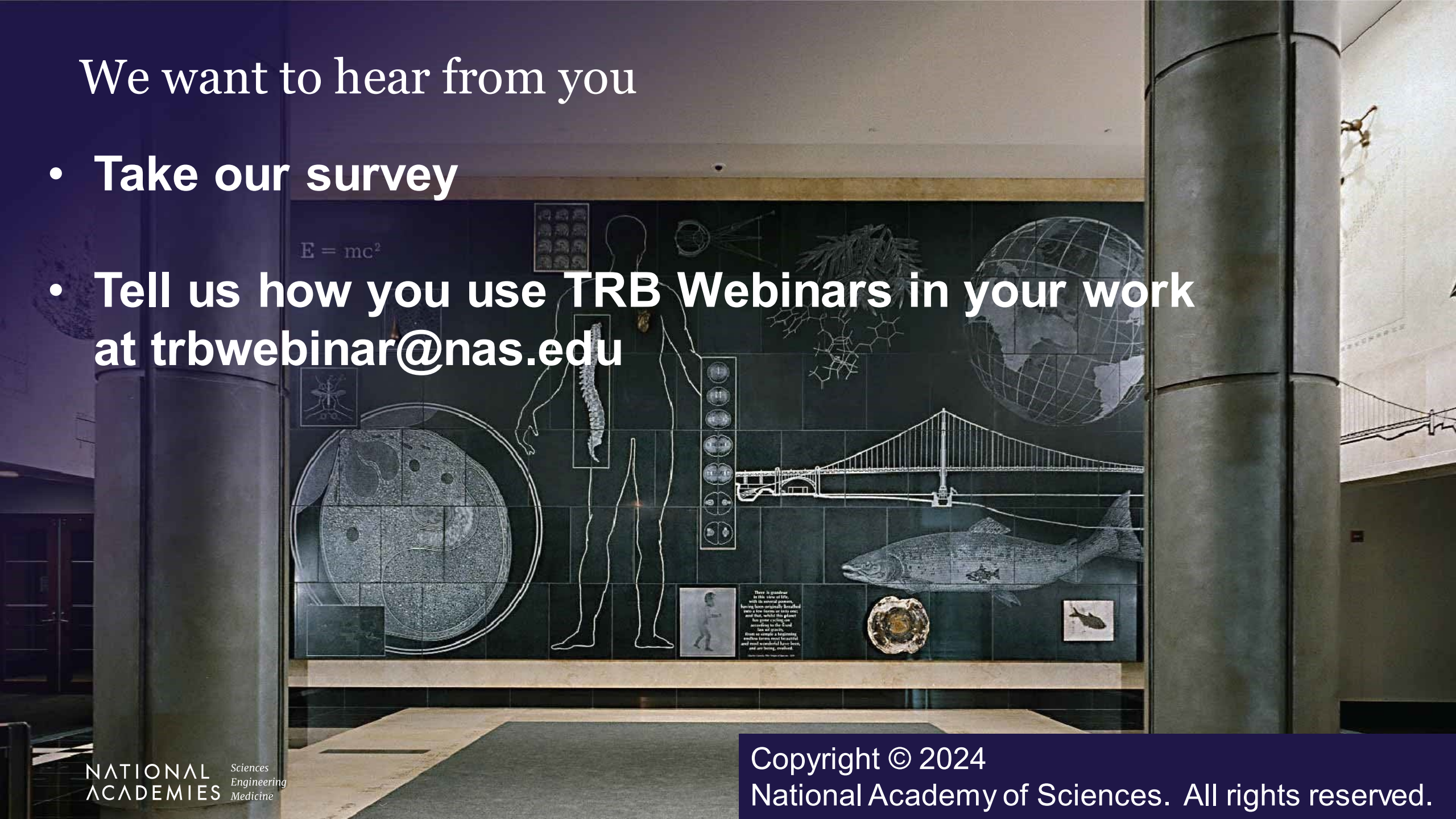

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