

# Beyond the Break: Planning for Infrastructure Intelligence

Turning disruption data into insights for smarter cities

Presented by: Acuitas 3D  
Mark Reiner and Sai Charan Kukunoor

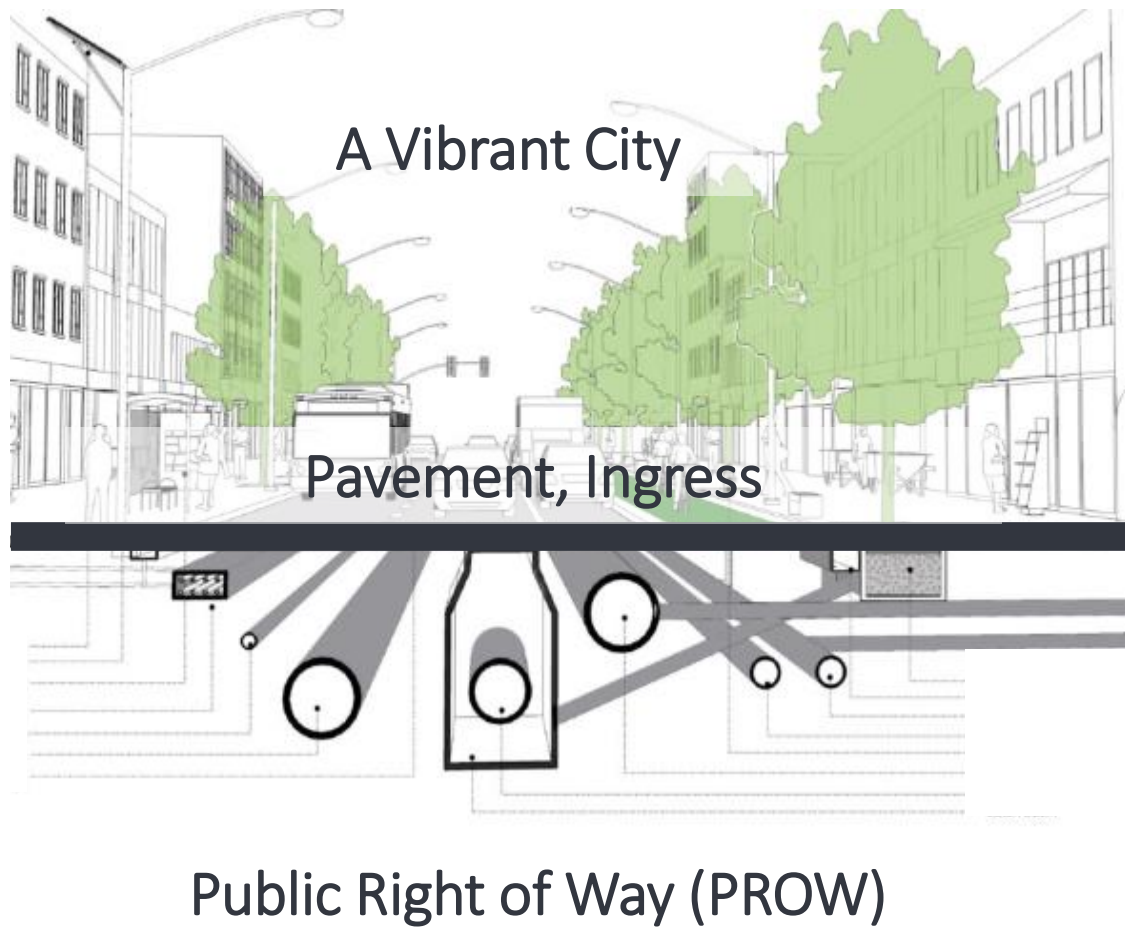
June 5, 2025  
NYC DDC Town and Gown – Under the Ground 3.0



# Year 2075 – Beyond Baseline

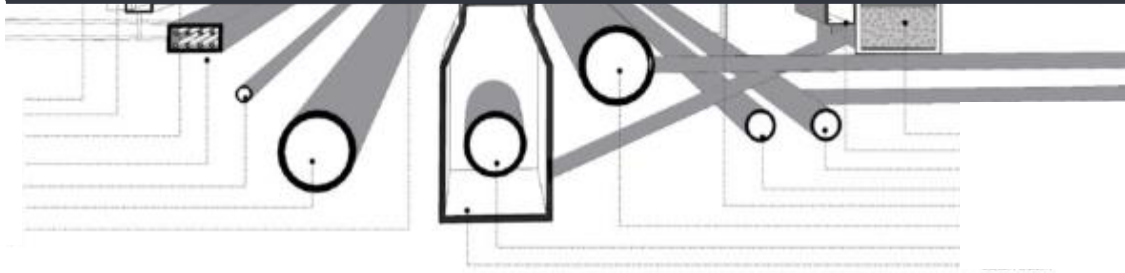


# System of Systems View



- All urban distributive infrastructure (buried and overhead) represent different:
- Services, Owners, Materials, Age, Pressures,...etc.
  - Sector by Sector: Asset management systems...etc.

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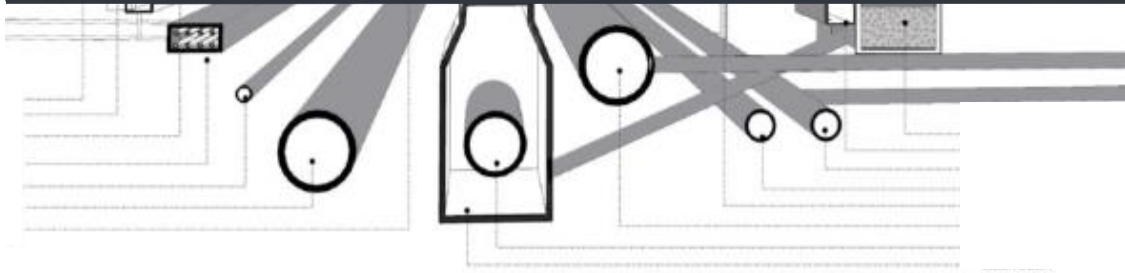
Public Right of Way (PROW)

*When the two worlds meet*

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# System of Systems View



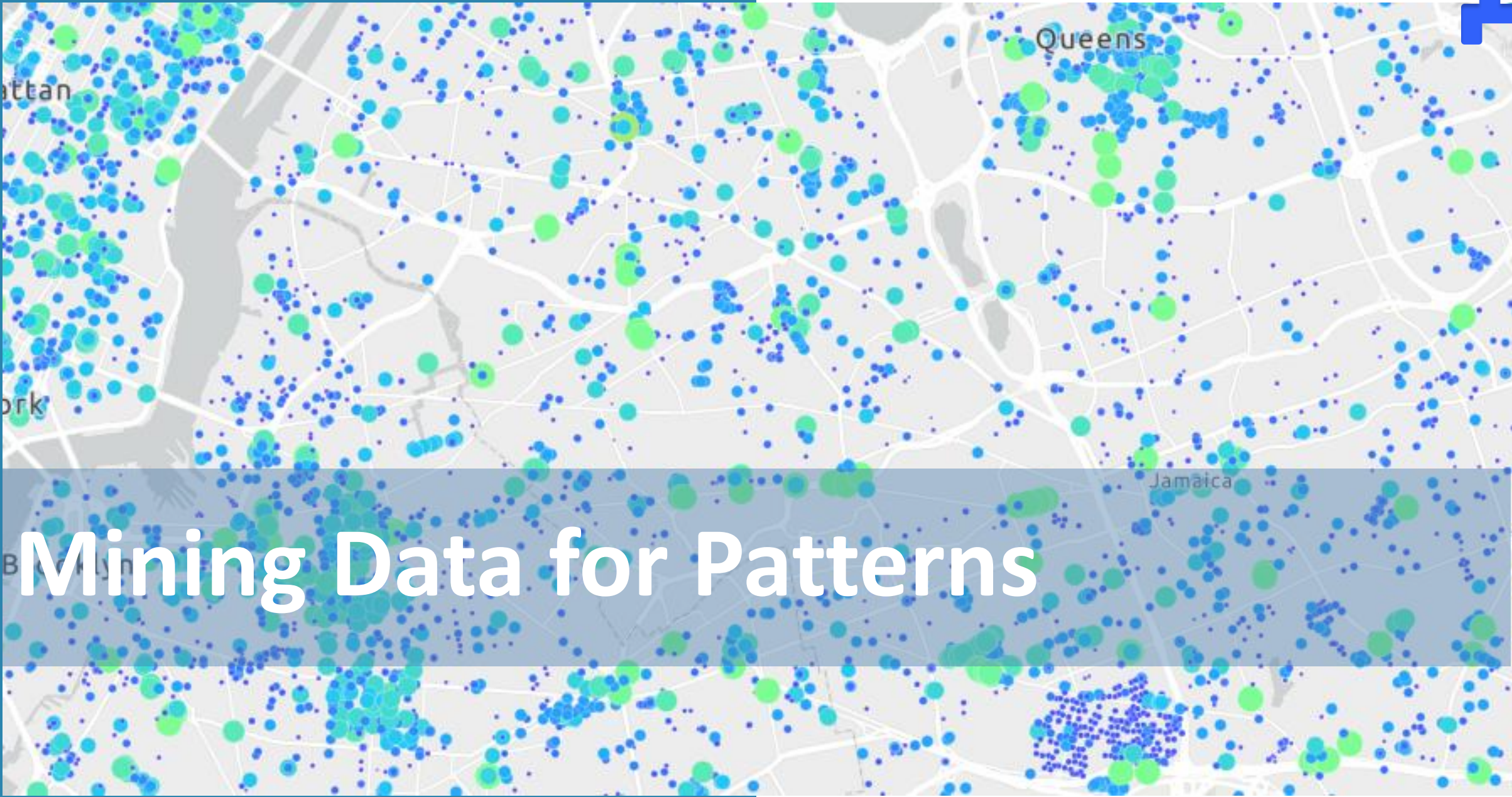
Public Right of Way (PROW)

One permit system answers the:

- Where? When? What sector? Duration? Emergency or Planned?
- Modelling overall “health” and trends
- Digital twin component of the built environment

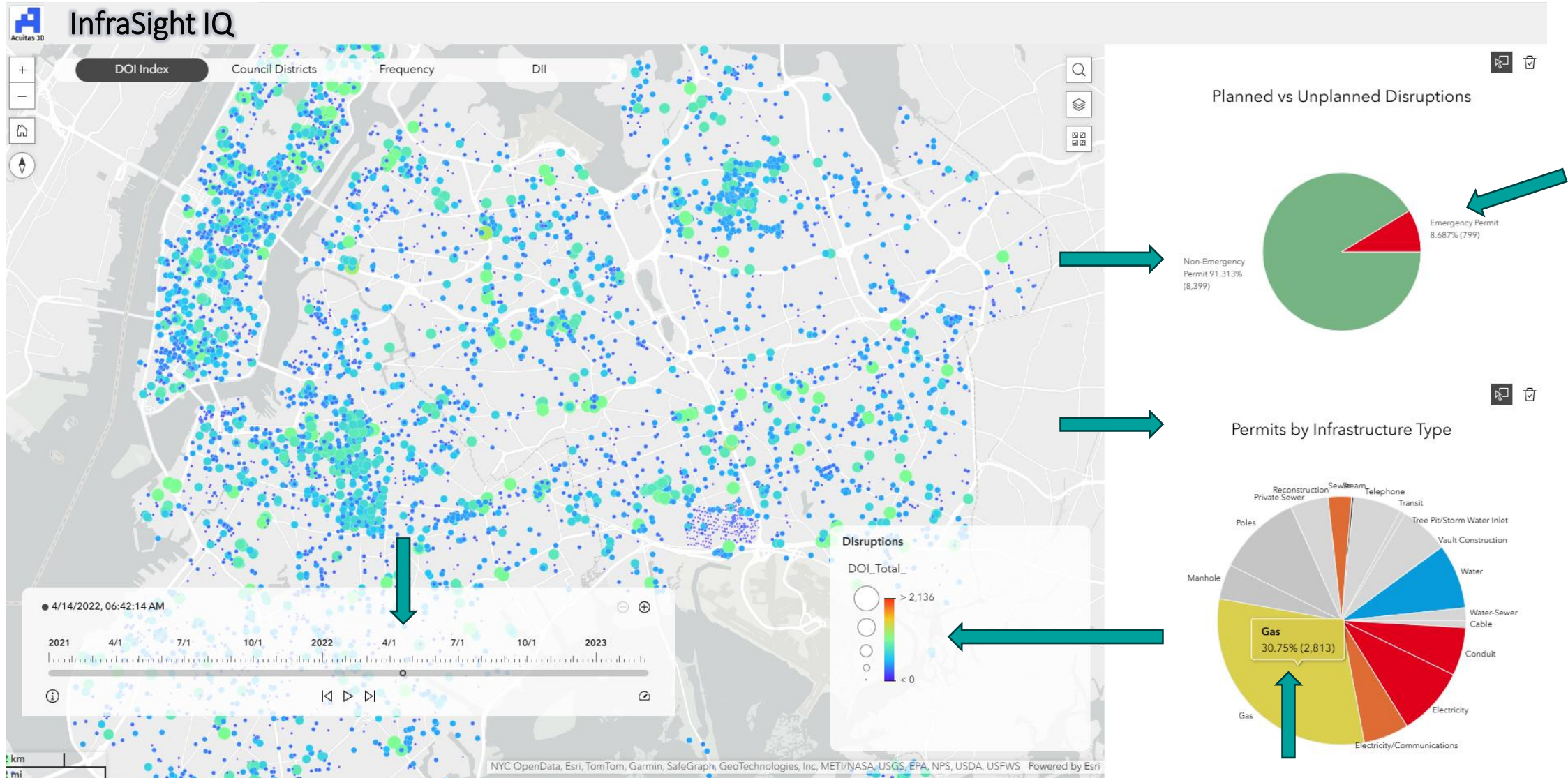
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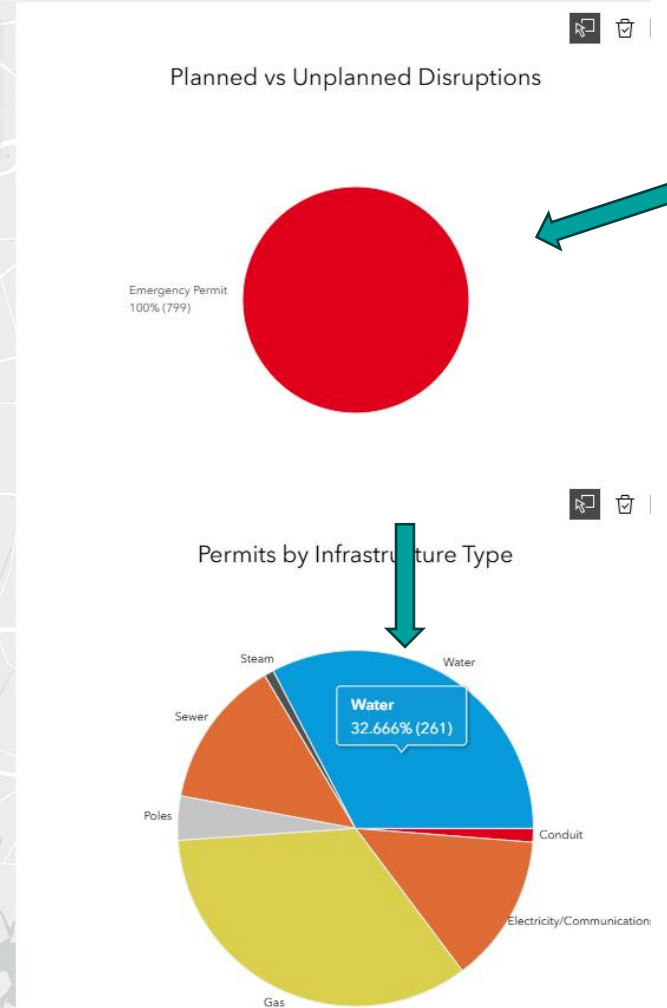
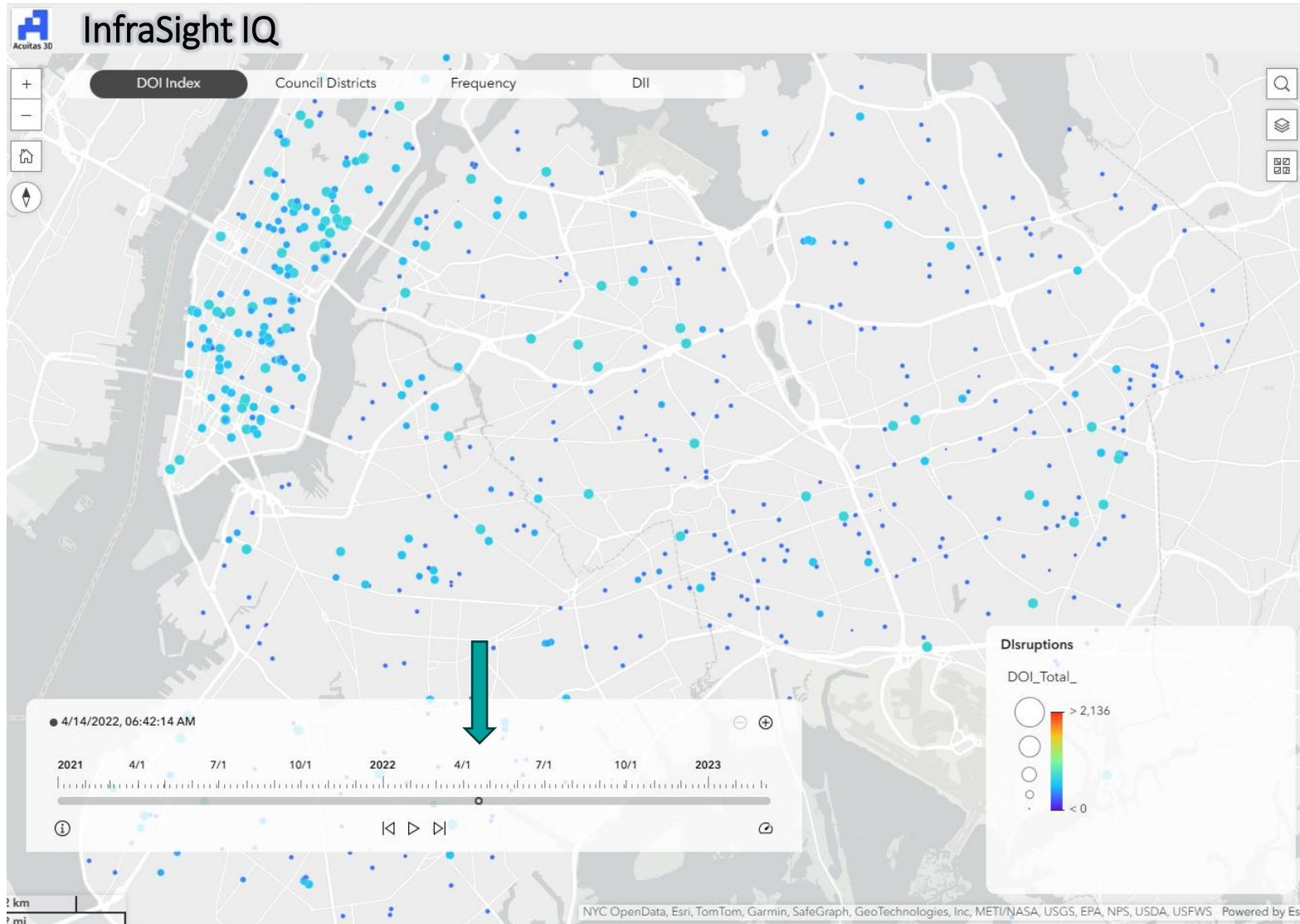


# Mining Data for Patterns

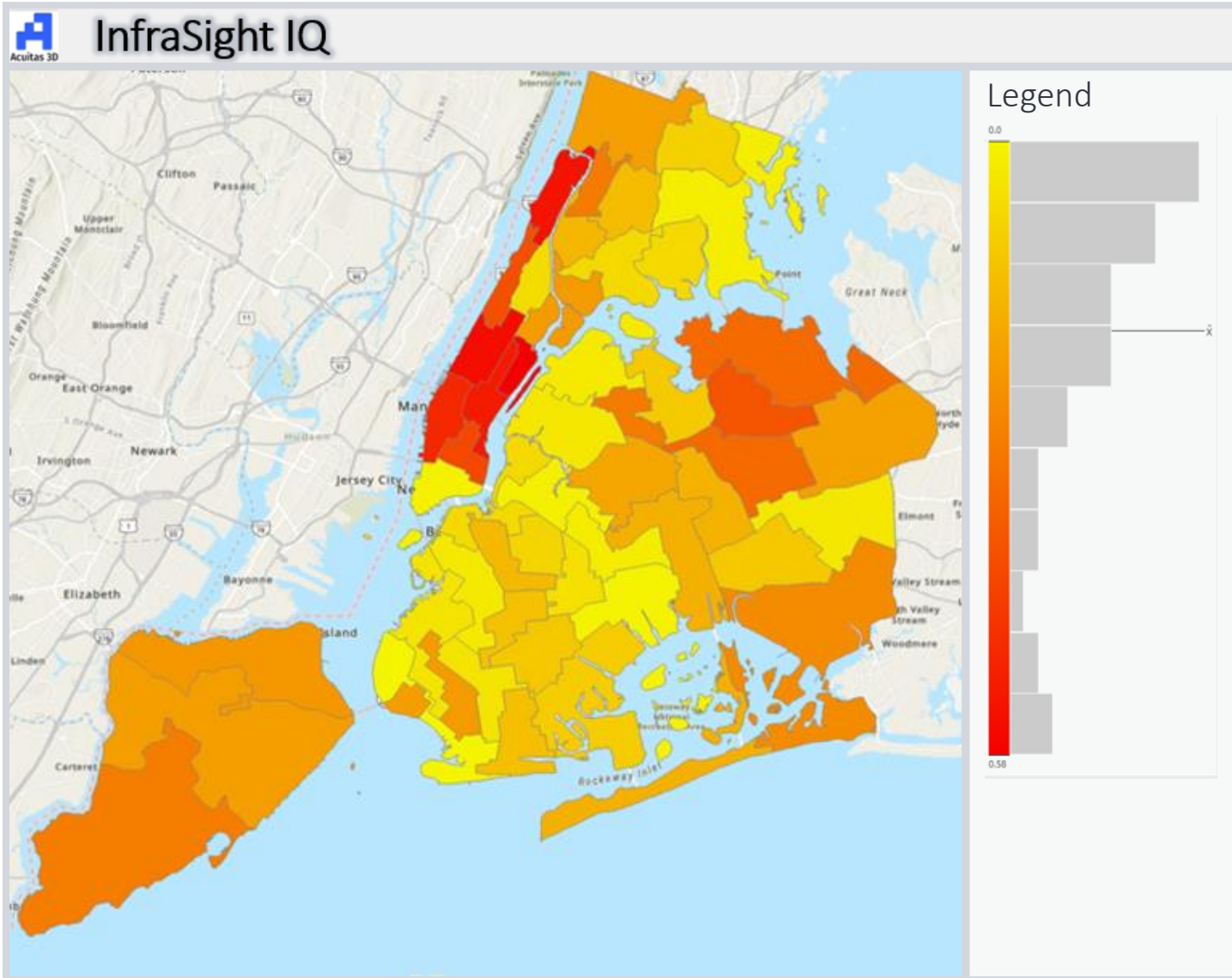
# Establishing the Disruption Occurrence Index (DOI)



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# Permits for Potable Water Assets, % Emergency



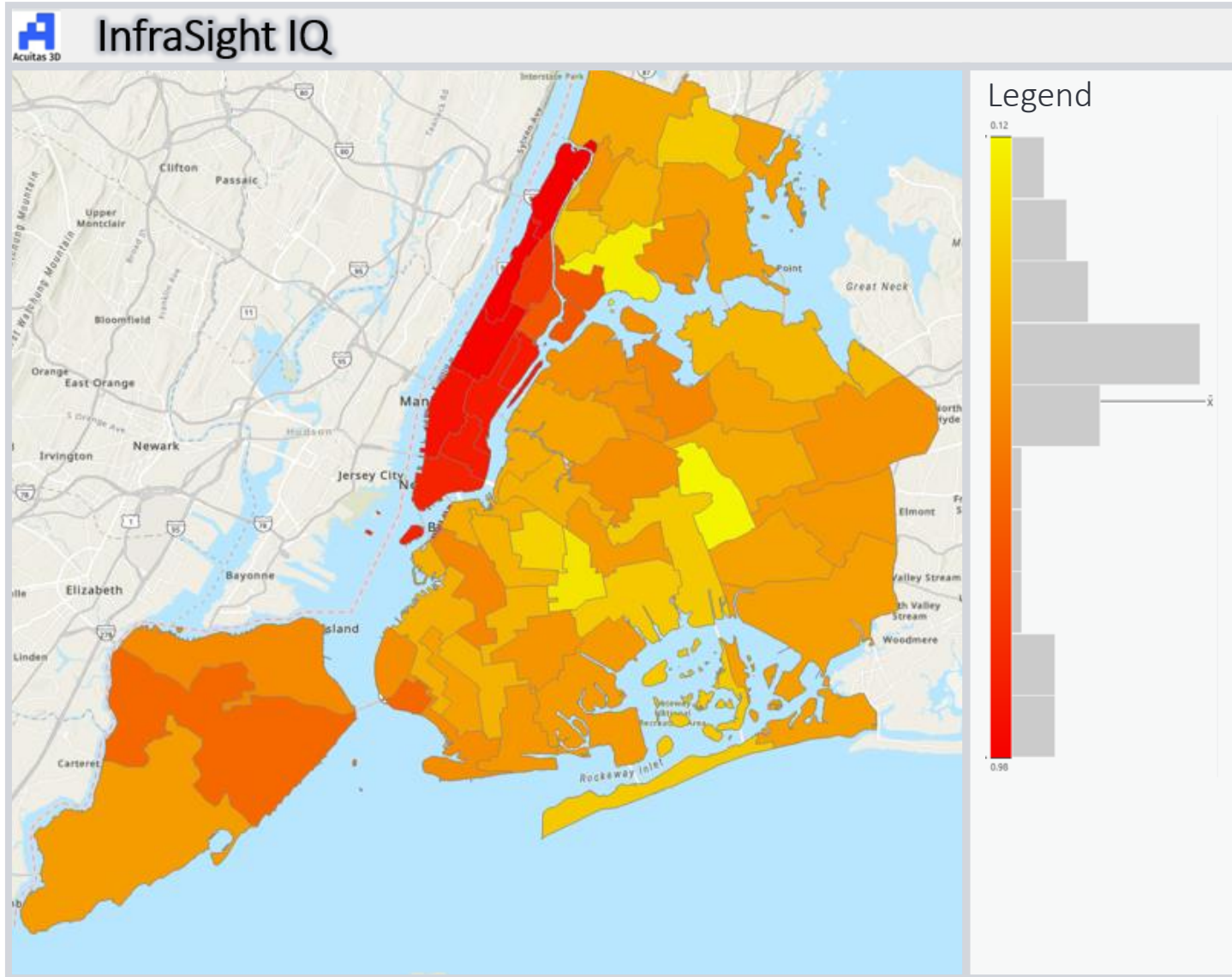
2000 to 2004

← City-wide Median





# Permits for Potable Water Assets, % Emergency

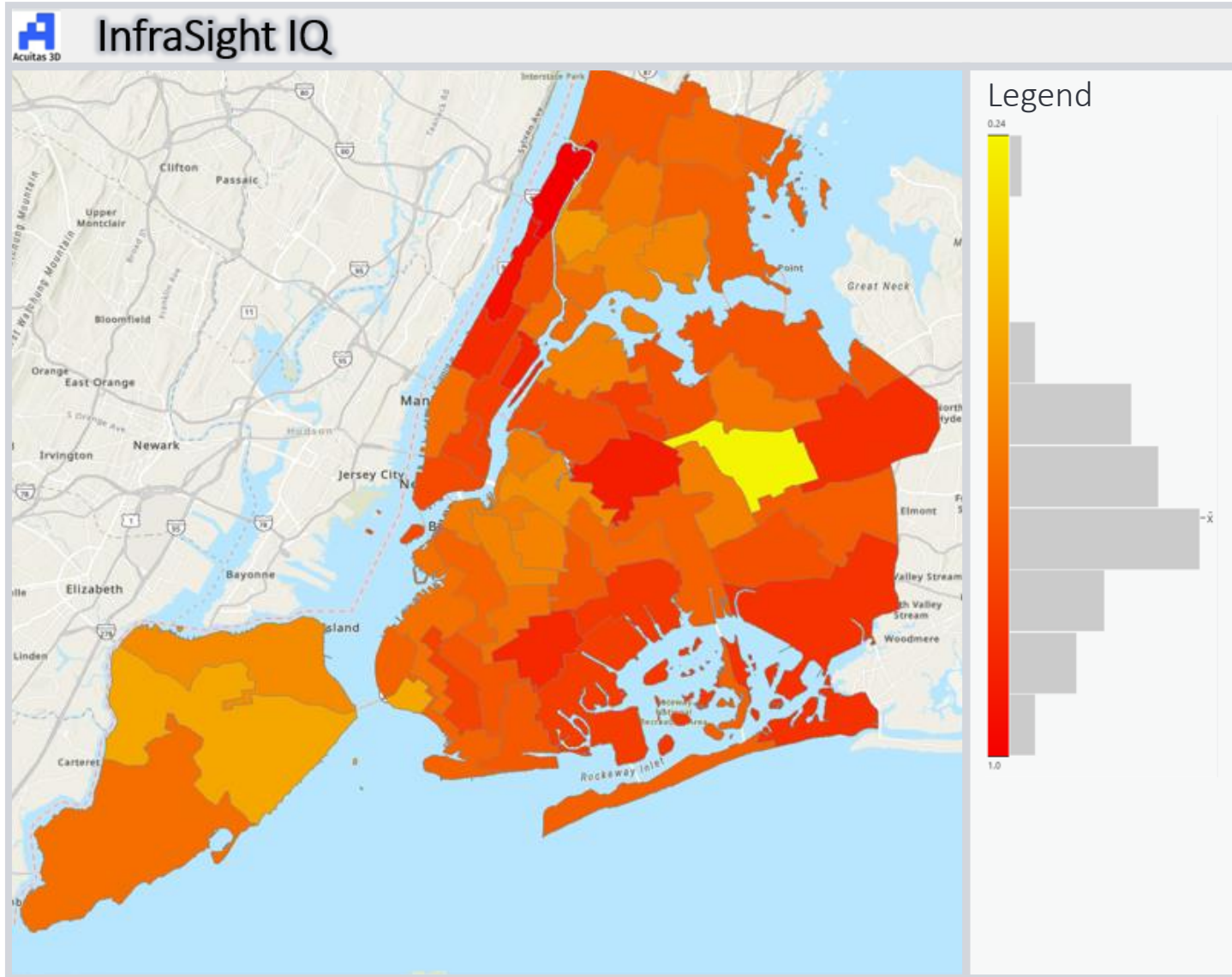


2010 to 2014

← City-wide Median

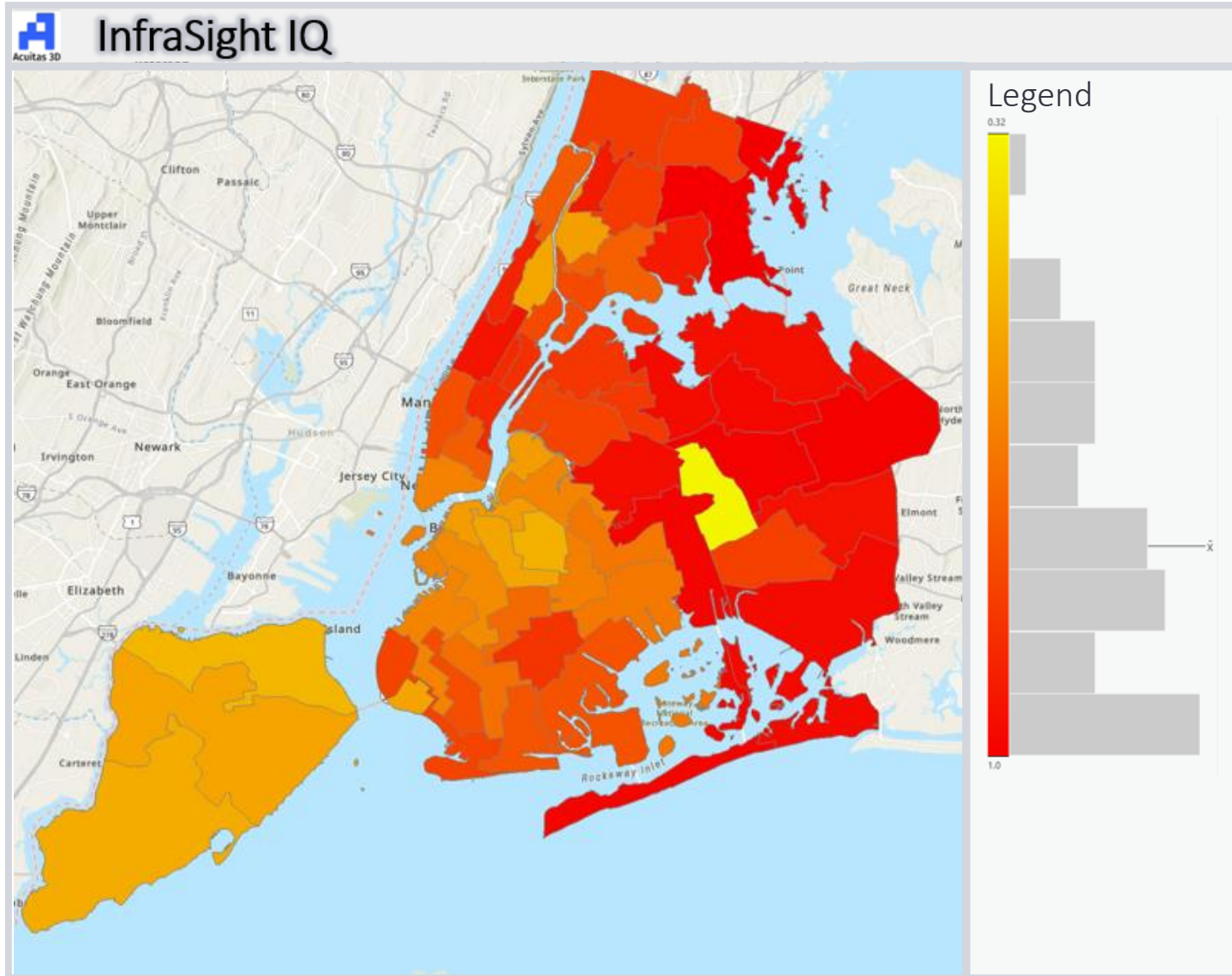


# Permits for Potable Water Assets, % Emergency





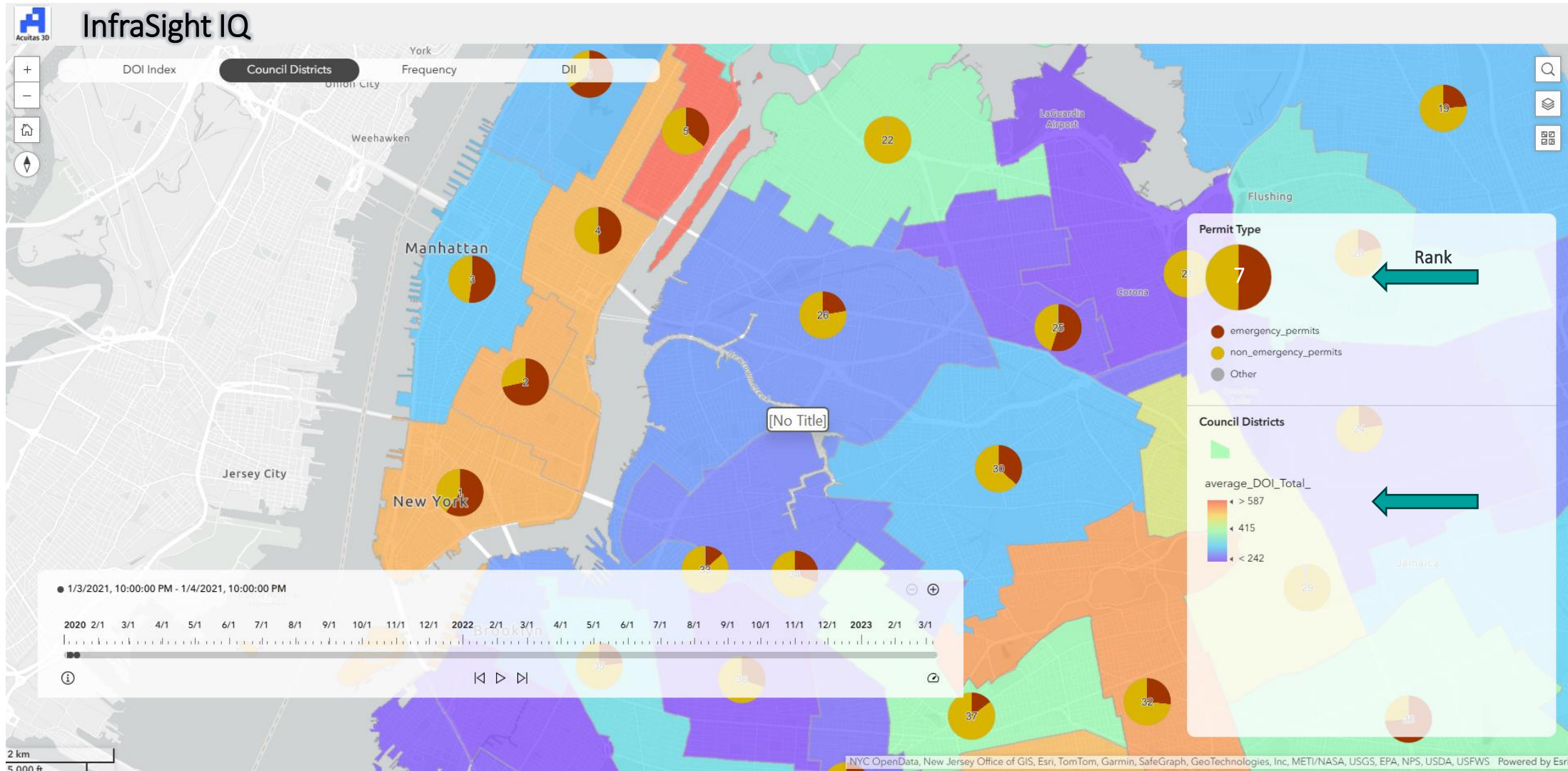
# Permits for Potable Water Assets, % Emergency



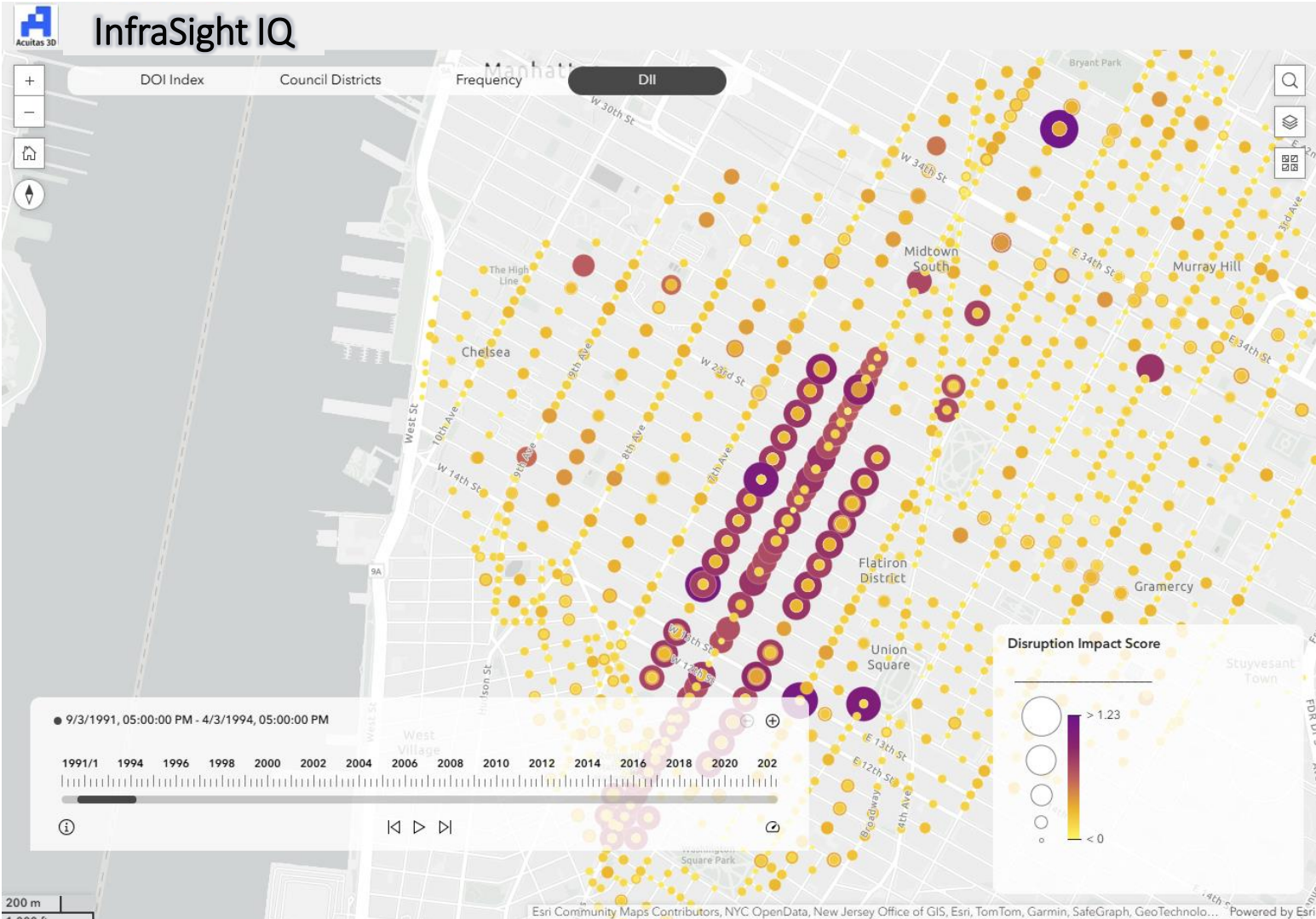
2020 to 2024

← City-wide Median

# Ranking and Change – DOI with Political Boundaries



# Vibrant City Ecosystem Disruption Impact Index - DII

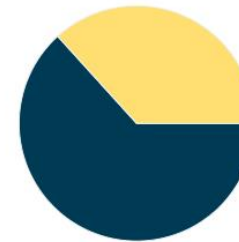


Total Number of Active Excavation Permits: **4,931**



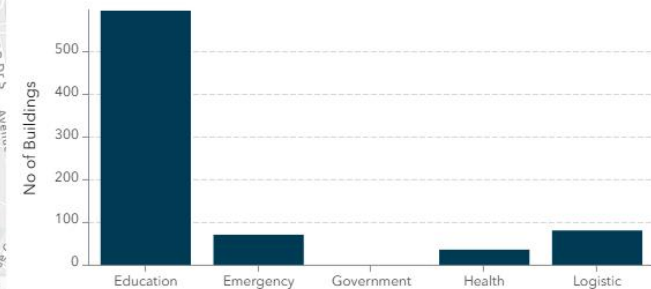
Total population affected by disruptions: **7,080,346**

Building Use Affected by Disruptions



Commercial  
Residential

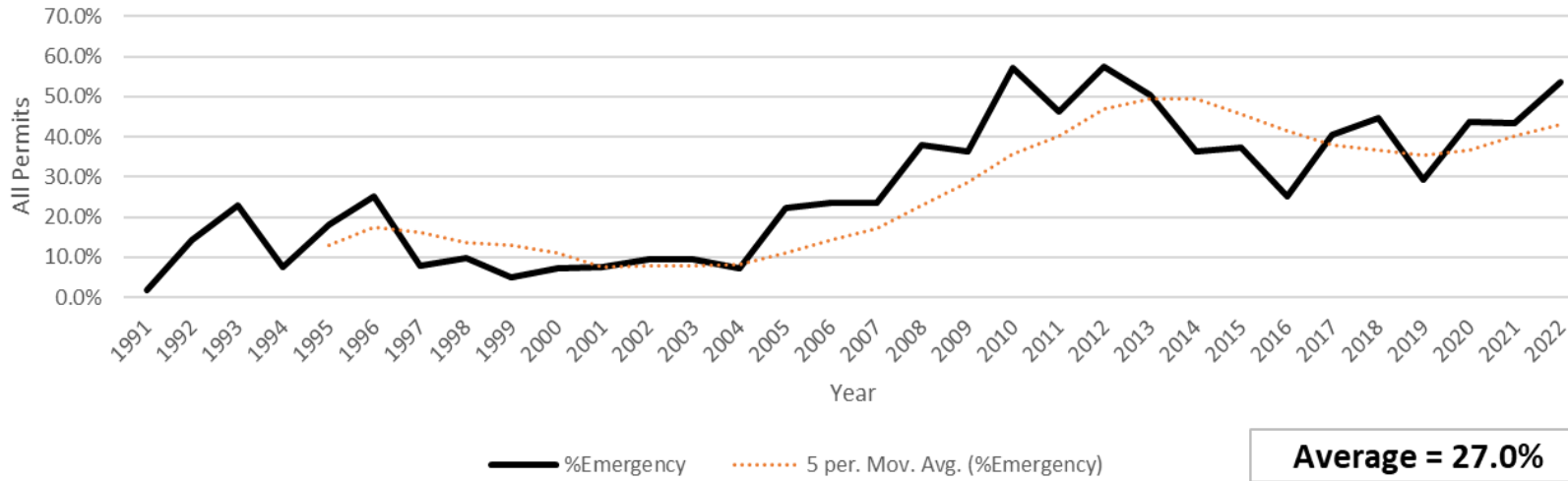
Social Infrastructure Buildings Impacted by Disruptions



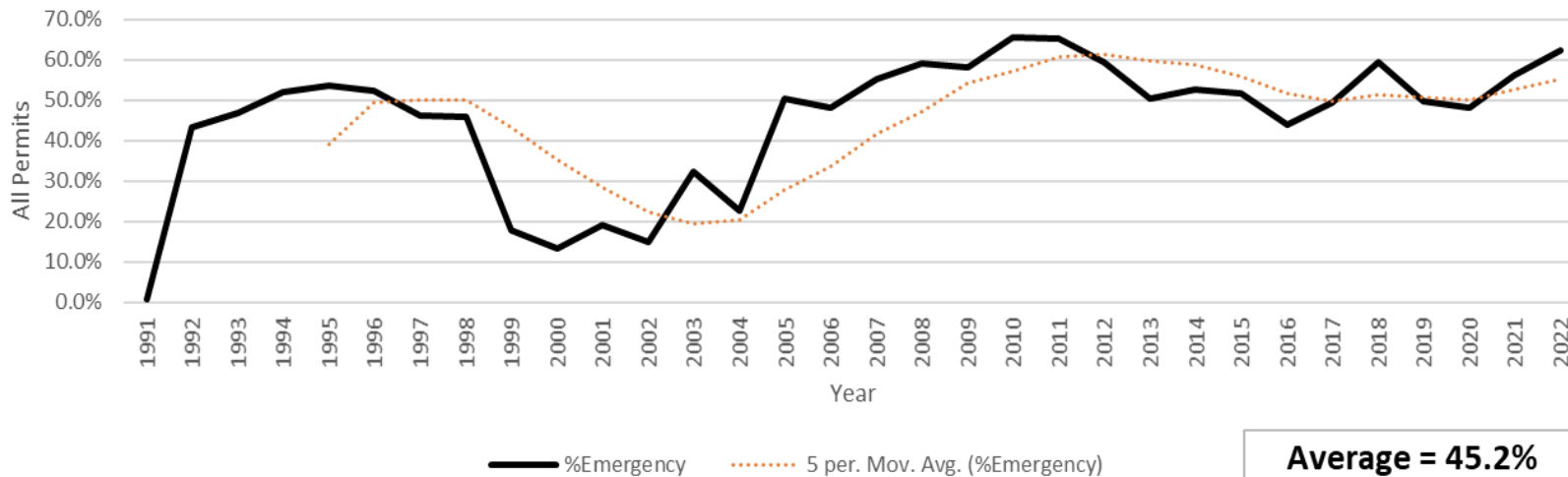
# Trends, Scale, and Spatial: Duration, Sector, Planned...



Manhattan: Sewer Permits - %Emergency



Manhattan: Water Permits - %Emergency



Scale:

- City-wide
- Borough
- Council District, and
- Critical Urban Corridors

An aerial view of a city street grid with colorful topographic contour lines overlaid. The contours are in shades of red, orange, yellow, green, and blue, indicating elevation changes. The street grid is shown in a light grey color. The overall image has a wireframe or technical drawing aesthetic.

# Critical Urban Corridors



# What is a Critical Urban Corridor?

A **Critical Urban Corridor** is a high-value route or public right-of-way where disruptions have **major ripple effects** across city operations, safety, and equity.

These corridors are **not just high-traffic routes**, but **lifelines** that support core public services, emergency response, economic activity, and social equity.

Lays the foundation for **Smart Cities** aligning infrastructure with corridors that are “Disruption Free”.



*Identify*

*Plan*

*Prioritize*

*Protect*

# Key Characteristics of a Critical Urban Corridor



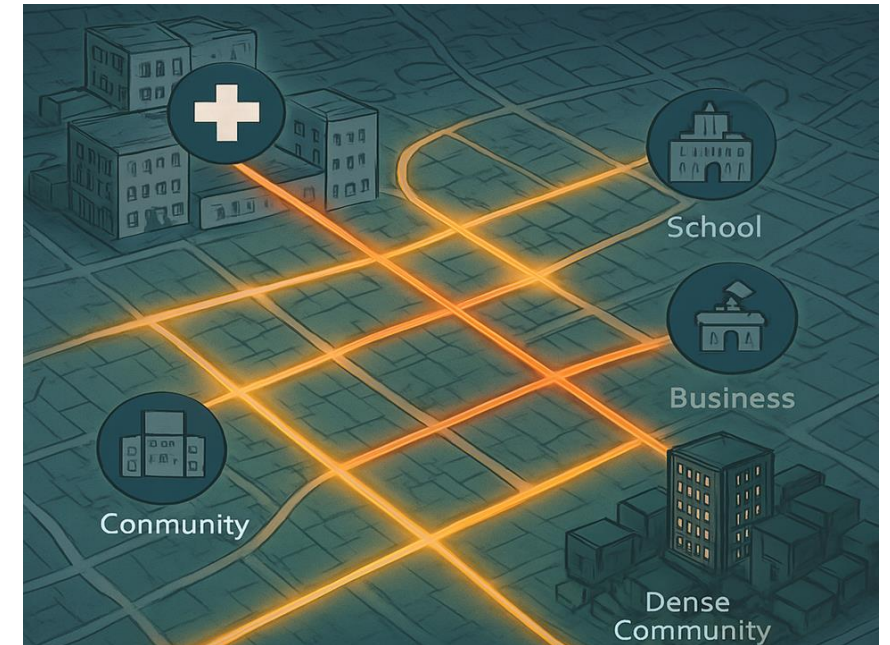
**Essential connectivity:** hospitals, transit, utilities, and CBDs

**Disruption-sensitive:** failures cause widespread consequences

**Multi-sector dependencies:** multiple systems in one corridor

**Equity implications:** serve the most vulnerable communities

**Strategic redundancy:** few or no backup routes or redundancies





# Long Term Strategic Planning

## Sensitive Areas

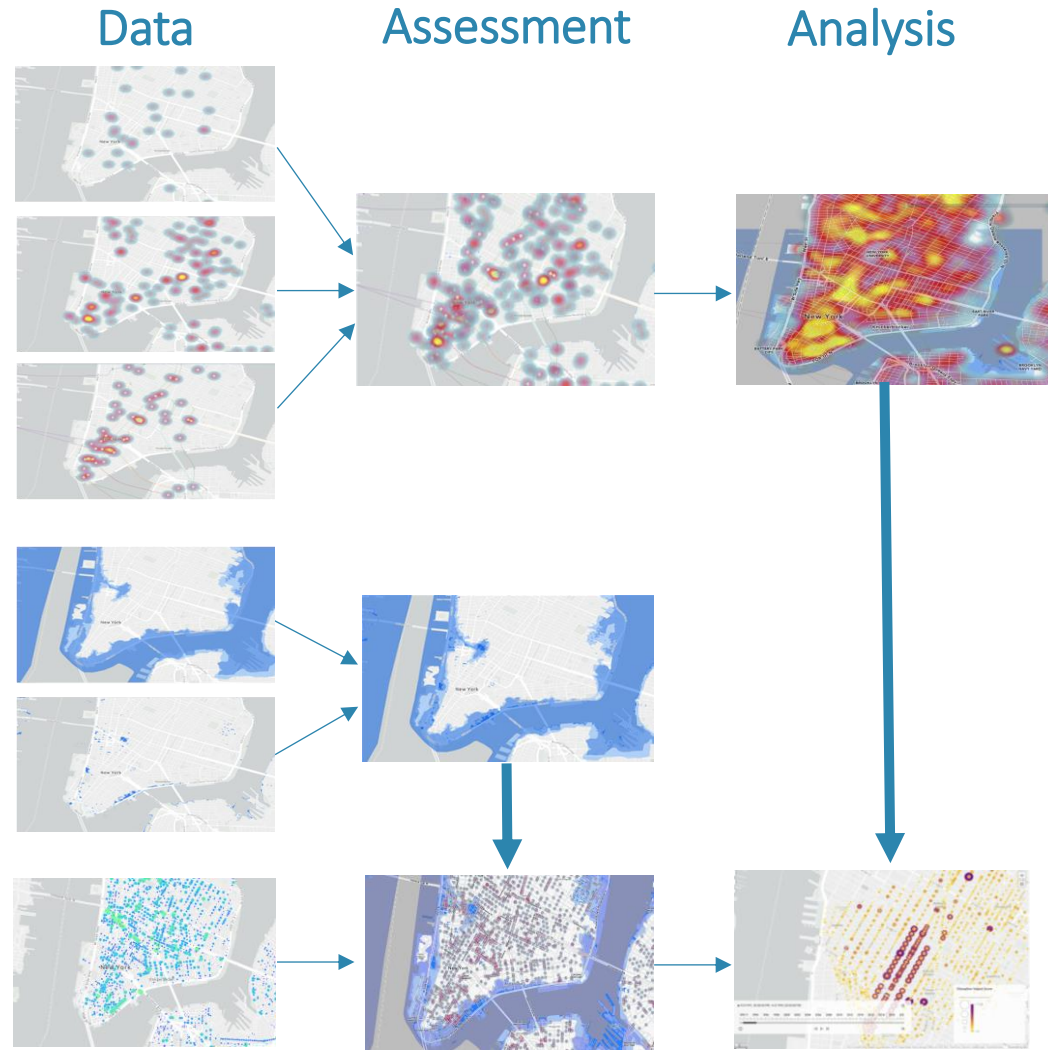
- Schools
- Fire and Police
- Hospitals/Clinics
- Transportation
- Communities

## Vulnerable Areas

- Flood
- Sea Level Rise

## Disruptions

- Planned
- Unplanned



## Disruption Free Scenarios

### Determine:

- Where to harden
- What to move
- Disruption Free Corridors



### Future Proof:

- Safe
- Secure
- Reliable



# Why Critical Urban Corridors Matter

Ensure continuous mobility

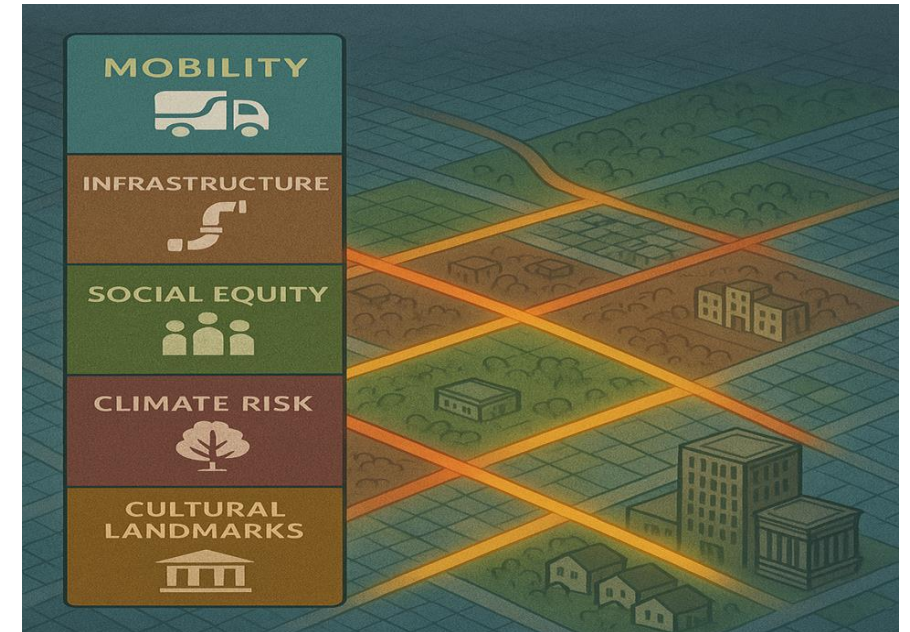
Enhance resilience

Minimize economic impact

Streamline infrastructure & utility management

Improve safety and quality of life

Enable better governance



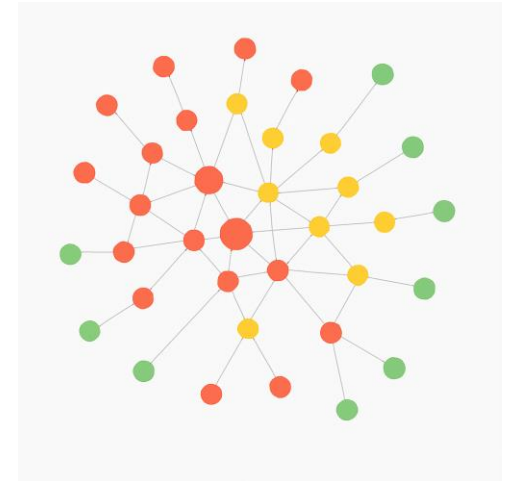
*Critical Urban Corridors are the first step toward building a connected, adaptive, smart, and resilient city.*

# Graph-Based and Ecosystem-Integrated Approach



Graph-based analysis: PROW World:

*Which assets are most likely to cause big problems if they fail?*  
It's all about **network connections** — the more things rely on an asset, the **higher the risk of cascading failure**.



InfraSight IQ analysis: Vibrant City World

*“Where and why do **disruptions** actually happen, and what **ripple effects** do they create **across a city’s ecosystem**—so we can **plan smarter** to avoid them?”* It's based on real **patterns**, and **cross-system modeling**.



The biggest missed opportunity for efficient infrastructure management and long-term is hiding in plain sight:

## Public Right-of-Way permits



They're filed for every cut, dig, and disruption- yet rarely used for anything beyond approval and archiving.

# Current Permit System

- Built for compliance, not intelligence
- Siloed
- Minimal data captured
- No coordination
- No feedback loop into planning

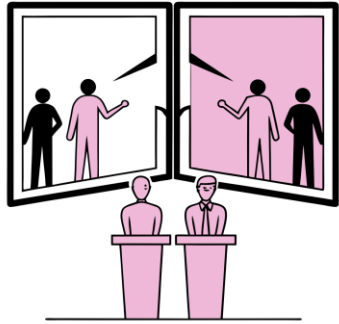


# Vision for Permit System

- User-centric
- Smart data capture
- Automated conflict detection
- Anomaly alerts
- Live API
- Open, modular design



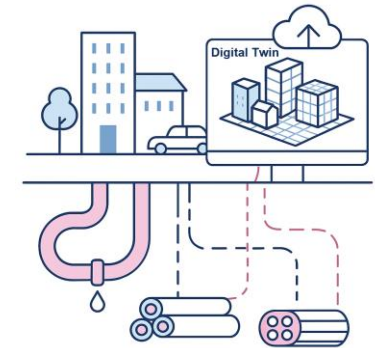
# Benefits of a Smart Permit System



Improved Transparency



Enhanced Collaboration



Feedback loop for Digital twin's



Informed Decision-Making



Efficient enforcement and Anomaly detection



Integrating real-time data streams



Contact: [Mark.Reiner@acuitas3d.com](mailto:Mark.Reiner@acuitas3d.com); [Charan.Kukunoor@acuitas3d.com](mailto:Charan.Kukunoor@acuitas3d.com); [www.acuitas3d.com](http://www.acuitas3d.com)