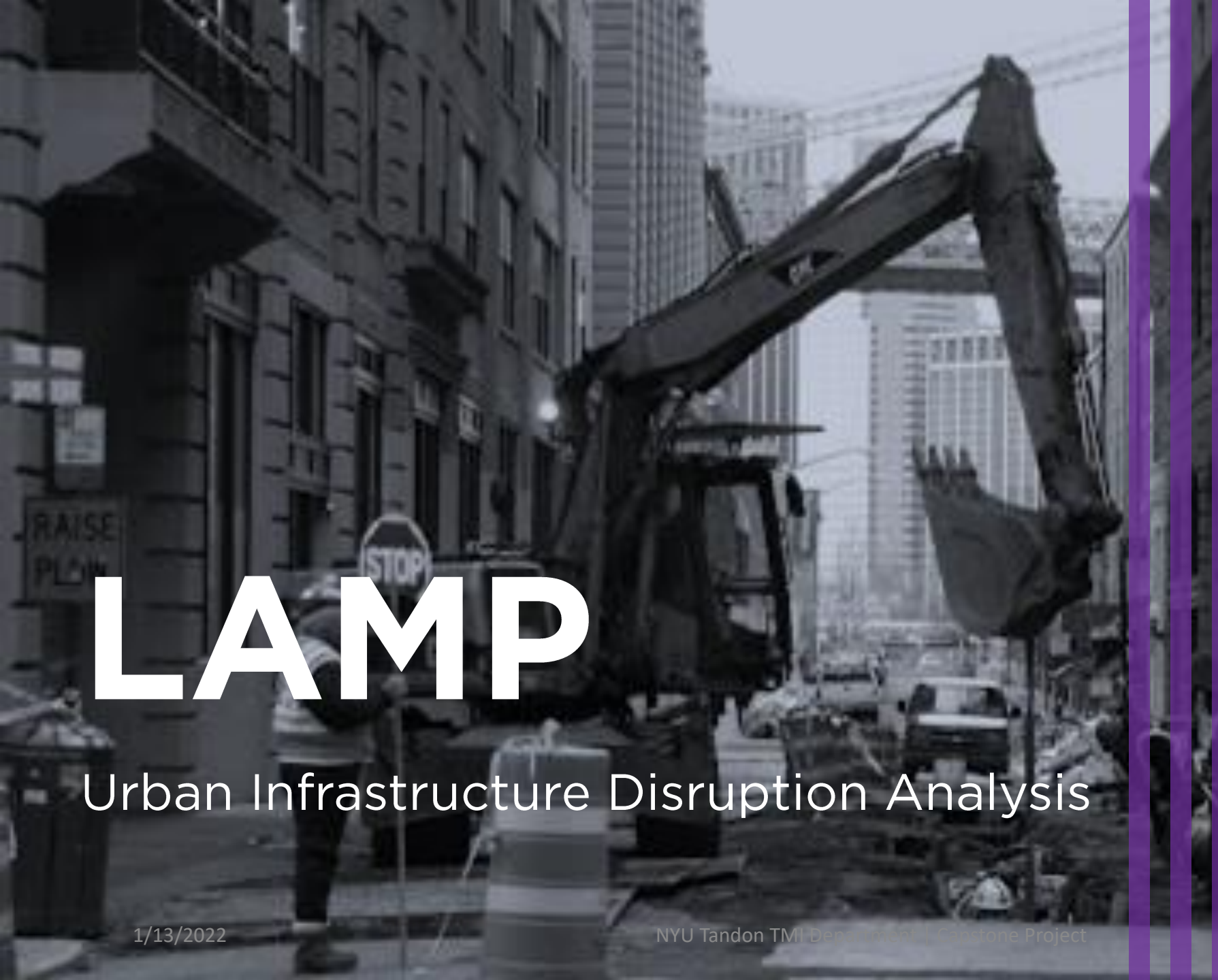

LAMP

Urban Infrastructure Disruption Analysis

NYU TANDON SCHOOL OF ENGINEERING

Capstone Project

Department of Technology Management and Innovation

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Edward Wang
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Kwang Soo Park
Shreta Mohan
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Toward a "Smarter" City: Utilidors (Utilidor Working Group)

In January 2019, the Utilidor Working Group picked up from 2006 idea for pilot utilidor implementation program from Edison and OMB value engineering study

Utilidors = transitable linear subsurface infrastructures that

- safely segregate public and private utility transmission infrastructure
- protect infrastructure from damaging subsurface conditions, subsurface spaghetti problems, and accidental strikes
- permit easier lower-cost access to infrastructure for increased periodic state of good repair activities with minimal, if any, street excavation
- reduce predictable failures causing personal injury and property damage
- significantly lengthen roadway design lives
- permit application of remote sensoring equipment for real time asset and commodity monitoring for preventive repairs and safety purposes
- produces long-term direct cost savings to NYC's public and private utilities and NYC as a municipality

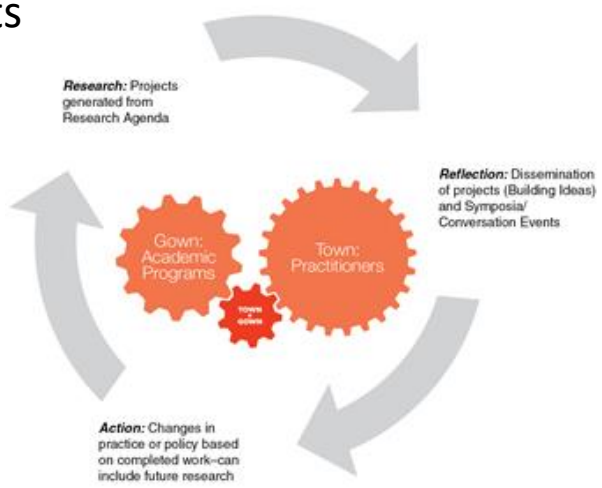
Context for this NYU/Tandon-MOT Project

1/29/20 Under the Ground: Planning, Management, and Utilization Event

2020 Columbia/SIPA lifecycle cost benefit analysis model showed benefits greater than costs

4/28/21 Under the Ground: Planning, Management, and Utilization.2 Subsurface Transformations for a Smart, Sustainable and Resilient City Event

Fall 2021 NYU/Tandon-MOT LAMP Project—today!



Spring 2022 Columbia/SIPA project will:
quantitatively assess social costs
evaluate financial benefits from subsurface public right of way accruing to private utilities that franchises do not reflect and
evaluate the costs/benefits from remote sensoring

LAMP

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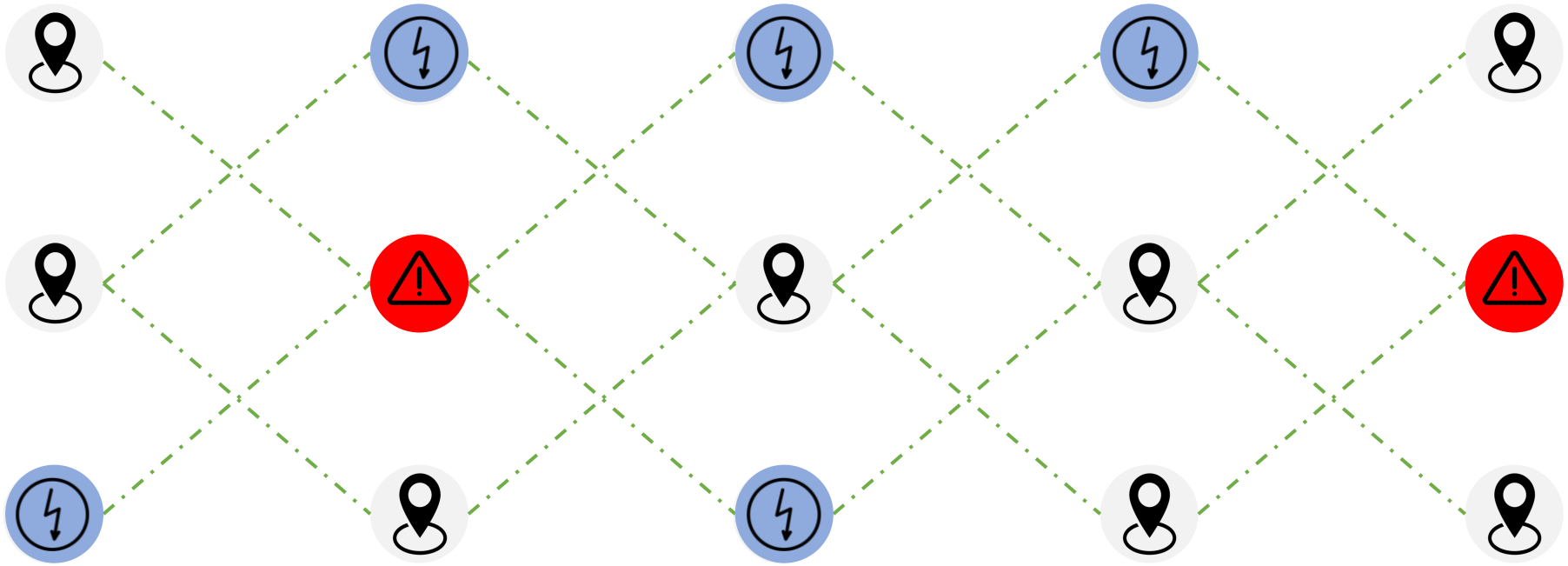
Methodology to understand disruption in urban environments.



Locate Urban Data

Understand It

Inform Decisions

Scope

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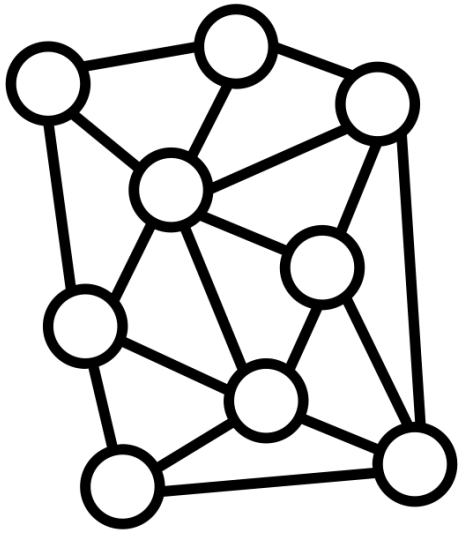
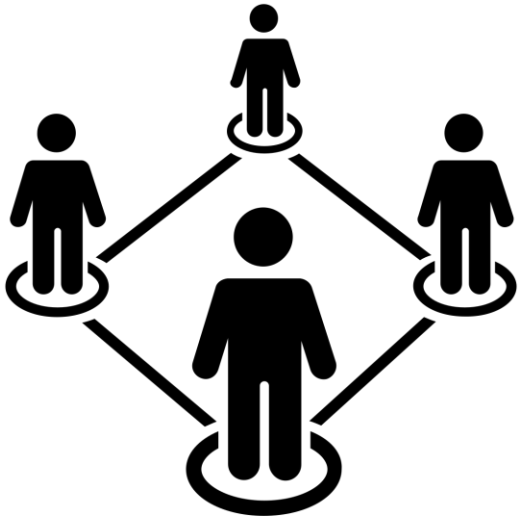
Locate



Systems



Benefit

Creating a methodology that locates, analyzes, measures risk/impact, and prioritizes disruptions to infrastructure systems in a human centered way for collaborative project planning.

Context

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Decentralized

Context

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COLLABORATIVE PLANNING

PROCESS

PLANNING

- Agency A
- Agency B
- Agency C
- Agency D
- Agency E

APPROVAL

project and estimate review

vs.

priorities

SCHEDULED

- Project A-1
- Project A-2 — Joint Project
- Project B-1 — Joint Project
- Project C-1
- Project D-1

- Long term planning
- Major Priorities
- AIMS
- City Council

STRATEGIC **CONNECTED** **EFFICIENT**

Context

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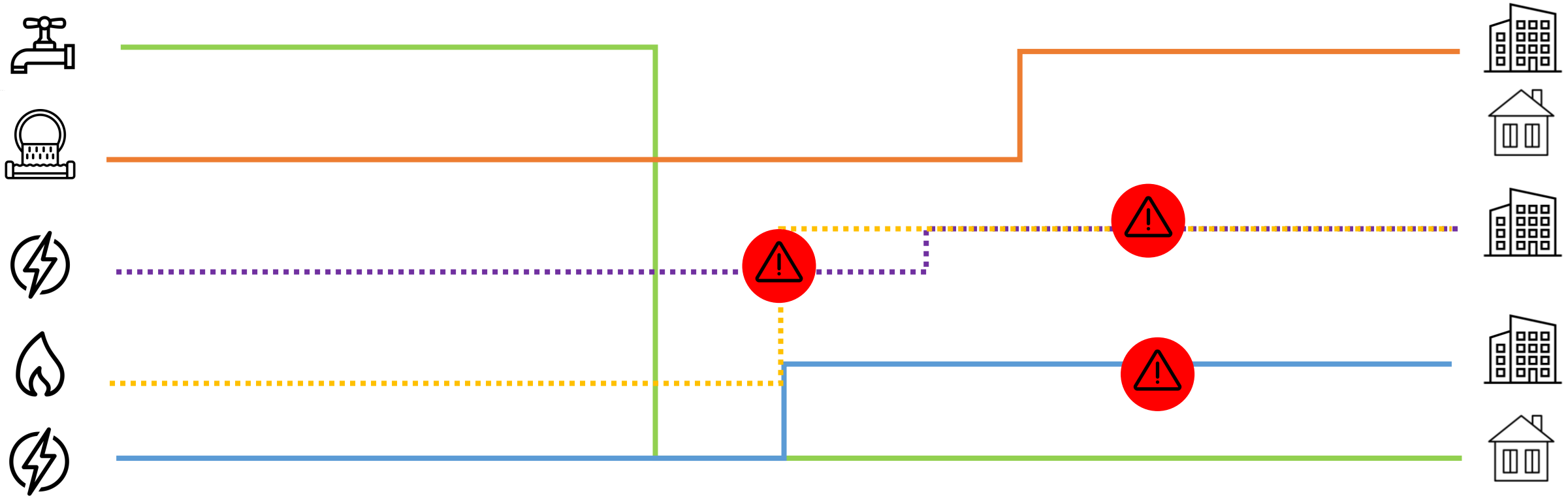
Traceability



Context

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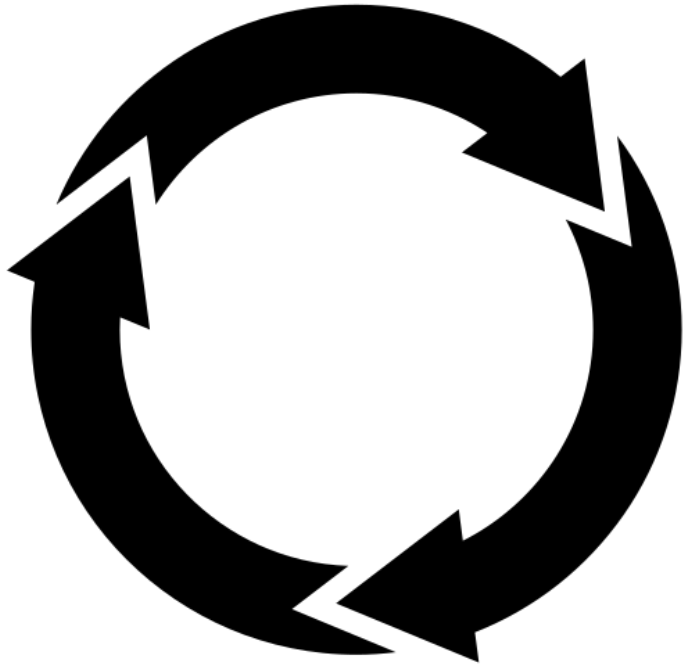
Collaboration

AGENCY A

AGENCY B

AGENCY C



AGENCY D

AGENCY E

AGENCY F

Context

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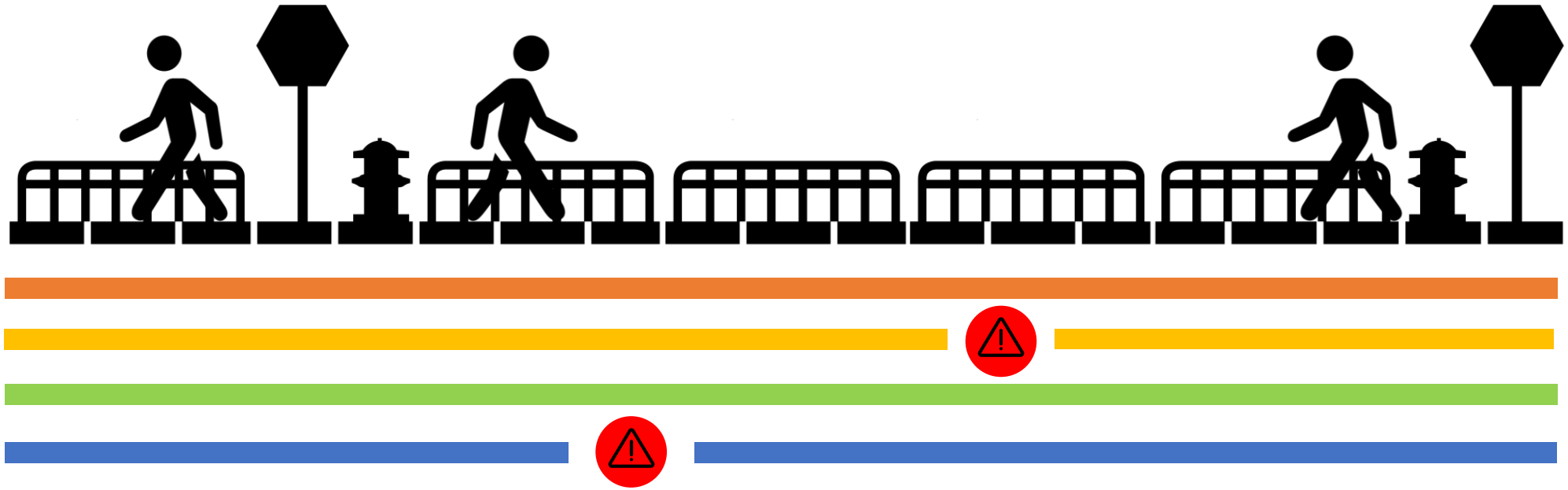
Risk



Context

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Current Data:

- Transportation Permits and Records
- Weather/Environmental Data
- Pollution Reports
- Accident Records
- Community Alert Systems (Complaints/reports)
- Population Records

LAMP Principles

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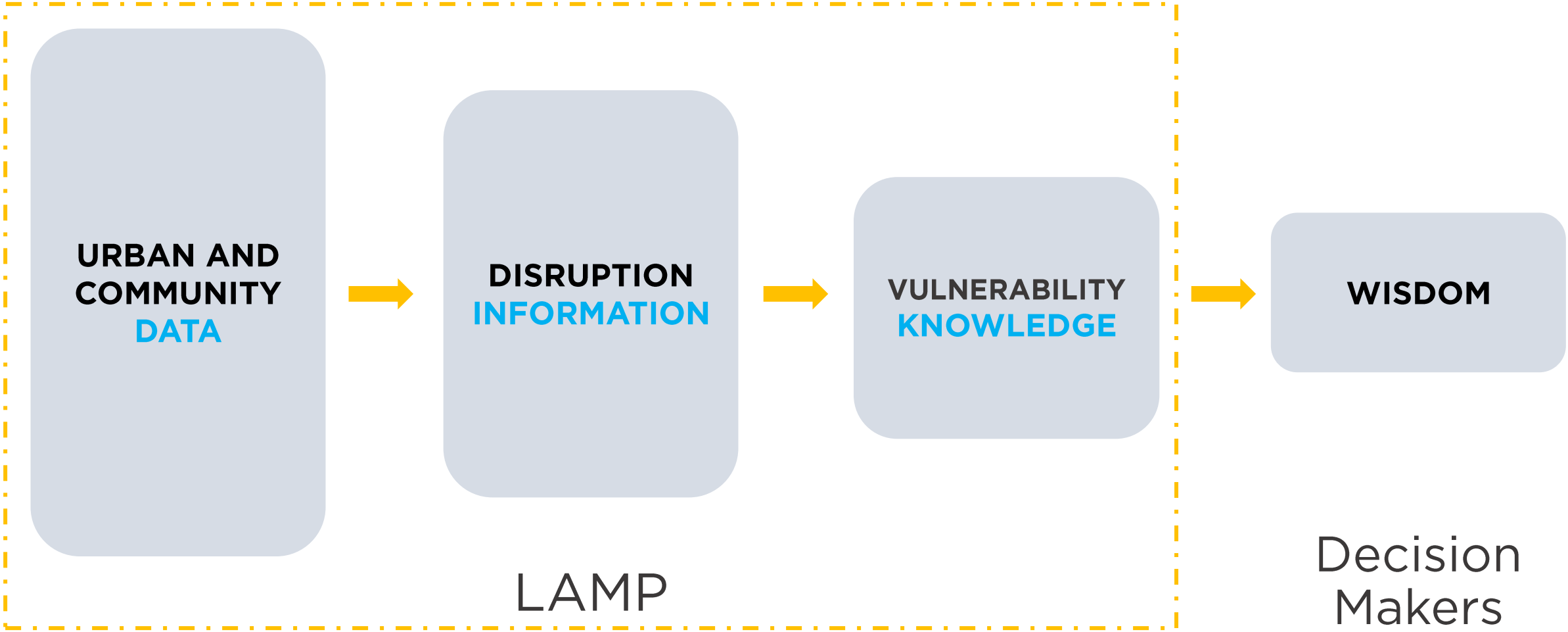
Data to Wisdom Model



LAMP PRINCIPLES

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Solution Agnostic

Utilidor

Omnidor

Precast

Traditional

LAMP PRINCIPLES

City Agnostic

NYC

Any Urban Setting

Minimum	(Basic Data)
Optimal	(Current Data)
Advanced	(Complementary Data)

Resources

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City Data

- Current Planning Process
- City/State Department Data
- Planned Projects
- Priorities

Published Research

- What has been done in the past.
- What is currently being developed.
- Possible solutions.

Experts

- Stakeholders involved in:
  - Planning
  - Designing
  - Construction
  - Community
  - Councils

Locate Analyze Measure Prioritize

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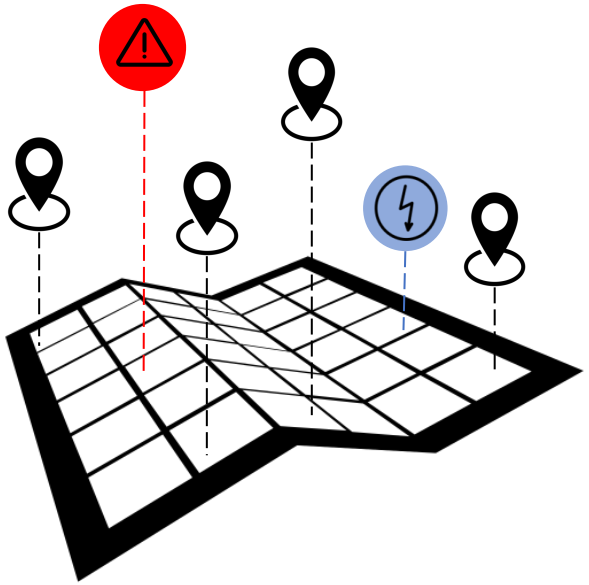
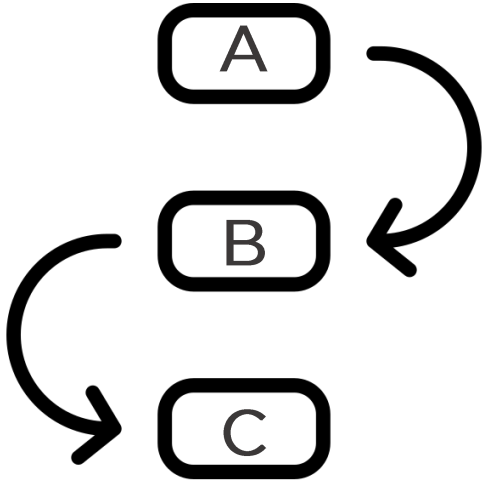
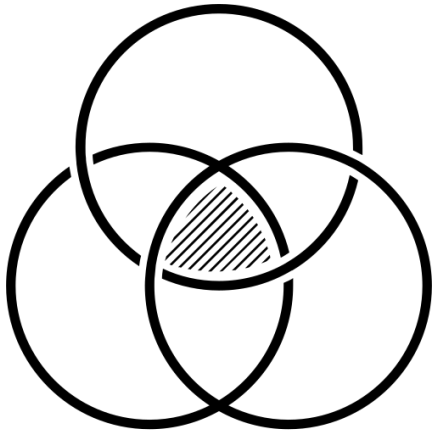
Objectives



Map



Understand



Process

Locate Analyze Measure Prioritize

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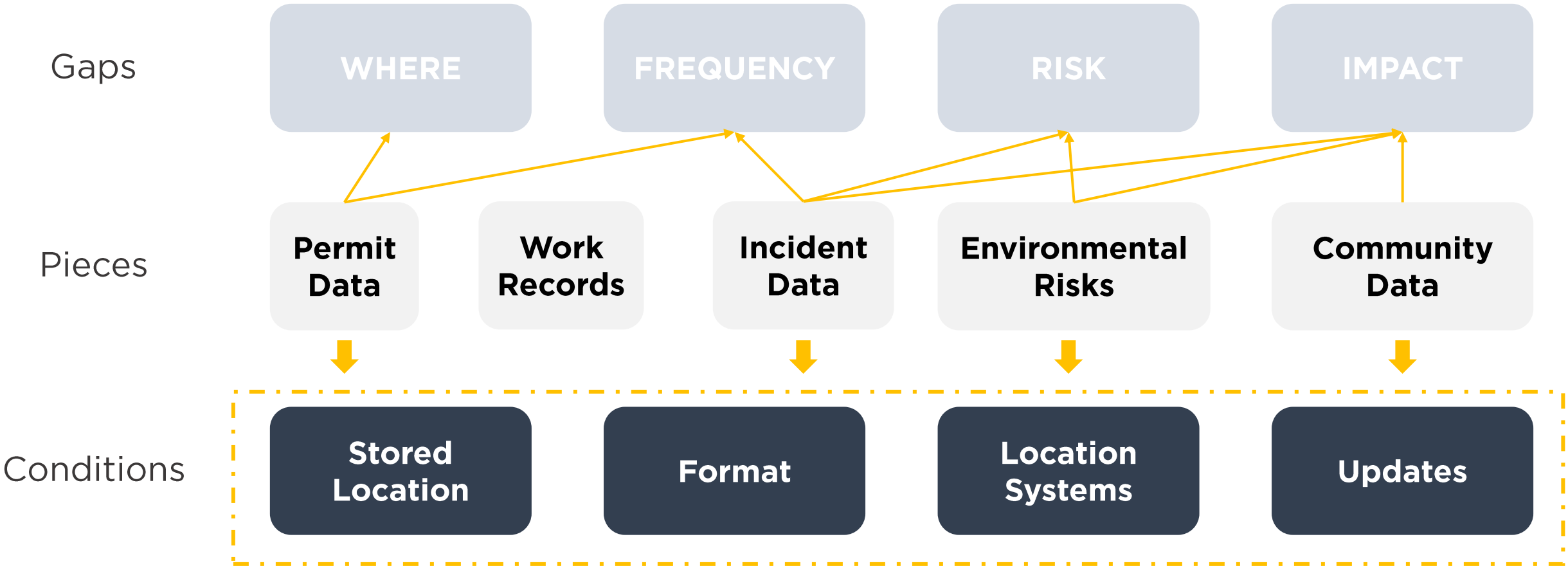
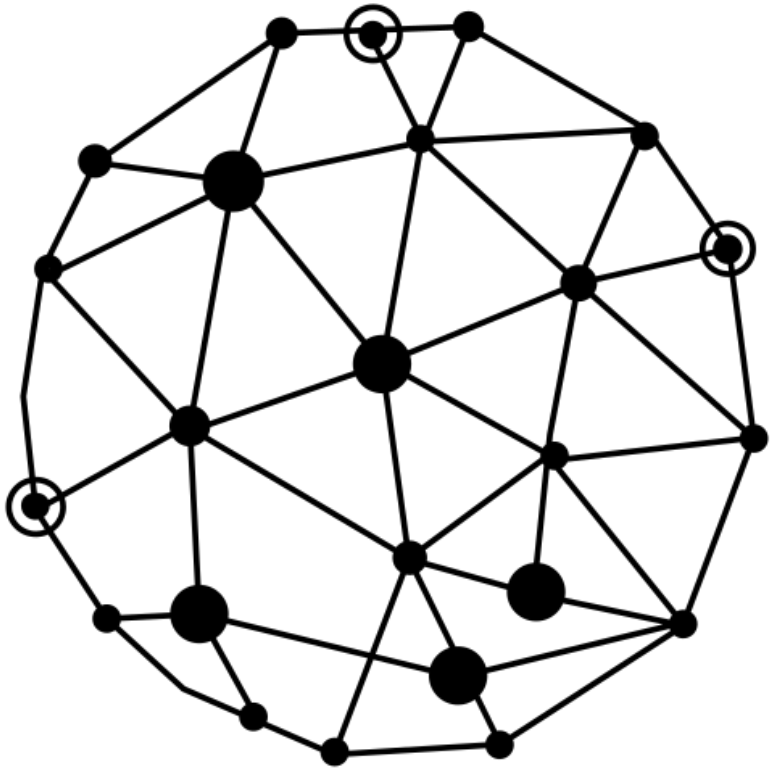


Locate **Analyze** Measure Prioritize



- Common Elements
- Compatibility Requirements
- Units of Measure
- Overlapping
- Additional Gaps

Locate Analyze **Measure** Prioritize

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Connect

Data → ← **Records** → ← **Maps**

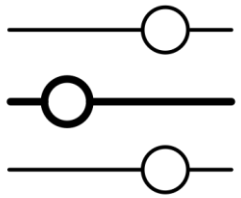
Aggregate + Unite

Data | **Vulnerabilities** | **Incidents**

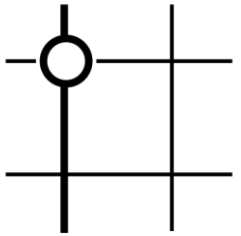
Intersect + Add Parameters

Visualization Standards

Layers



Visual Attributes



Symbology

Locate Analyze Measure **Prioritize**

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Decision Makers

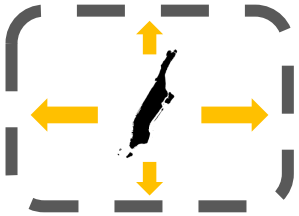
Spatial and Temporal Tools

Interactive Parameters

- Time Period Analysis
- Specific Date Conditions
- Systems Intersections
- Accident Risks
- Weather Risks
- Community Impact

Case Study: Manhattan

Manhattan



Location Constraints

NYC OpenData

Data Availability

High Traffic

Locate Analyze Measure Prioritize

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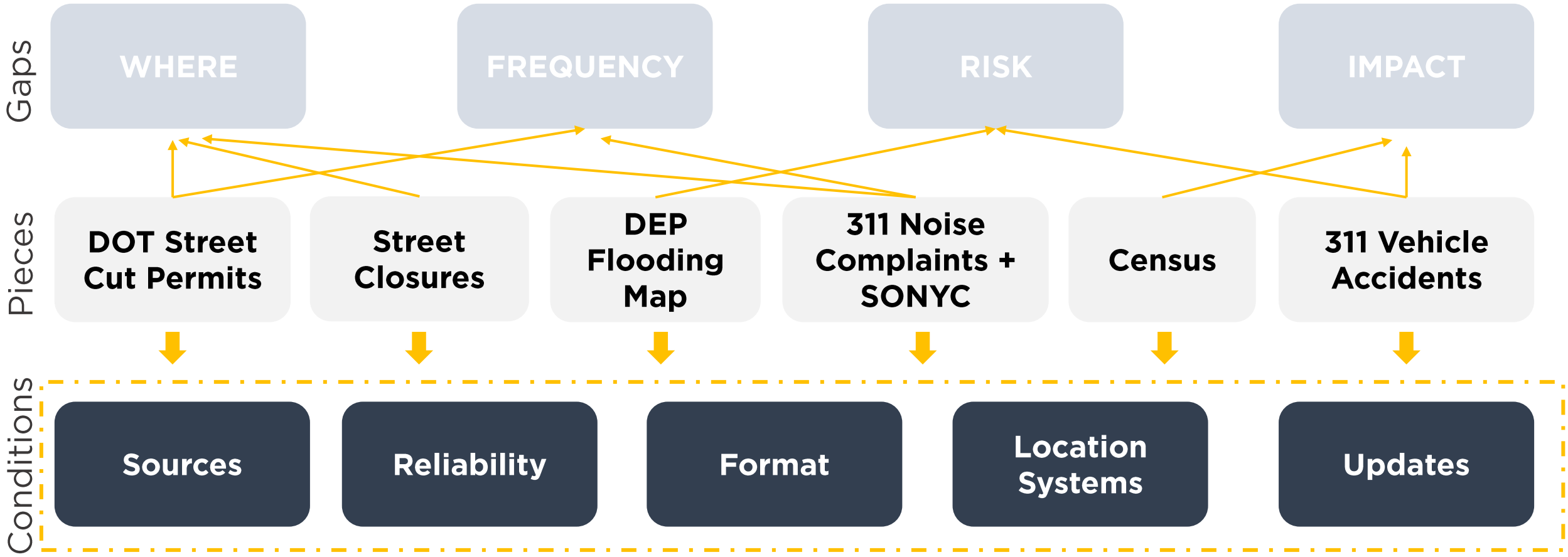

Locate Analyze Measure Prioritize

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Data Set	Cuts per Street	Cuts Freq.	Cuts Location	Const. Noise	Work Activity	Flood Risk	Downed Trees	Traffic	Density	Standards
DOT – Cuts Permits	X	X	X							X
SONYC				X	X			X		X
311 – Noise Calls				X	X					X
311- Flooding						X				X
311- Downed Trees							X			X
311- Traffic Accidents								X		X
CENSUS									X	X

Locate **Analyze** Measure Prioritize

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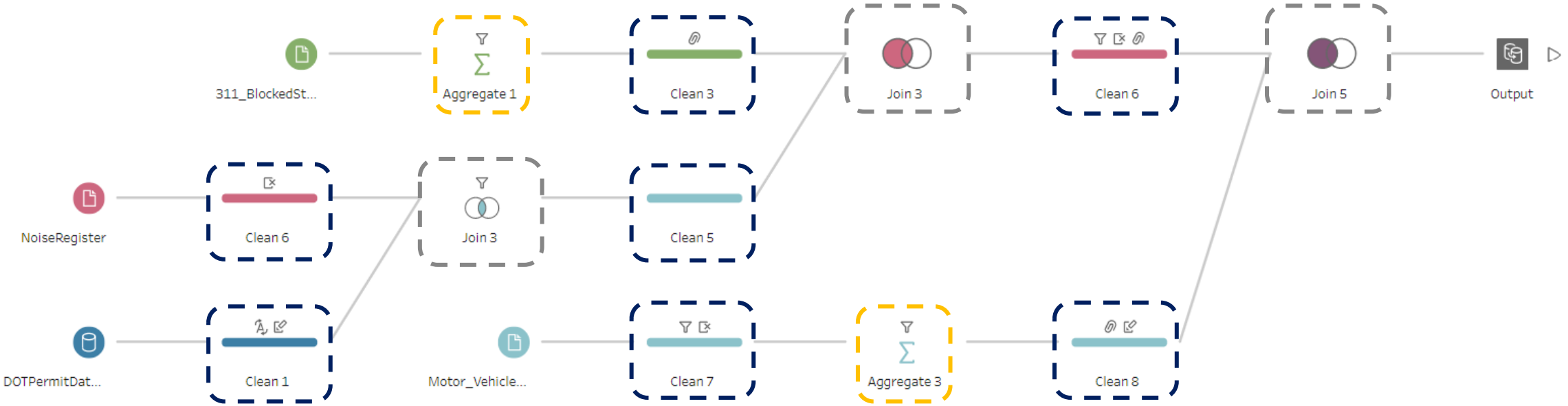

Clean **Aggregate** **Join**

Locate Analyze **Measure** Prioritize

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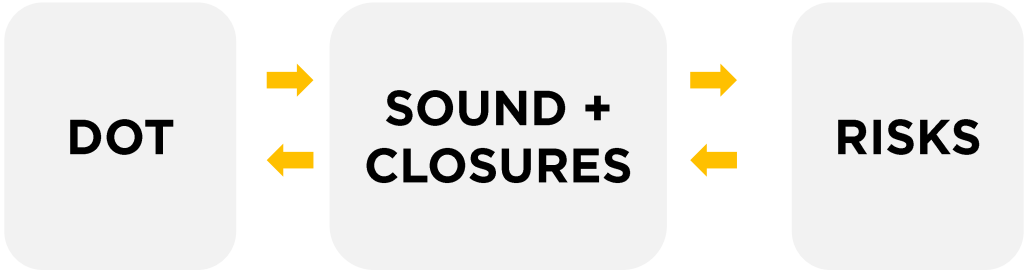
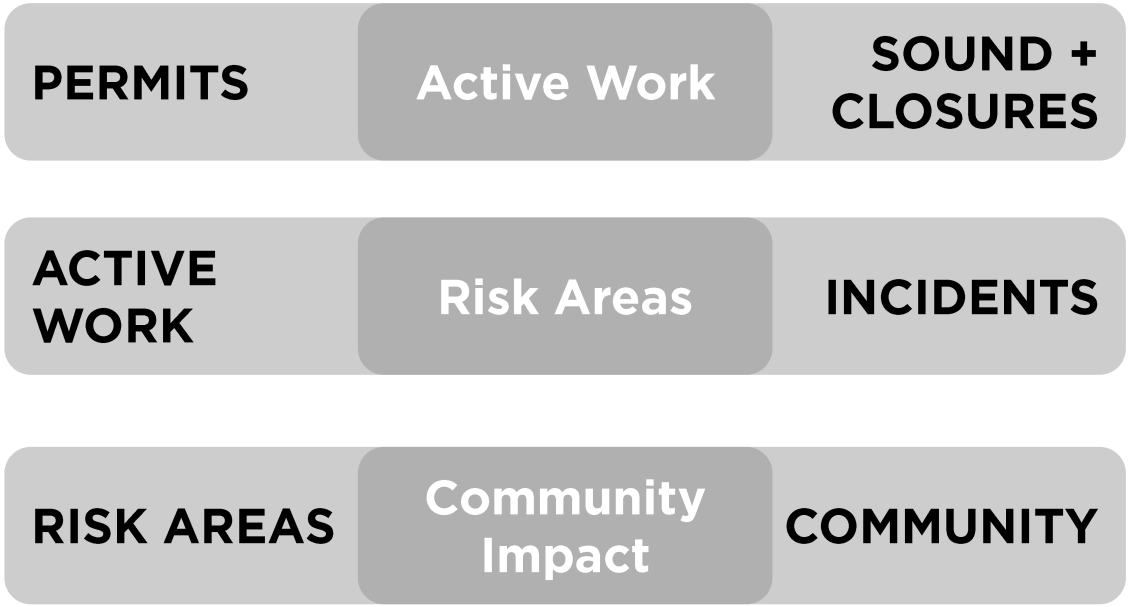
Parameters



Find connections



Find intersection points

Visualization Standards

Locate Analyze Measure **Prioritize**

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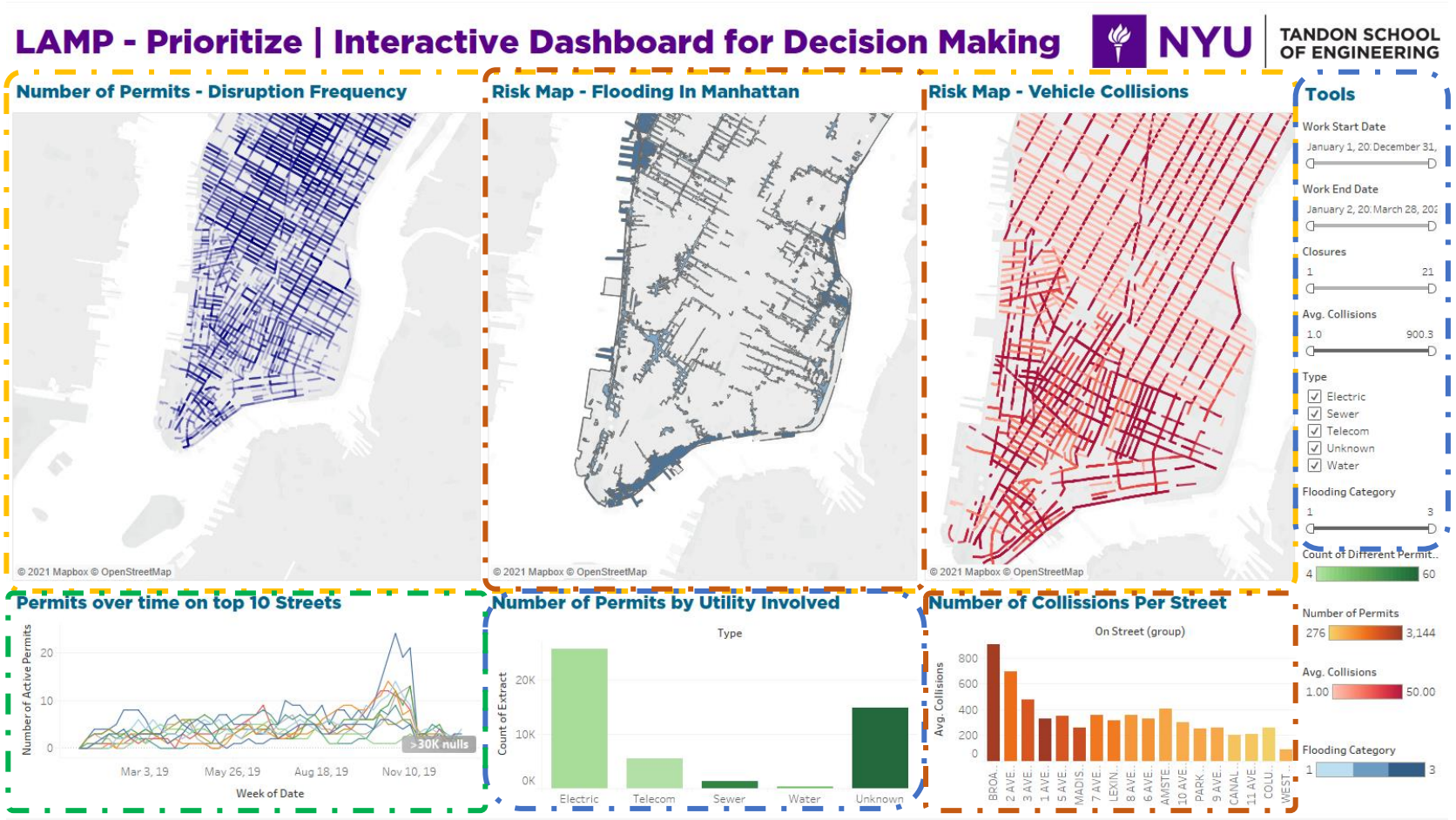
Selected cloropeth maps show different decision factors and can be customized.

Permits frequency on top 10 streets show areas of interest and seasonality.



Interactive filters allow users to see a range of dates and decision factors conditions.

This prioritize map selected vehicle collisions and flooding as a decision factors.

Systems involved and number of disruptions

Locate Analyze Measure **Prioritize**

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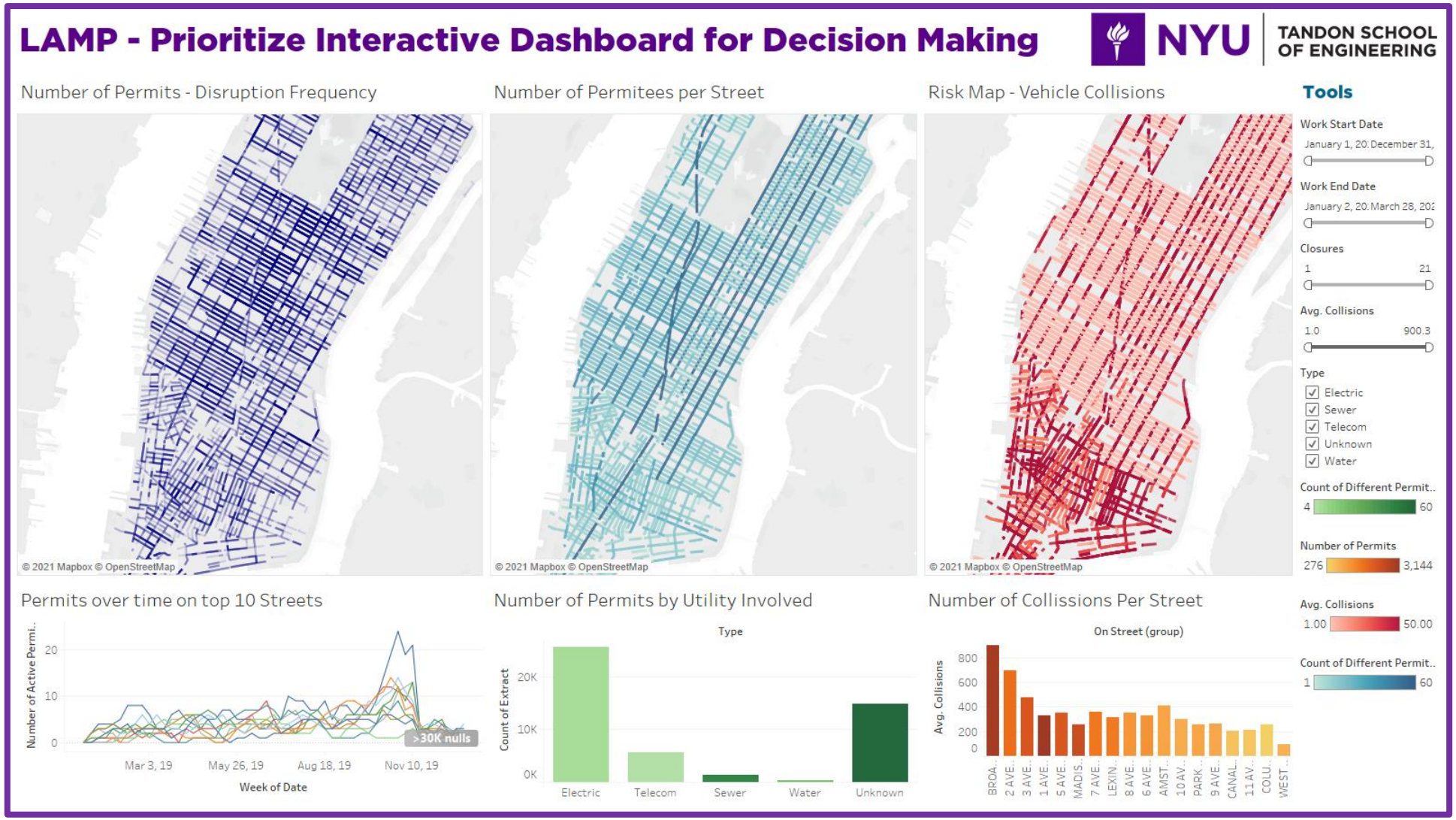
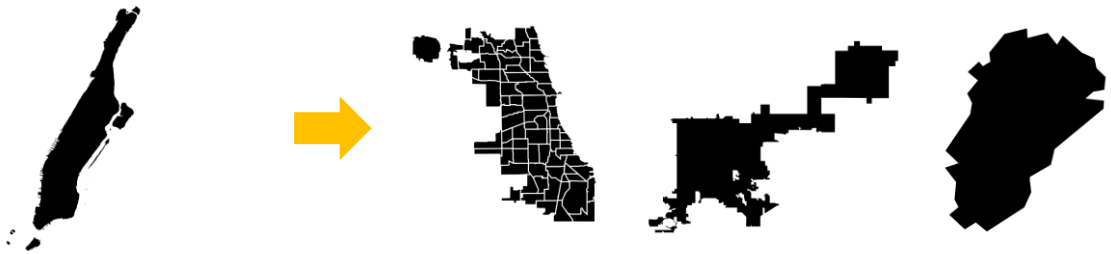
Take me to Dashboard



Next Steps

Replicable



NYC

Other Urban Areas

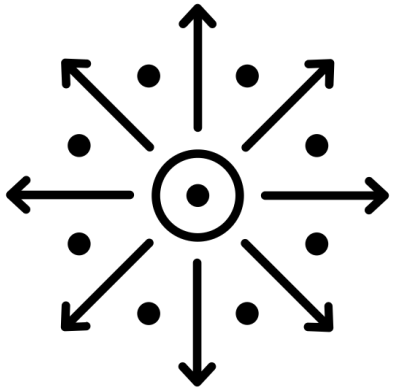
- Complement with other case studies.
- Generate interaction standards for decision making.

Scalable

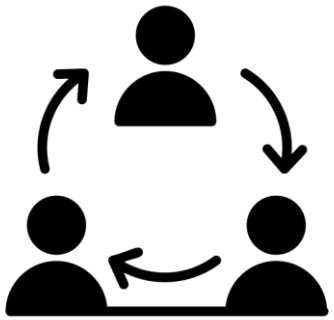
Deeper and Longer Planning

- Machine Learning developed deeper connection of cause and impact.
- Predictive Statistics + Forecasting.

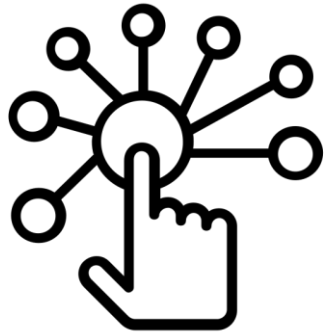
Conclusions



Resources are Scattered

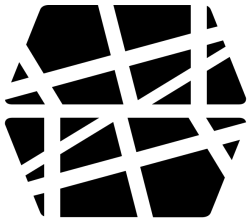


Need for Collaboration

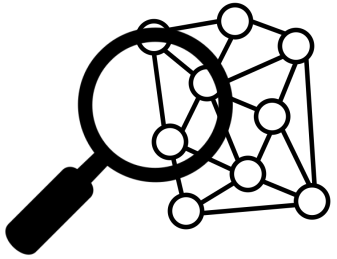


Create Interaction Points

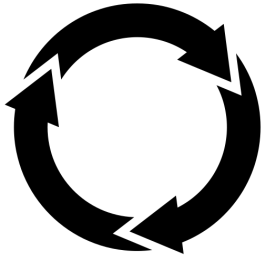
LAMP



Map



Understand



Process

THANK YOU

Mark, Terri, Jabril and Christopher