Strategic Shift to Climate Risk
Focus on Adaptation

MWCOG – July CEEPC Meeting

June-24-2024

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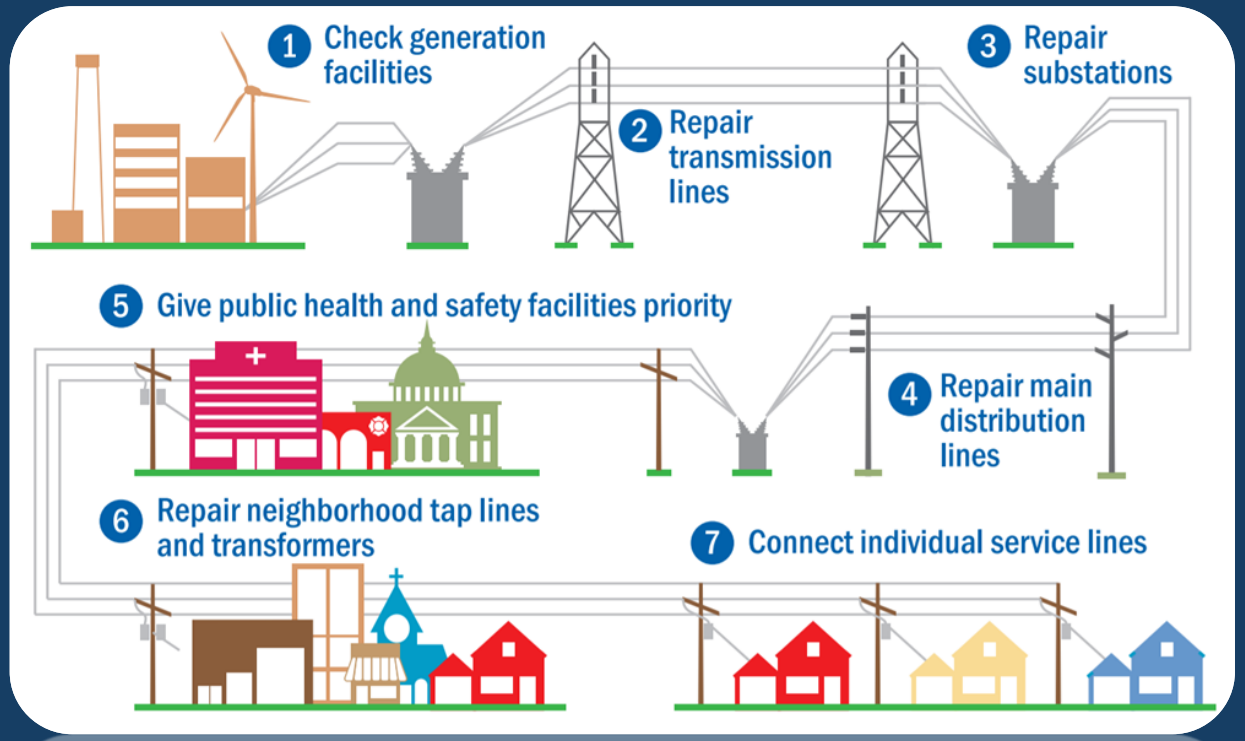
Triple-Aspect of Climate Action

Climate Mitigation

Reduce GHGs - Do no greater harm
Reverse impacts of carbonization

Climate Resiliency

Continuity or restoration of core services and operations *following* an extreme event

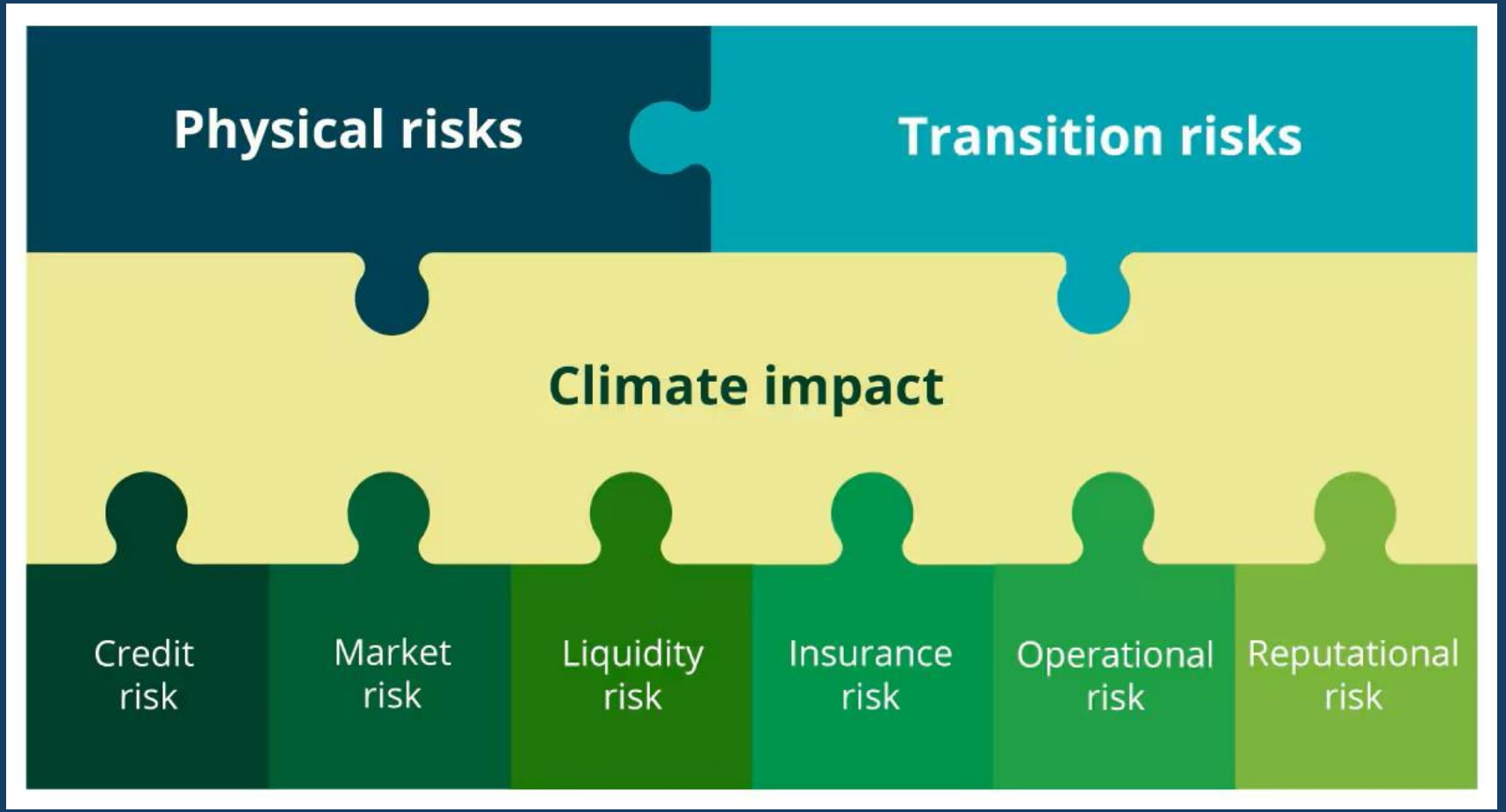


Triple-Aspect of Climate Action

Climate Adaptation (Risk)

Fortifying Communities for the Change We Cannot Avoid

The Age and Strategies of *Climate Risk*



The Age of Climate Risk

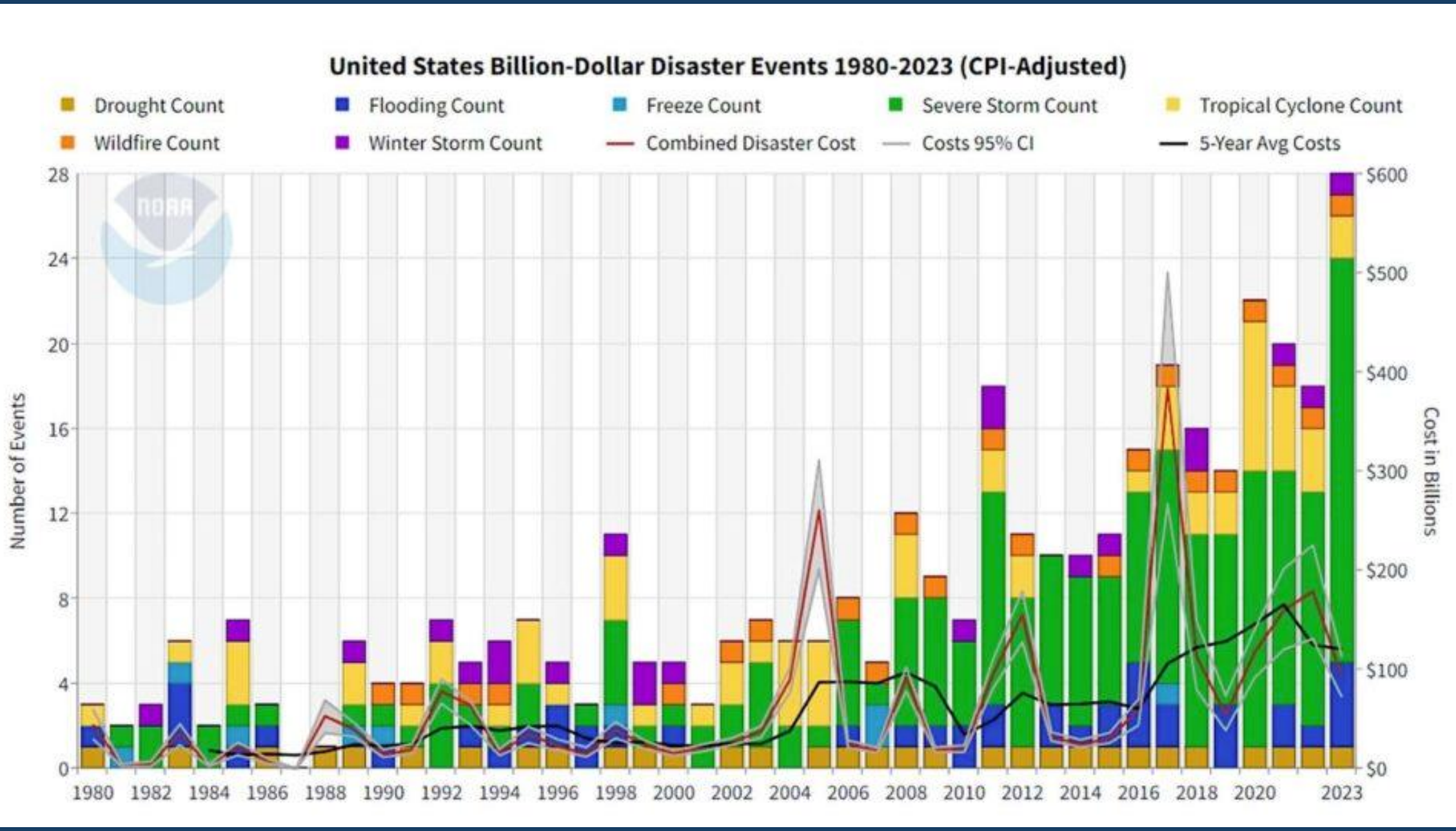
As Climate Toll Grows, FEMA Imposes Limits on Building in FEMA Floodplains, New York Times, July 10, 2024

FEMA is Denying Requests for Aid as Relief Fund Runs Dry Amid Record Number of Costly Disasters, FORTUNE Magazine, July 12, 2024

The Effects of Flood Damage on the Subsidy Cost of Federally-Backed Mortgages, Congressional Budget Office Working Paper, July 2024

S&P Data Shows Governments, Investors 'Highly-Vulnerable' to Climate Risk, Bond Buyer, April 29, 2024

As Climate Risk Heats Up, State and Local Governments May be on the Hook, ImpactAlpha, January 16, 2024


United States Billion-Dollar Disaster Events 1980-2023 (CPI-Adjusted)
Drought Count
Flooding Count
Freeze Count
Severe Storm Count
Tropical Cyclone Count
Wildfire Count
Winter Storm Count
Combined Disaster Cost
Costs 95% CI
5-Year Avg Costs
Number of Events
Cost in Billions
0
4
8
12
16
20
24
28
$0
$100
$200
$300
$400
$500
$600
1980
1982
1984
1986
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2012
2014
2016
2018
2020
2023

Climate Risks and Cascading Impacts

- Economic disruption
  - Property loss, supply chain disruption, economic activity interruption
  - Re/insurance markets
  - Bonding / Cost-of-Debt
- Physical damage
  - Greater impacts to roads, utilities, assets, communications, buildings, facilities
- Health and public safety
  - Loss of life, interruption in critical emergency services, equity disproportionality
- Population displacement
  - Short term displacement, long term relocation

Arlington Case Study – Inland Flooding

Background Conditions/Stressors

- Rapid, extensive development 1938 – 1977
  - prior to adoption of meaningful SW regulation or overland relief
- Undergrounding of 2/3 of the streams
  - formed the majority of the SW infrastructure system
  - lack of lateral / tertiary infrastructure
- Poor soils and acute elevation changes
- Lack of easements and dramatically-reduced physical access to the system
- Climate-driven loading patterns and intensity
- @ 2018 - the SW Infrastructure 10-Year CIP -- $11.5 Million (total)

Pivot to Climate Adaptation-Climate Risk

Influenced by Silicon Valley 2.0 (2015; updated 2023)

- Abandon historic-present data approach
- What are the future climate projections for flood vulnerability
- Identify direct and *cascading* impacts
- What is the community vision for 2050 and beyond?
  - Levels of vulnerability that need to be addressed to ensure that Vision?
- What is needed to "inoculate" the community vs. unavoidable climate impacts?
- *What is the cost of inaction?*
  - Include the market trends and impacts

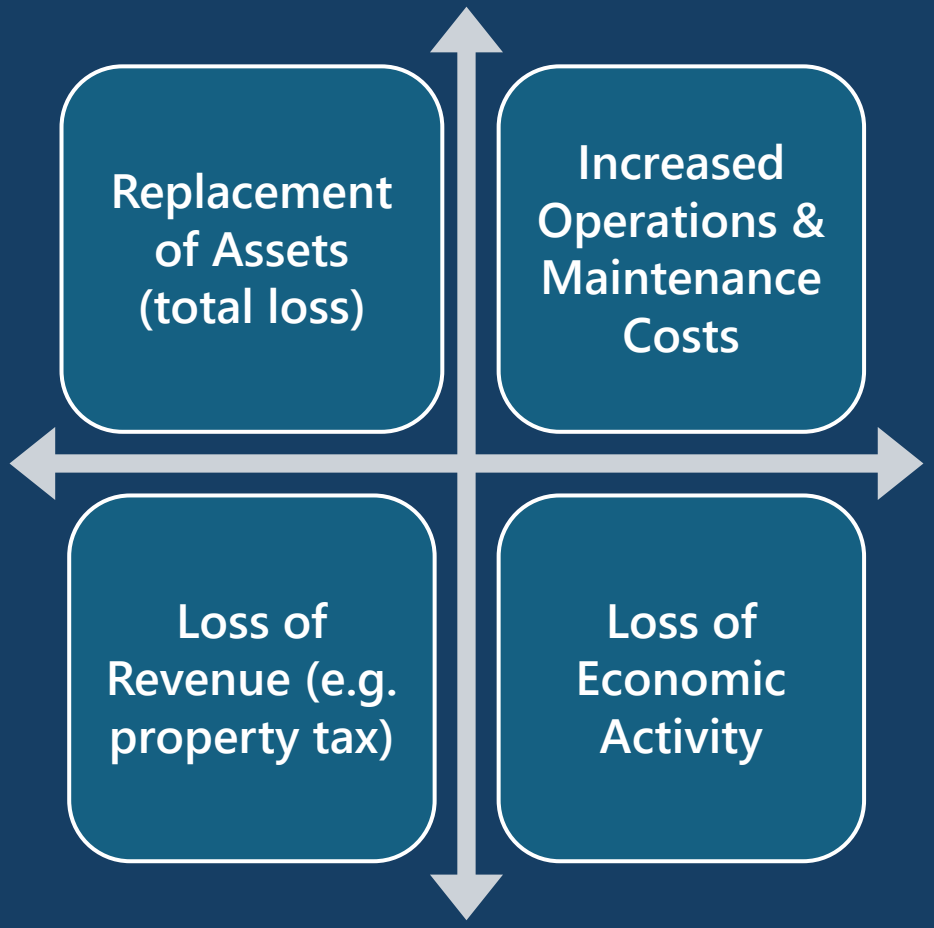
Pivot to Climate Adaptation-Climate Risk

Program Pivot

- The Risk Assessment and Management Plan (pivot to an adaptation/risk approach)
  - the RAMP also modified FEMA's HAZUS tool to include environmental and social equity valuations
- Forward-facing, climate-driven planning (2040, 2070, and 2100)
- Increased analytics and data
- "Blended engineering"
- Property acquisition for flood mitigation & create overland relief
- Policy development – Flood-Adaptive Design & Construction Guidelines
  - potential overlay districts
- Cost-benefit process for project benefits and co-benefits
- Entrepreneurial thinking – programs informed by market trends and direction
- Current 10-CIP for Stormwater Infrastructure -- $220 Million (community-wide support)

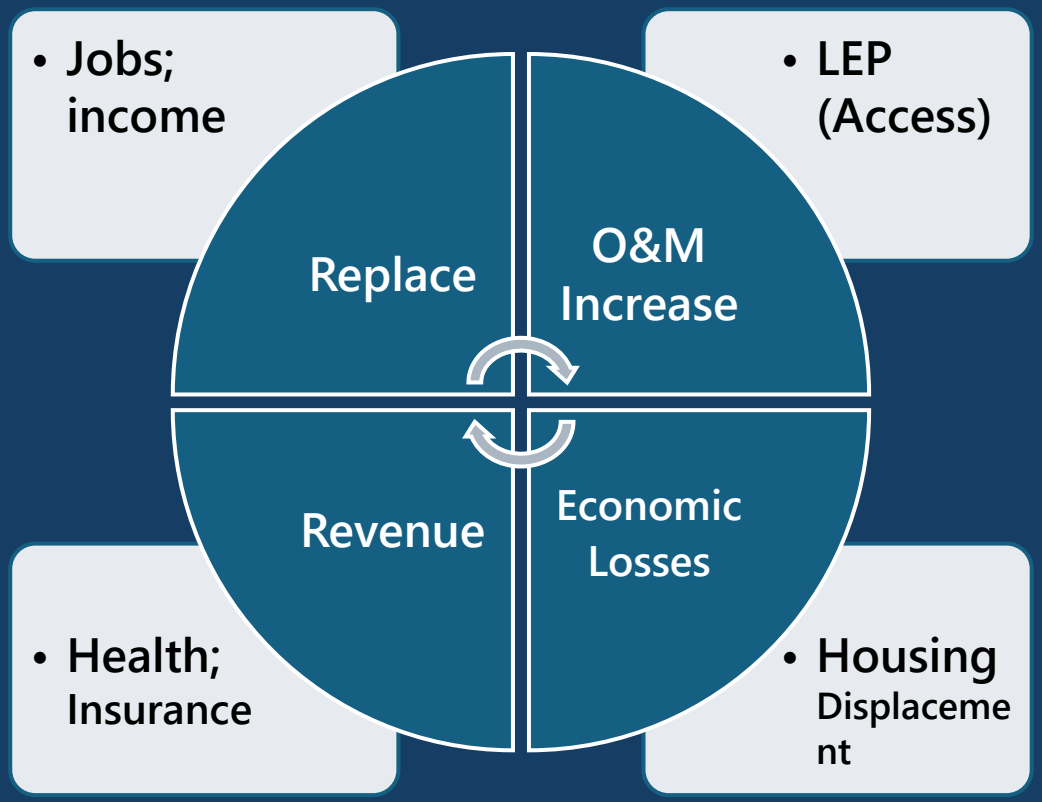
RAMP – Risk Assessment + Social Vulnerability Risk

Conventional Model - FEMA



Direct and indirect PLUS Cascading Impacts

RAMP Model – Plus Social Vulnerability Impacts



Direct and indirect PLUS Cascading Impacts

Economic Risk by Watershed - "Cost of Inaction"

Watershed	Annualized Risk of Losses (millions $)	Potential Losses for 100-year Storm (millions $)	
		100-year Storm in 2020: 8.5 Inches in 24 Hours	100-year Storm in 2070: 9.6 Inches in 24 Hours
Roaches Run	112.8	718.9	803.5
Spout Run	41.0	234.4	263.4
Lubber Run	32.4	297.1	344.2
Four Mile Run Lower Mainstem	14.7	109.2	136.8
Doctor's Branch	6.4	39.0	46.1
Torreyson Run	2.6	17.9	19.7
Bailey's Branch	1.0	7.5	n/a

RAMP at a Glance

Final Document Suite

- Executive Summary
- Full Report
- Appendices Report – Technical Memoranda

Technical Memoranda

- Climate Projections and Scenarios
- Arlington Interior and Riverine Flooding
- Coastal Surge Modeling
- Arlington Flood Vulnerability Assessment
- Arlington Flood Risk Assessment
- Arlington Flood Mitigation and Adaptation Strategy
- Programmatic Strategies for Flood Management
- Market Trends Analysis

Core RAMP Elements

- **Updated Climate Projections**
  - Multiple climate vulnerabilities and climate “horizons” or timeframes
- **Inundation Maps / Updated IDF Curves**
  - modeled on a Watershed-Scale over multiple climate horizons (2040, 2070, and 2100)
- **Vulnerability Assessments**
  - Calculations factoring critical civil/civic assets, environmental impacts, and social vulnerability
- **Risk Assessments**
  - Direct, indirect and cascading impacts based on 1) total loss or replacement, 2) lost revenue, 3) increased costs of O&M, 4) loss of economic activity
- **Capital Projects, Programs and Policies to Mitigate and Manage Flooding in Arlington County**
  - By type and cost-benefit calculations
- **Market Impacts and Analysis**
  - Impacts on bonding/cost of debt, re/insurance, land use – and possibly FEMA

The RAMP Webpage,
https://www.arlingtonva.us/Government/Government/Projects/Plans-Studies/Environment/Risk-Assessment-and-Management-Plan

Questions?

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RAMP (Risk Assessment and Management Plan)

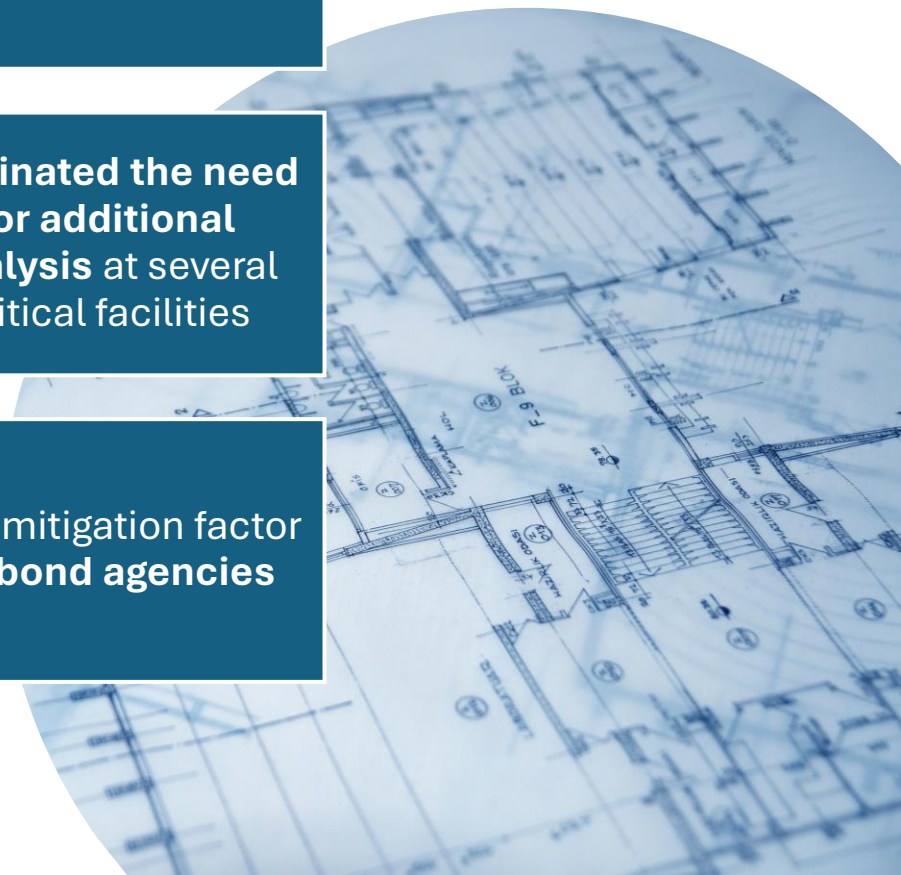
- Prior to the RAMP, flood mitigation planning used ATLAS 14, a common and widely-used NOAA Tool
- ATLAS 14 lags in updates but, critically, uses past and present storm/flood data only (temporal stationality)
- The RAMP expands upon past and present data, with climate projections and modeling for 2040, 2070, and 2100
  - RCP 8.5 with moderate forcing
  - Inland flooding, sea level rise, and storm surge
  - Present and future 2-D flood mapping within the key watersheds identified as flood-vulnerable

Programmatic and Policy Recommendations

- Communications and data sharing among agencies
- Increasing access to flood risk information for the public
- Storm infrastructure asset management
- Real time rainfall or stream gauges
- Better flood insurance information tracking
- Flood proofing technical assistance
- Voluntary property acquisition
- Adding drainage focus to building permit reviews
- Integrate flood risk into land use planning
- Update regulations and design standards based on flood risk information
- Funding for flood management strategies

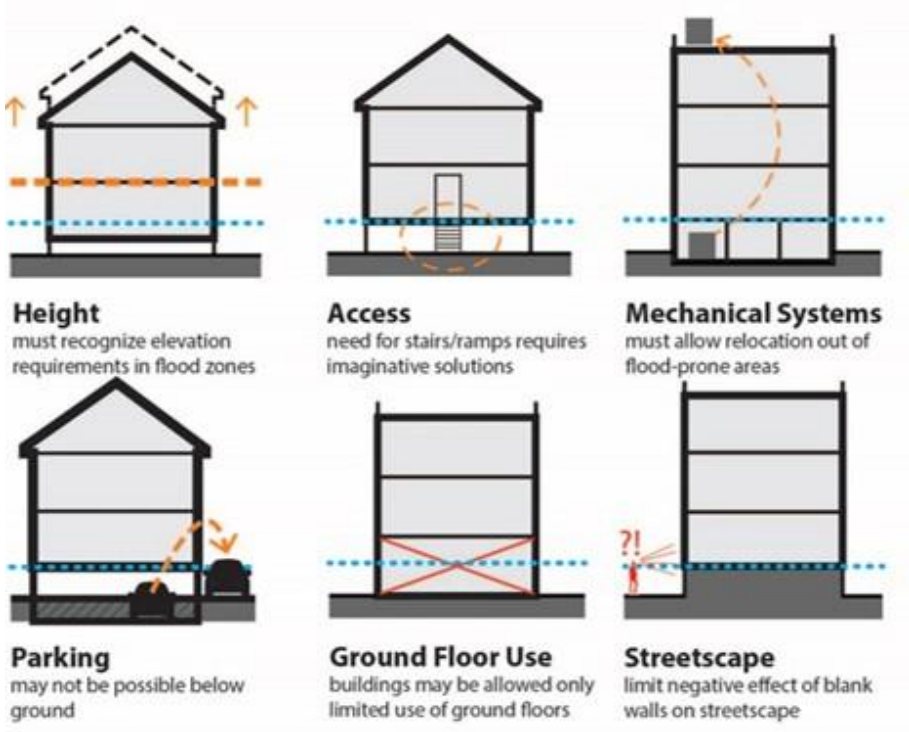
RAMP Present and Future Uses

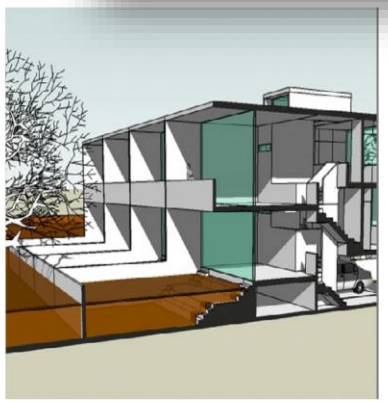
CIP Design and Budgeting	Compares **value of current investments** against **cost of inaction**	**Special Projects Planning**, e.g., Barcroft, PLB	**Adaptation & Resiliency planning** and measurement
Inform **adaptive design and construction** standards	Use in **plan reviews** (private and public)	Provides **independent confirmation** of previous watershed analyses	**Eliminated the need for additional analysis** at several critical facilities
Provides guidance on **policies and programmatic measures** for implementation	**Certifications, rankings, and recognitions**, e.g., CDP, LEED® Platinum Cities	**Grant support**	Risk-mitigation factor for **bond agencies**

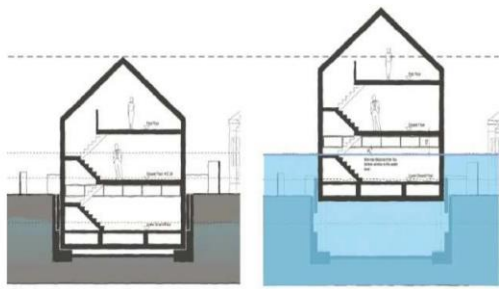


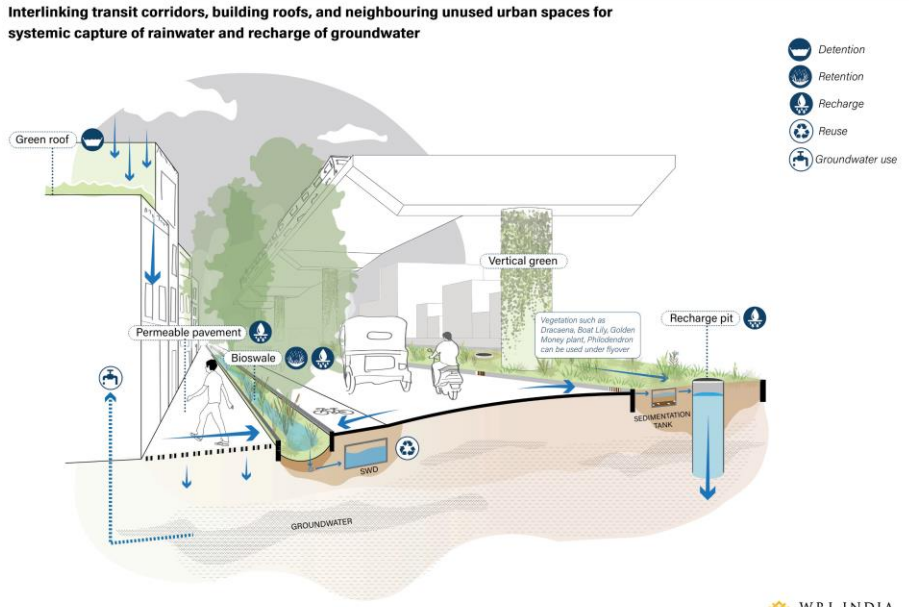
Coming Design/Construct Guidelines and Blended Infrastructure Survey

- Adaptive Flood Design and Construction Guidelines Manual
- Future-Facing Natural Infrastructure Manual – *urban heat mitigation*









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