

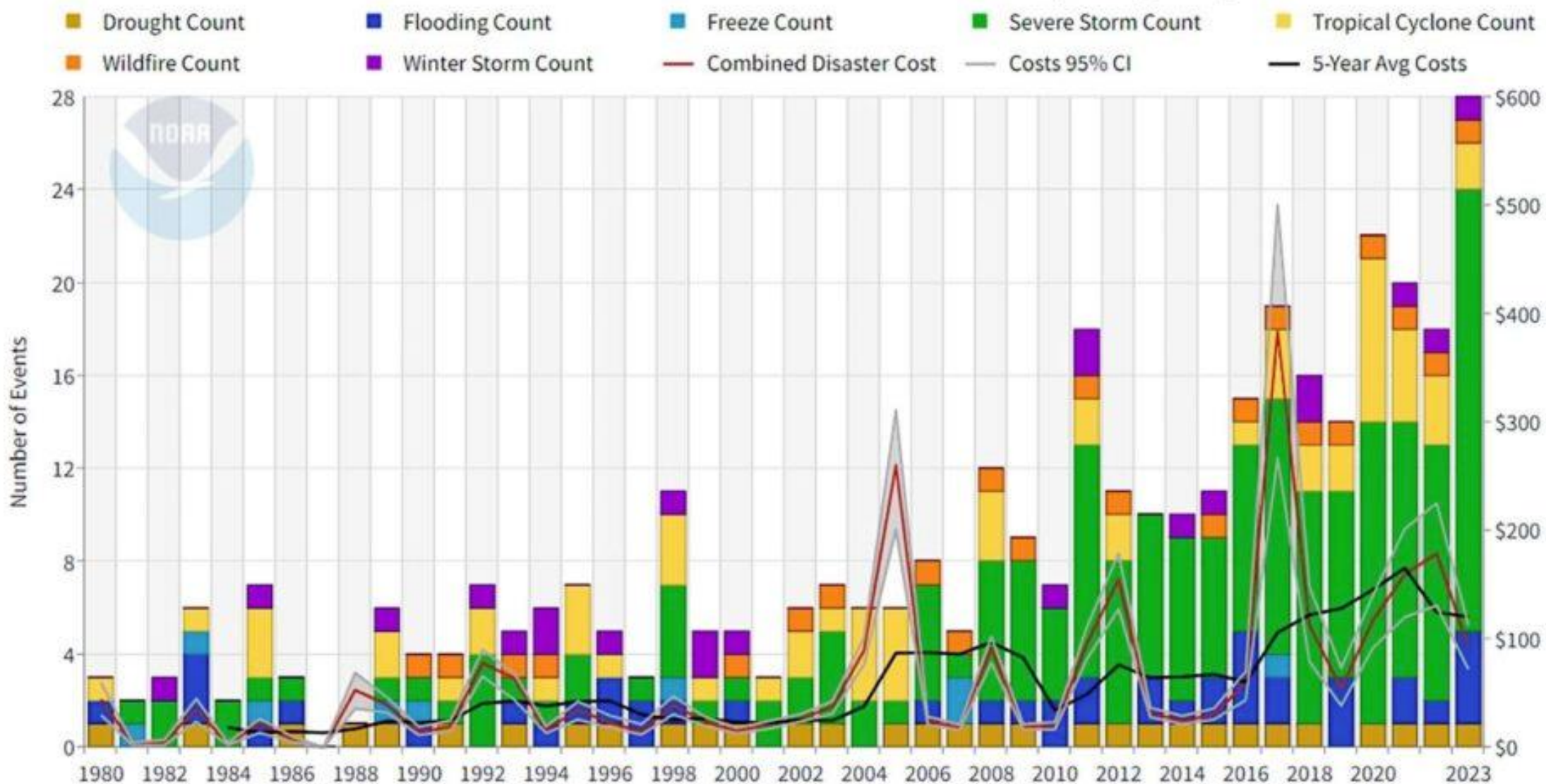
MWCOG Water Resources Technical Committee Meeting

Risk Assessment and Management Plan (RAMP)

September 13, 2024



United States Billion-Dollar Disaster Events 1980-2023 (CPI-Adjusted)



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 Flood Resilient Arlington



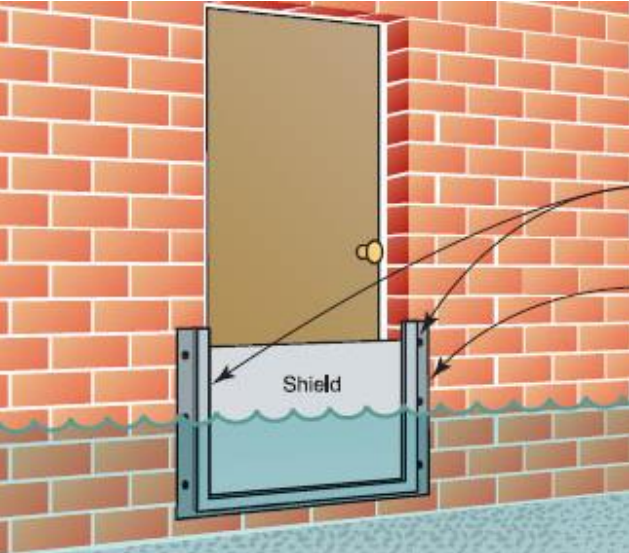
Analytics and Data Assessment



New Types and Locations for Capacity Projects



Increased Stormwater Requirements



Increased Funding



Voluntary Property Acquisition



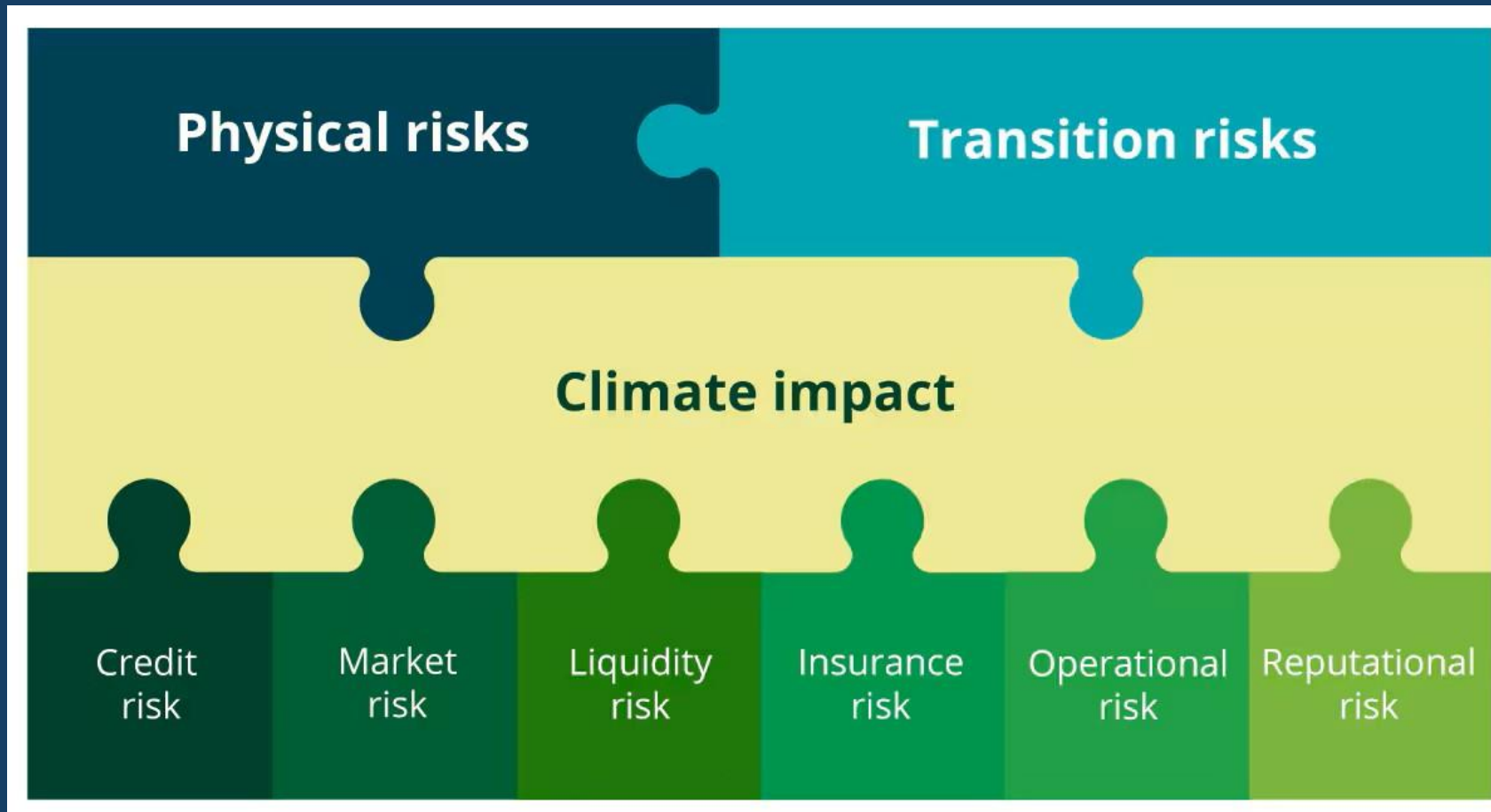
Floodproofing Outreach

Triple-Aspect of Climate Action

Climate Adaptation (Risk)

Fortifying Communities for the Change We Cannot Avoid

The Age and Strategies of *Climate Risk*



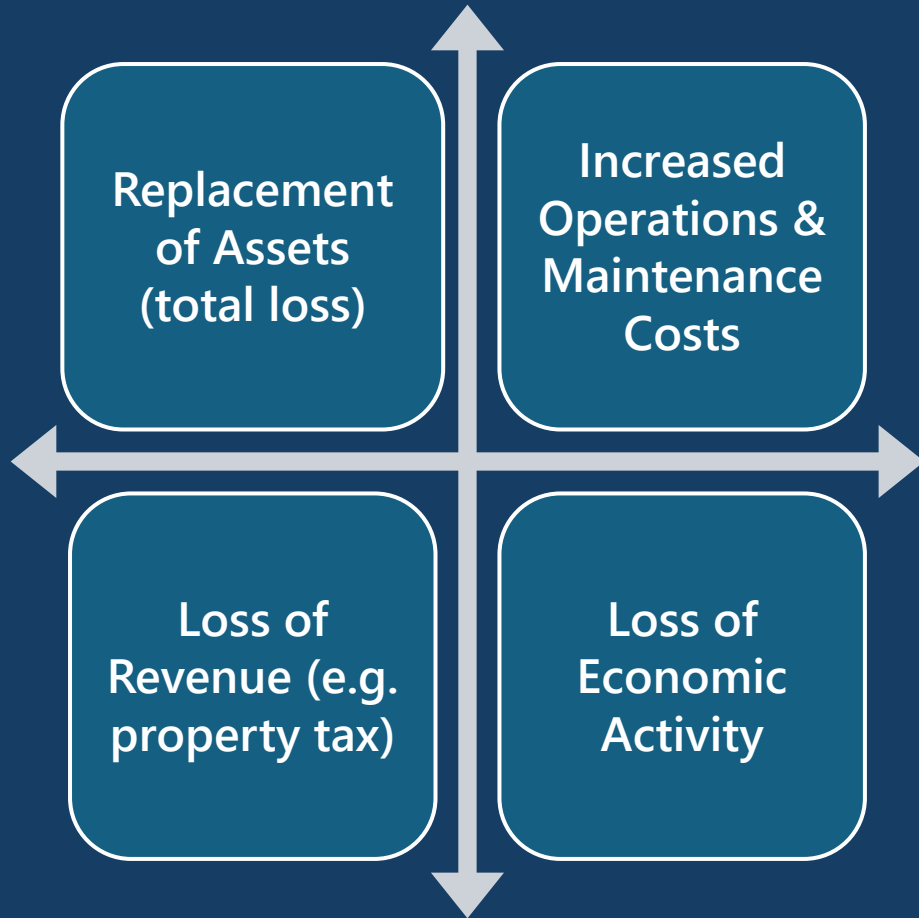
Climate Risks and Cascading Impacts

- **Economic disruption**
 - Property loss, supply chain disruption, economic activity interruption
 - Re/insurance markets
 - Bonding / Cost-of-Debt
- **Physical damage**
 - Damage to roads, utilities, assets, communications, buildings, facilities
- **Environmental**
 - Sweep and broad distribution of non-point source pollutants and solid materials
 - Threatened species – potential impacts
 - Implications of extreme heat
- **Health and public safety**
 - Loss of life, interruption in critical emergency services
- **Population displacement**
 - Short term displacement, long term relocation



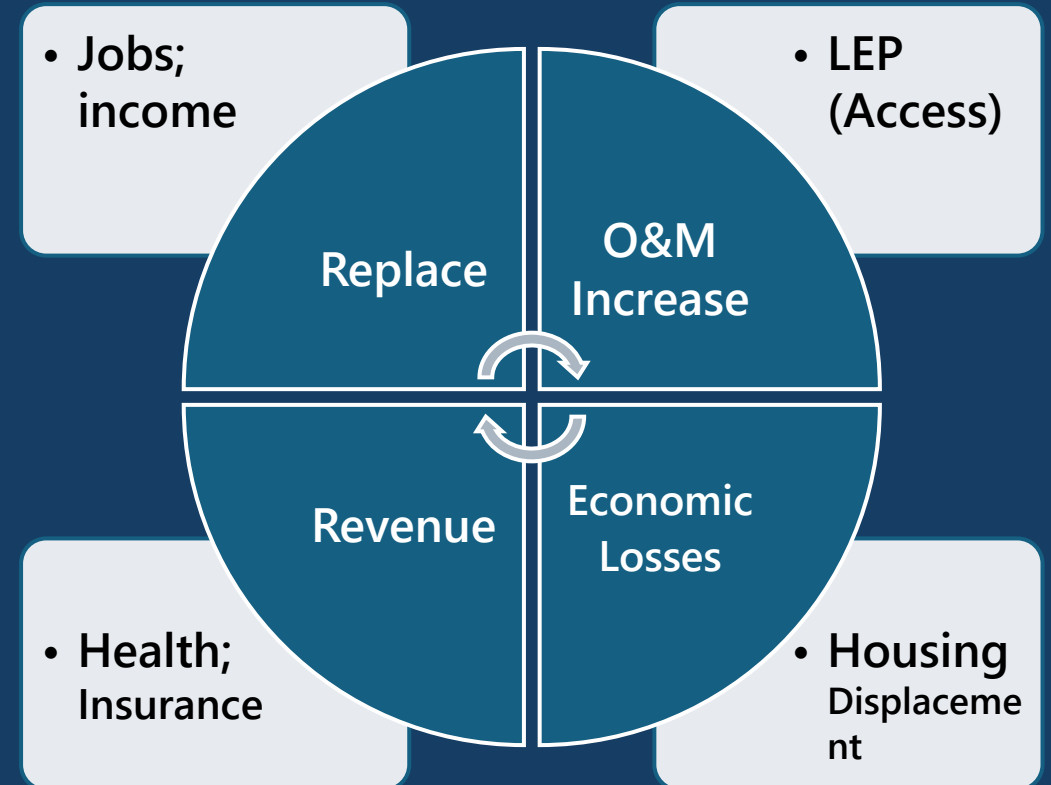
RAMP – Risk Assessment + Social Vulnerability Risk

Conventional Model - FEMA



Direct and indirect PLUS Cascading Impacts

RAMP Model – Plus Social Vulnerability Impacts



Direct and indirect PLUS Cascading Impacts

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

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 - Current Application 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

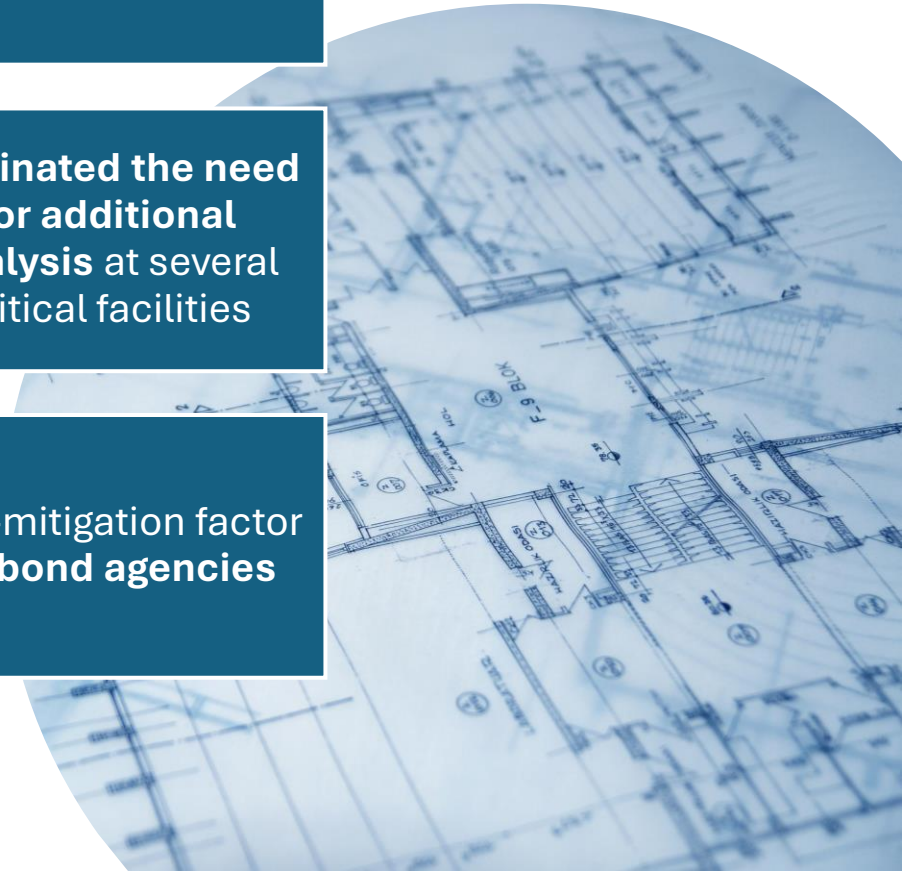
Eliminated the need for additional analysis at several critical facilities

Provides guidance on **policies and programmatic measures** for implementation

Certifications, rankings, and recognitions, e.g., CDP, LEED® Platinum Cities

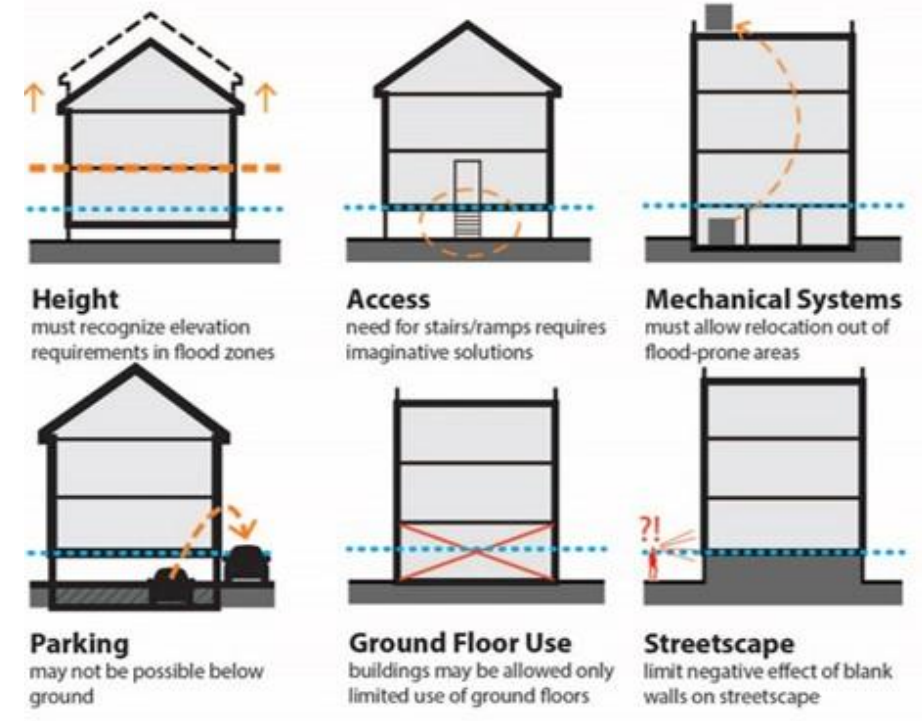
Grant support

Risk-mitigation factor for **bond agencies**

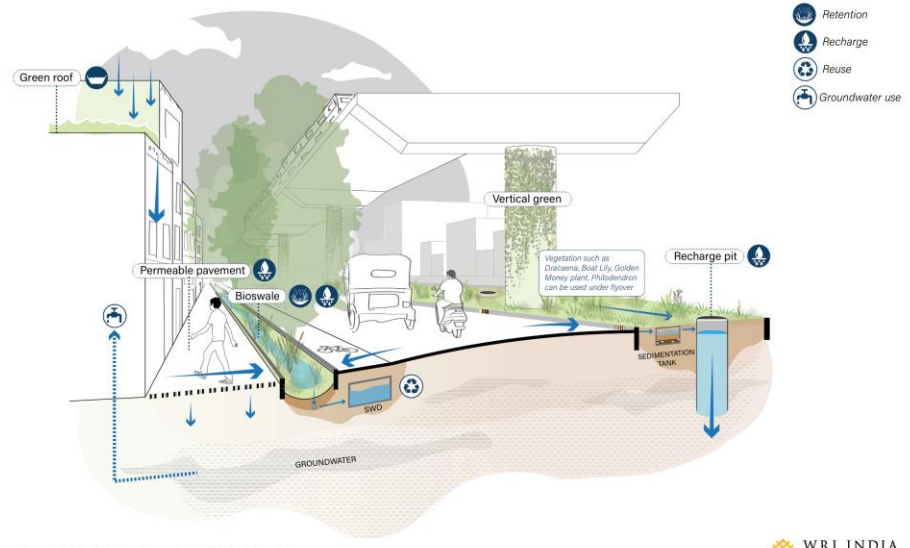


Coming Design/Construct Guidelines and Blended Infrastructure Survey

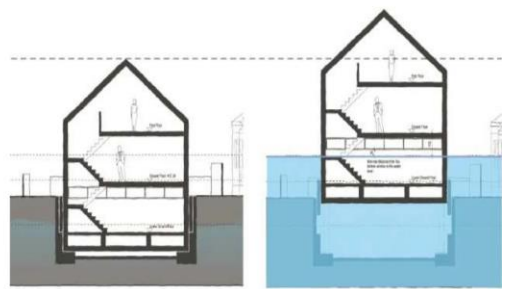
- Adaptive Flood Design and Construction Guidelines Manual
- Future-Facing Natural Infrastructure Manual – *urban heat mitigation*



Interlinking transit corridors, building roofs, and neighbouring unused urban spaces for systemic capture of rainwater and recharge of groundwater



Source: WRI India. Illustration created by Sindhuja Janakiraman



Questions?

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



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

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)**