

Incorporating Resilience into Atlanta's Data-Driven Transportation Planning Process

City Simulator in the Atlanta Region

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Agenda

- Project History
- City Simulator
- Atlanta Case Study
- Scenario Planning
- Future uses for ARC



Project History



How We Got Here

- In 2018, identified a need to better understand and measure resiliency to align with federal expectations, regional plans, and regional needs.
- ARC awarded \$250k FHWA grant to study resiliency
 - Resilience and Durability to Extreme Weather Pilot Program
 - Fully federally funded
 - Atkins hired as consultant to develop City Simulator tool for the Atlanta region
 - 18-month contract; recently closed out and completed

City Simulator

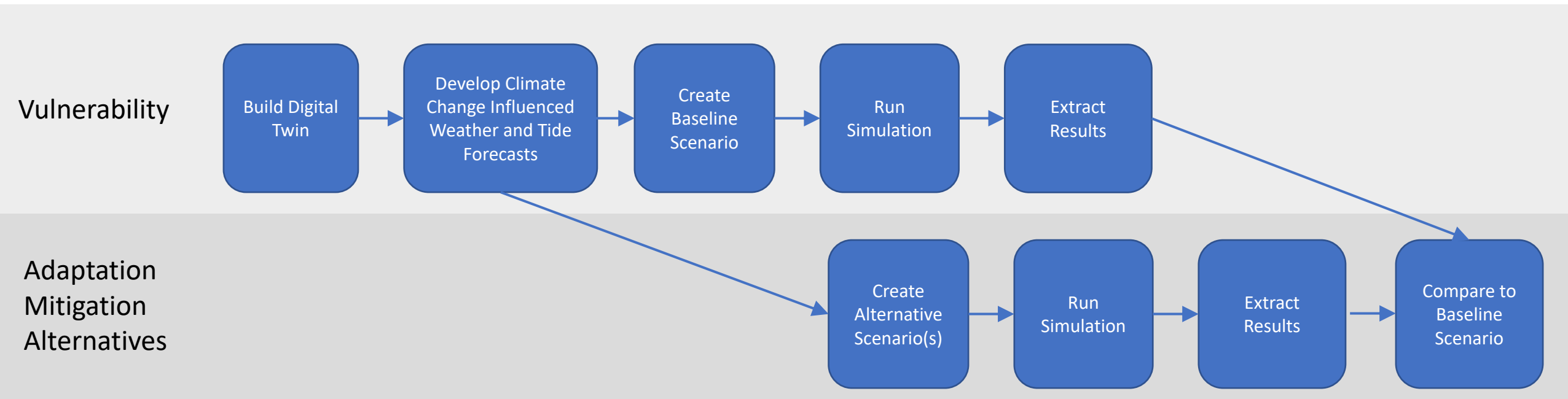
ARC

Forecasting Resilience with City Simulator

- Capture interacting systems (Economy, People, Infrastructure, Natural)
- Include business-as-usual as well as disasters
- Include disasters that are representative of climate change effects
- Allow for addition of proposed strategies and measures their effect
- Include a long enough timeline to measure return on investment
- Conduct in Planning Context, 12 months, \$1-200K



Scenario-based Resiliency Modeling



Alternatives

- > Planning/Policy
 - Master Plans with SLR aware
 - Public Awareness
 - Zoning
 - Freeboard
- > Infrastructure Improvement
 - Stormwater System
 - Green Infrastructure
 - Telecomm Improvements
- > Physical Counter-Measures
 - Elevate Buildings
 - Buy Out
 - Wet Flood Proof

Metrics

- > Storm Damage (\$)
- > Economic Productivity (\$)
- > Tax Revenue (\$)
- > Capital Improvement Expenditures (\$)
- > Risk
- > Population Growth (ppl)
- > Job Growth (jobs)
- > Land Development (acres developed)
- > Commutes Disrupted (trips)
- > ...



System Users

Resident Agents

Non-Resident
Agents

Tourists

System Infrastructure

Parcels

Building Stock

Roads

Stormwater

Power

Water Supply

Waste Water

Telecom

Soils

Ocean/Land

Floodplains

Transit

System Control

Political Boundary

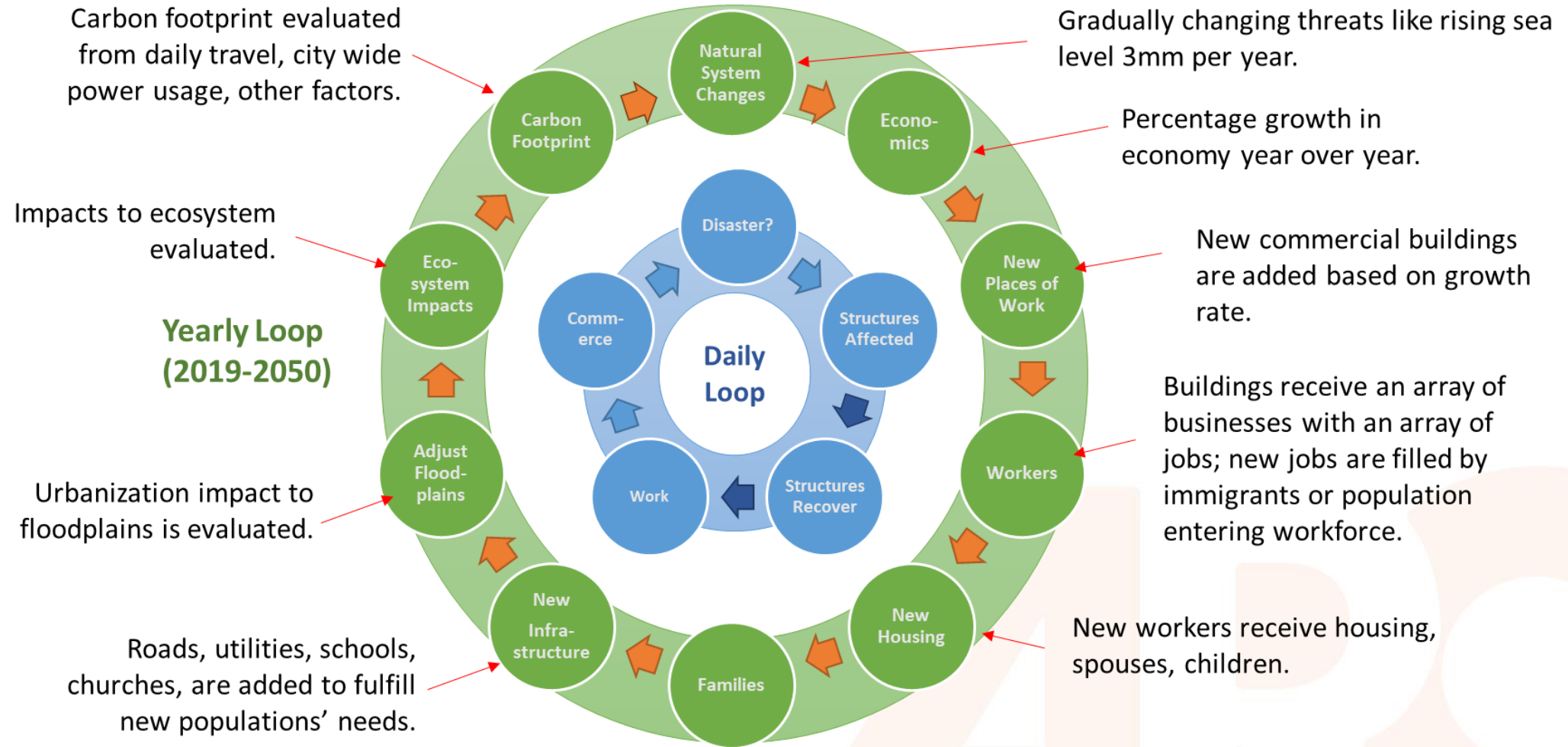
Zoning

Building Code

Policies

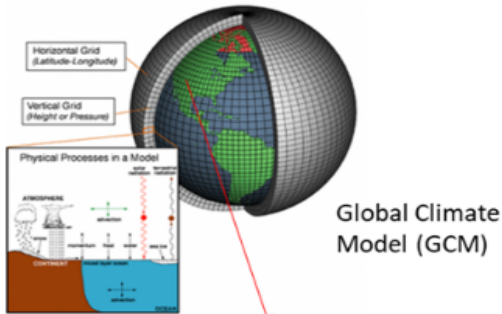
City Simulator Modeling Process

A nested loop to capture city growth and response to hazards



Incorporating Climate Change

Forecasting Climate Change's Impact on Storms Using the Atkins StormCaster Algorithm



63 high-GHG
Monthly Rainfall Projections

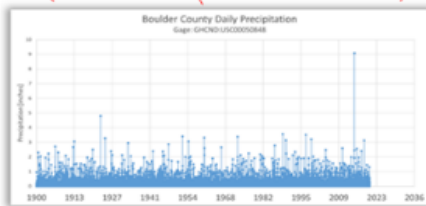
Monte
Carlo
Process

630 Daily
Rainfall
Forecasts

Jan
Storms

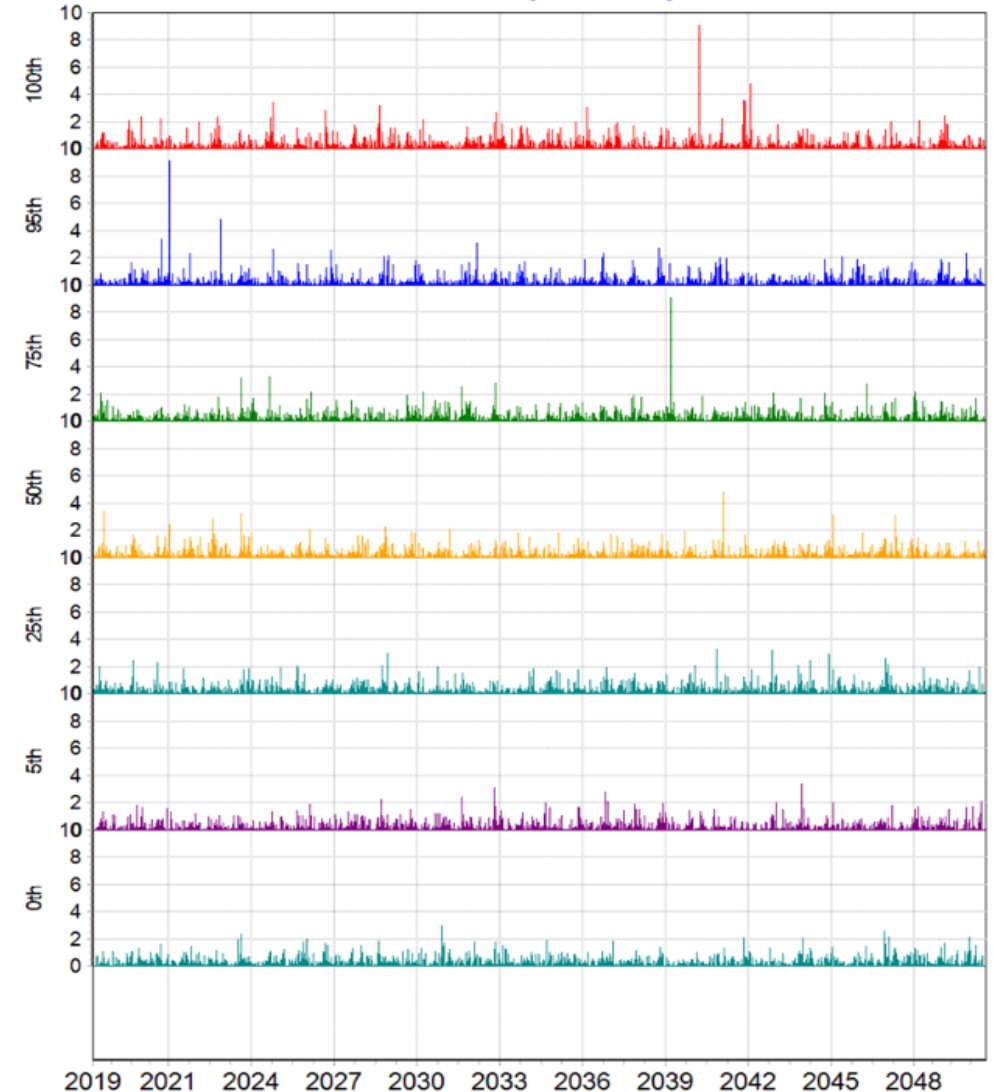
Feb
Storms

Dec
Storms

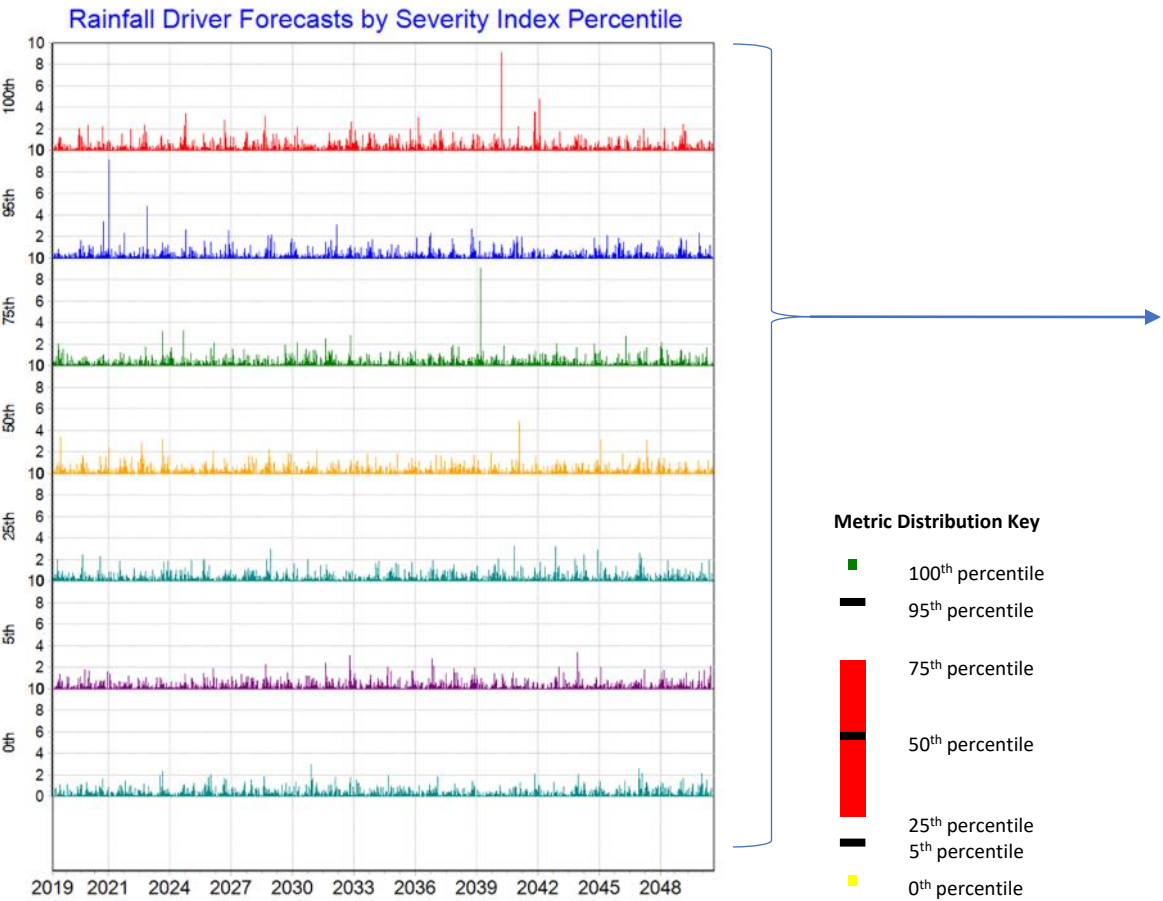


Local Historic Rainfall

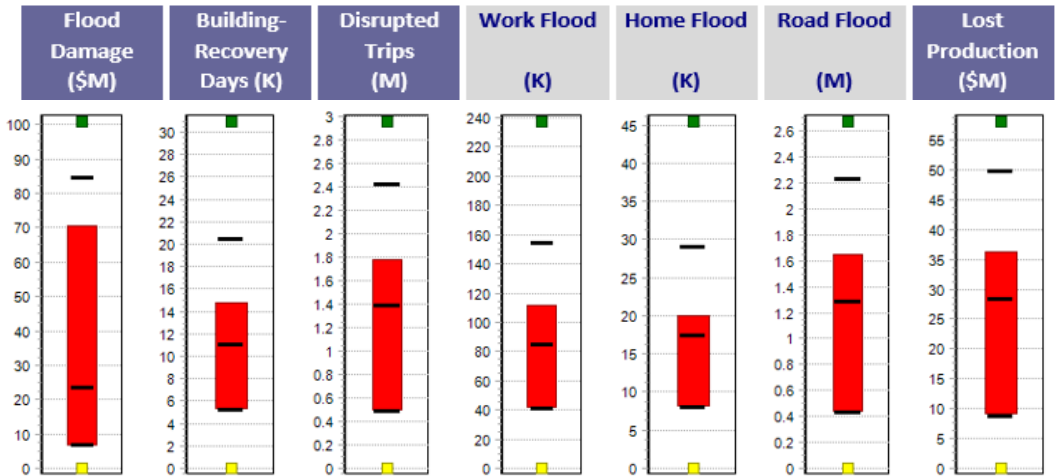
Rainfall Driver Forecasts by Severity Index Percentile



2019-2050 Simulation



Building Stock Impacts Transportation Impacts Economic Productivity Impacts



Elected to use 75th percentile forecast

Flood Damage	Building-Recovery Days	Disrupted Trips	Work Flood	Home Flood	Road Flood	Lost Production
\$70.6	14.7	1.78	111	19.8	1.64	\$36.3
M	K	M	K	K	M	M

Annual Averages

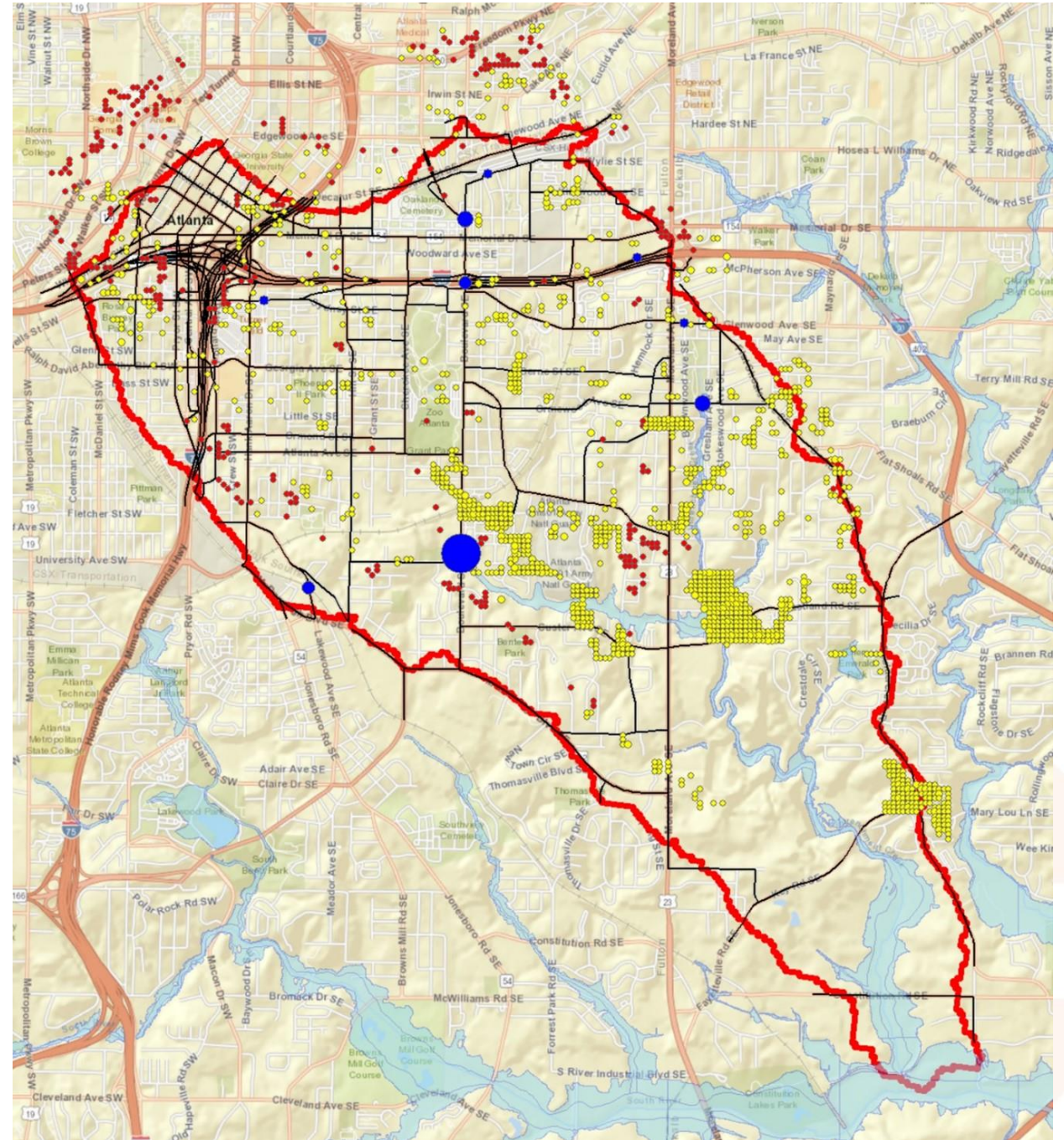
Atlanta Case Study



Vulnerabilities in Transportation System

Case study of south Atlanta Intramural Creek area

Results of a 30-year simulation of the tool. Yellow dots are new residential, red are commercial, blue dots are flood prone areas.

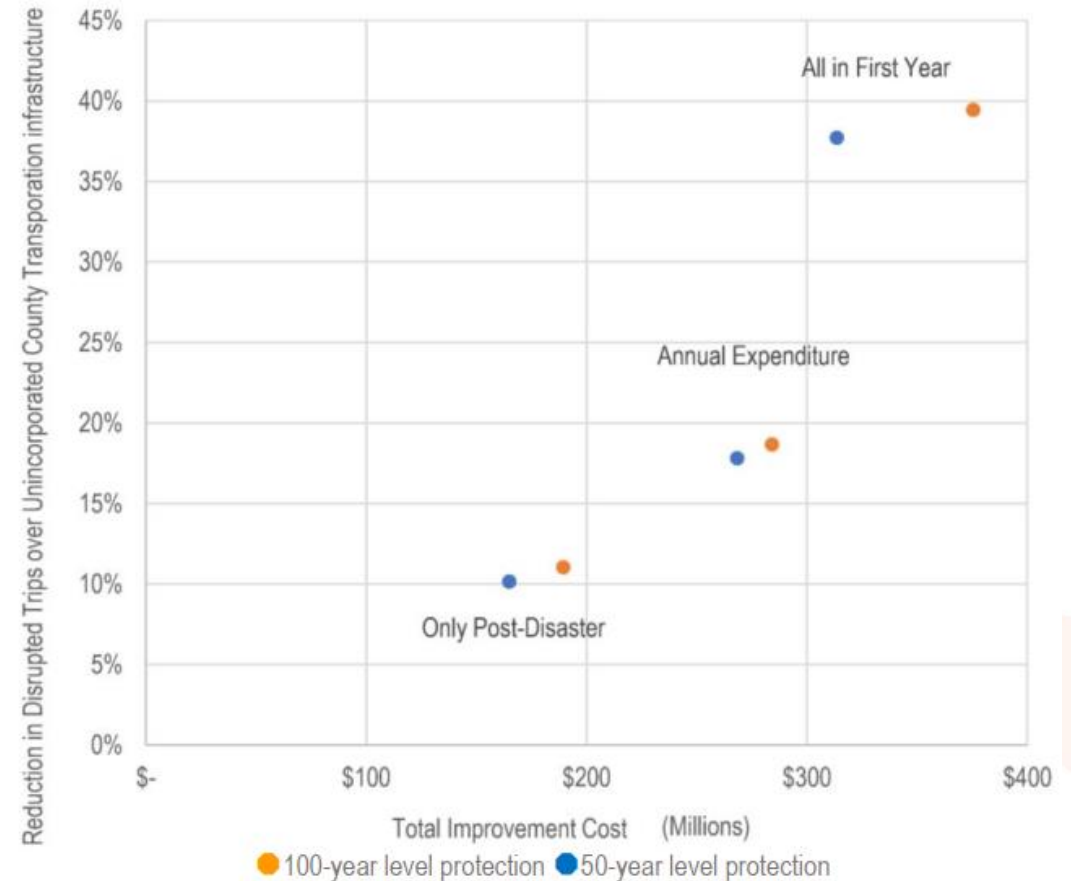


Scenario Planning: Boulder Case Studies



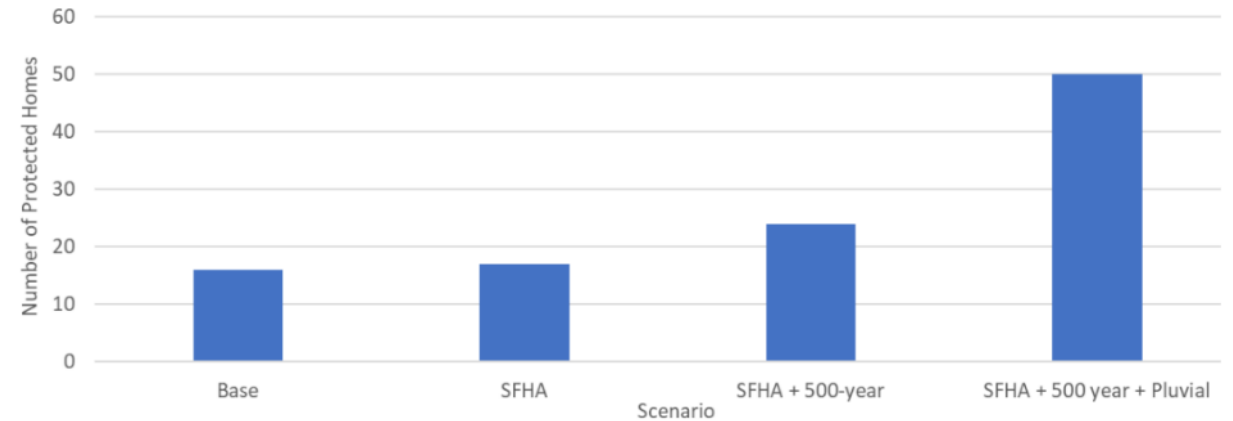
Scenario 1 – Improve Transportation Infrastructure

- Varied level of protection (50yr, 100yr) and when the protection occurs (2020, annually, or post-disaster).
- First Year gives highest reduction in disruption (39%)
- Annual results in half the reduction (19%)
- Post-disaster results in quarter the reduction (9%)
- Marginal improvement going from 50 to 100-year.
- Still considerable damage because future storms are larger than current-day 100-year.



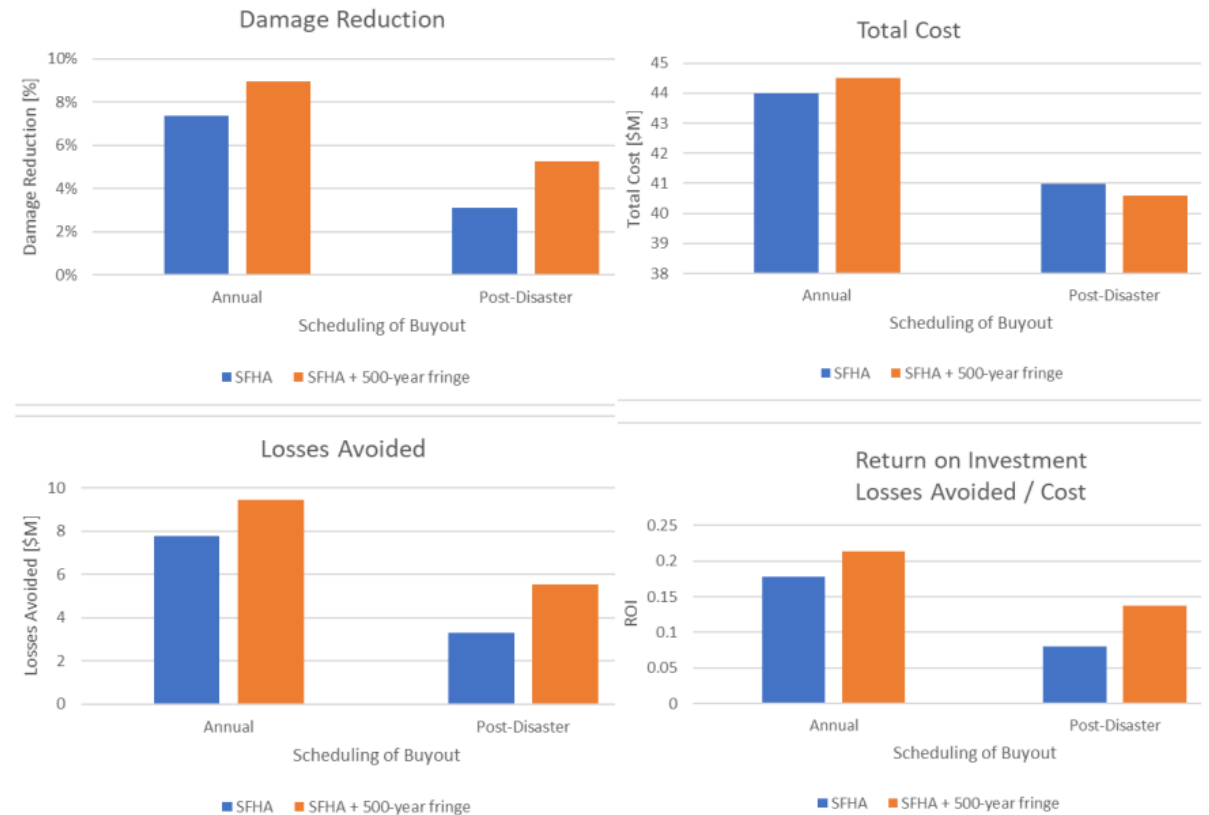
Scenario 2 – Incentivize Flood Protection Projects

- Study Impact of Incentivizing Flood Protection as part of home renovation. Examples:
 - permit fee reduction
 - exemption from other regulations
 - grant funding/rebates
- Varied where incentives were provided (SFHA, SFHA + 500 year, Whole County)
- Incentivizing in all zones resulted in 50 homes protected per year compared to 15 when incentives were only provided in the SFHA.



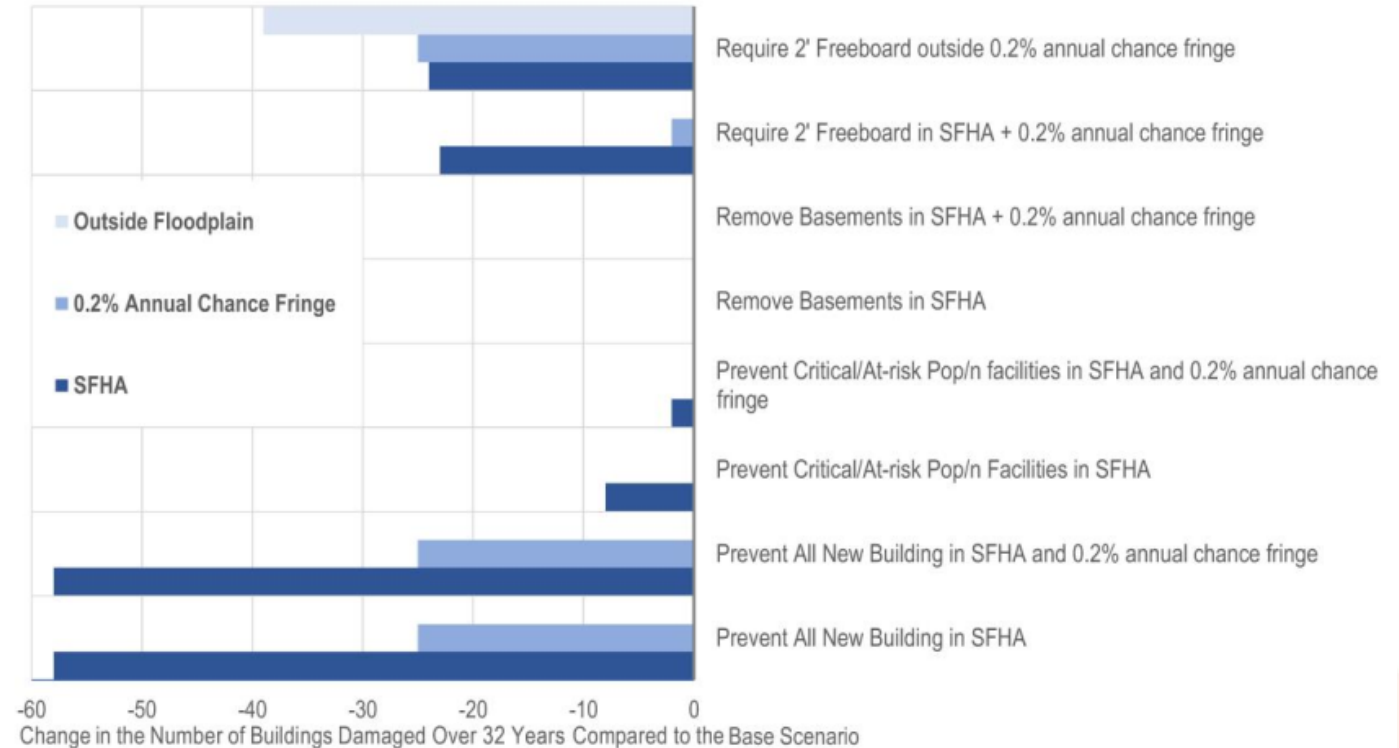
Scenario 3 – Buyout Program

- Varied when applied (3 homes per year vs \$20M Post-Disaster) and where applied (SFHA vs. SFHA + 500-year fringe)
- Damage reduction is better using an annual approach (about double)
- Alternatives like raising homes might give higher ROI, but need to consider risk appetite.



Scenario 4 – Regulate Construction in Flood Risk Areas

- Prevent building in at-risk areas
- Freeboard (2' above base elevation for riverine, 0' for pluvial)
- Remove basements in 500-year fringe at substantial renovation
- Preventing building altogether resulted in biggest reduction in losses
- Freeboard had second highest impact, particularly in pluvial flood scenarios

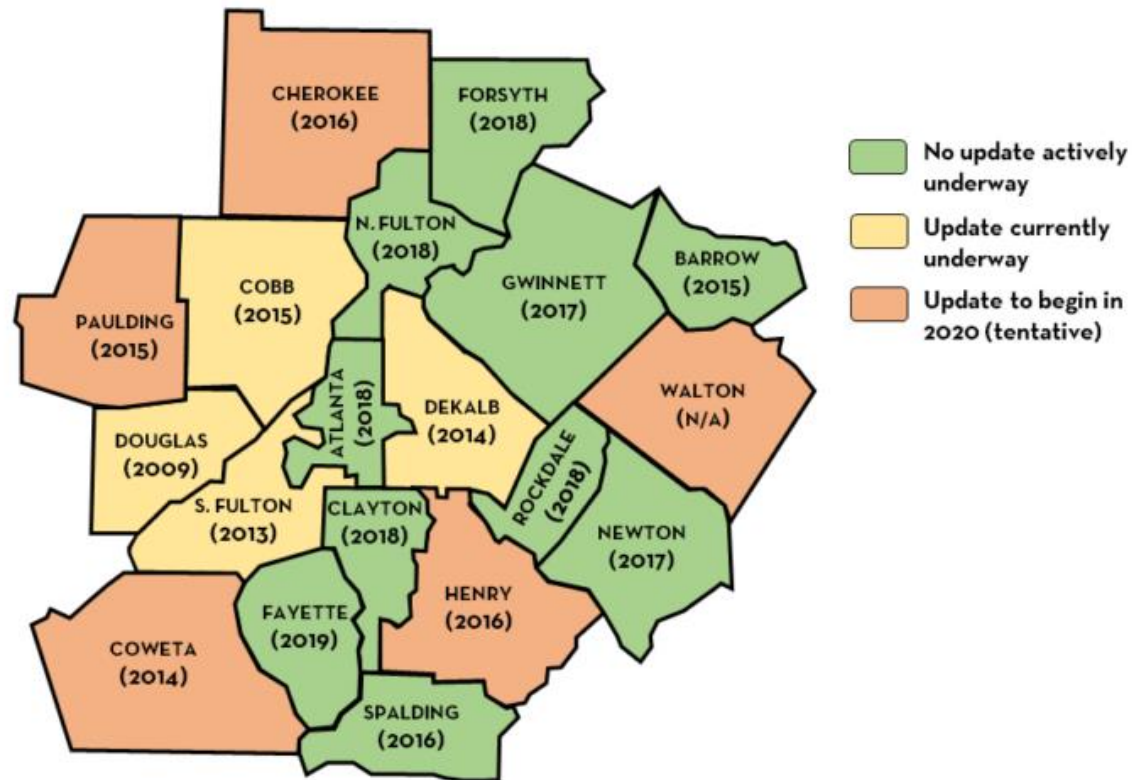


Future Uses for ARC



Current CTP Adoption Dates and Update Status

Reflects information as of February 2020



THE ARC TIP PROJECT EVALUATION FRAMEWORK

“The Project Evaluation Cookbook”

Atlanta Regional
Commission

Revised
August 2019

Thank you!

Questions?

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