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Adaptation For All—How to Build Flood Resilience for Communities of Every Size

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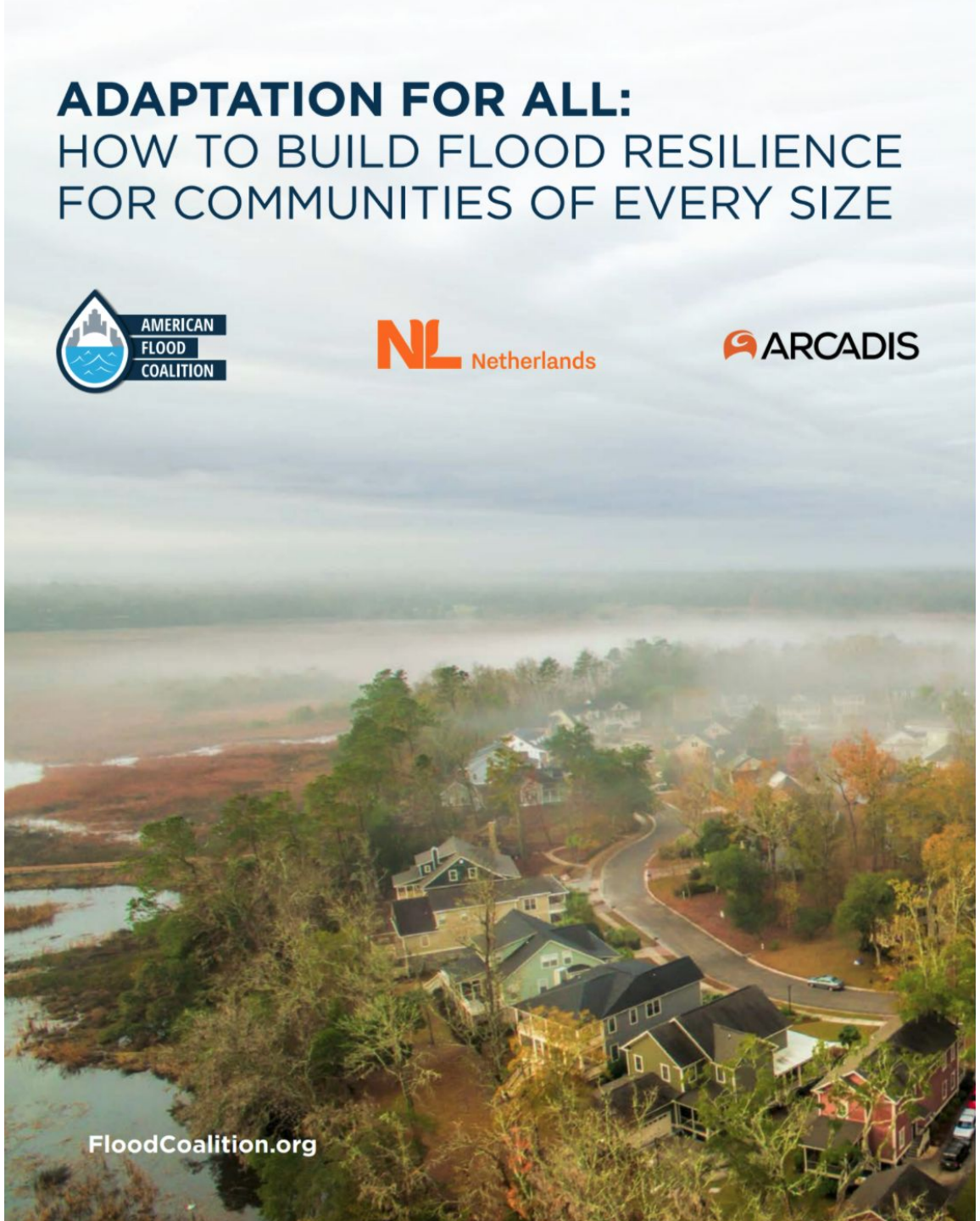
AMERICAN FLOOD COALITION

Adaptation For All

- Across the country, communities large and small feel the increasing and devastating impact of flooding, yet each community's ability to recover and plan for the future is different.
- Drawing on examples from the U.S. and the Netherlands - a country with a long history of flood challenges and innovations - this guide is for local communities of every size looking for strategies to address flooding.



What This Guide Offers

Explore concepts for local leaders:
review key tips and ideas for developing a local flood action plan

Understand cost and complexity:
explore which approaches may best fit local flood challenges, resources, and budget

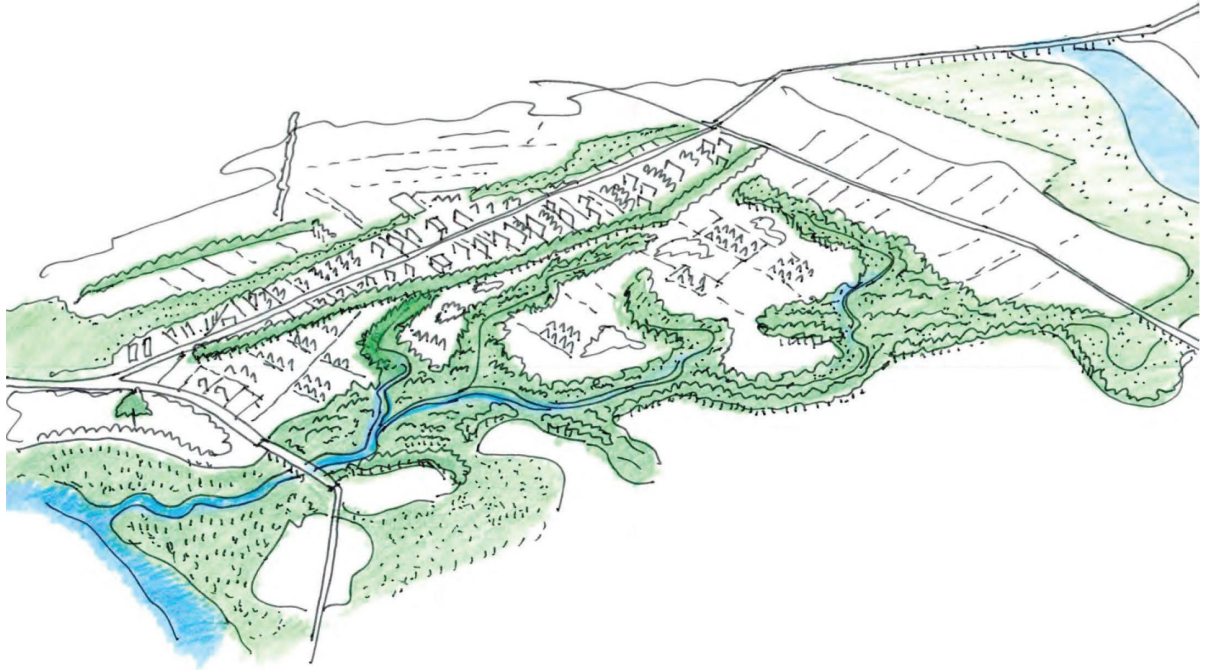
Review case studies and summaries:
review examples across different categories of approaches

Share this guide with key stakeholders:
use the guide as a resource to inform a local flood action plan

Core Values

Build Resilience and Adaptation

- **Use past flood costs to prompt investment.** Build a business case for investment in actions to reduce future flood impacts.
- **Estimate future flooding to plan wisely.** In many communities, rising sea levels, more heavy rainfall, and other environmental and land use changes are expected to increase flood risk.
- **Partner with others to understand flood risk.** Communities can partner to share data, develop analyses, and coordinate clear and consistent ways of communicating public information about flood risk.



Adapting development patterns: This sketch of Johns Island, South Carolina, proposes concentrating future development on high ground while preserving waterways for drainage as a method for adapting and building resilience. (Source: Dutch Dialogues)

Core Values

Invest in Resilience

- **Collaboratively develop criteria.** Actively seek community input to collaboratively develop and apply criteria for prioritizing areas and facilities for investment.
- **Identify critical facilities.** Assess and prioritize which infrastructure or buildings, such as hospitals, may be most important to life safety during a disaster.
- **Develop and compare options for action.** Develop a wide range of actions that could reduce the risk or impacts of flooding.

Image source: U.S. Army National Guard photo by Staff Sgt. Balinda

Core Values

Invest in Resilience

- **Use a systems approach.** Identify larger systems of the community, such as wastewater or transportation, and consider how investments in these systems could advance other resilience objectives.
- **Assess vulnerability.** Use data about local social, environmental, and economic conditions to identify people or locations that may need extra support
- **Establish multiple investment pathways.** Consider pathways for near-, medium-, and long-term investment to prepare for flood risk that may increase over time.

Core Values

Create Positive Change

- **Engage stakeholders.** Establish multi-step planning processes with clear and accessible opportunities for public input
- **Prioritize equity.** Shape and implement strategies that are responsive to diverse community needs and prioritize the most vulnerable community members

Image above: A public workshop in the Town of Cary, North Carolina. (Source: Town of Cary)

Core Values

Create Positive Change

- **Take a broad hazards approach.** Consider flooding alongside other relevant local hazards, and consider how these hazards may interact with one another
- **Consider setting up a backup plan.** Proper maintenance of pumps, pipes, and other infrastructure should be the first step, but planning for redundant “backup” systems may also be needed
- **Integrate solutions.** The approaches in this guide are not stand-alone solutions that “fix the problem.” They are a set of solutions that should be part of a larger planning strategy.

Image above: Integrated beach, seawall and boardwalk in the small Dutch city of Scheveningen (Source: Kingdom of the Netherlands)

26 Approaches Across 3 Categories

Land use and policy

Example: Ordinances
(Source: Town of Cary, NC)

Stormwater and drainage

Example: Stormwater Parks
(Source: City of North Miami)

Coastal and shoreline

Example: Living Shorelines
(Source: DE Center for Inland Bays)

For each approach, the guide describes: **Scale**, **Investment Type**, **Operations and Maintenance**, **Funding and Info resources, and a Case Study**

Example Land Use Policy Approach:

Zoning and Land Use Regulations

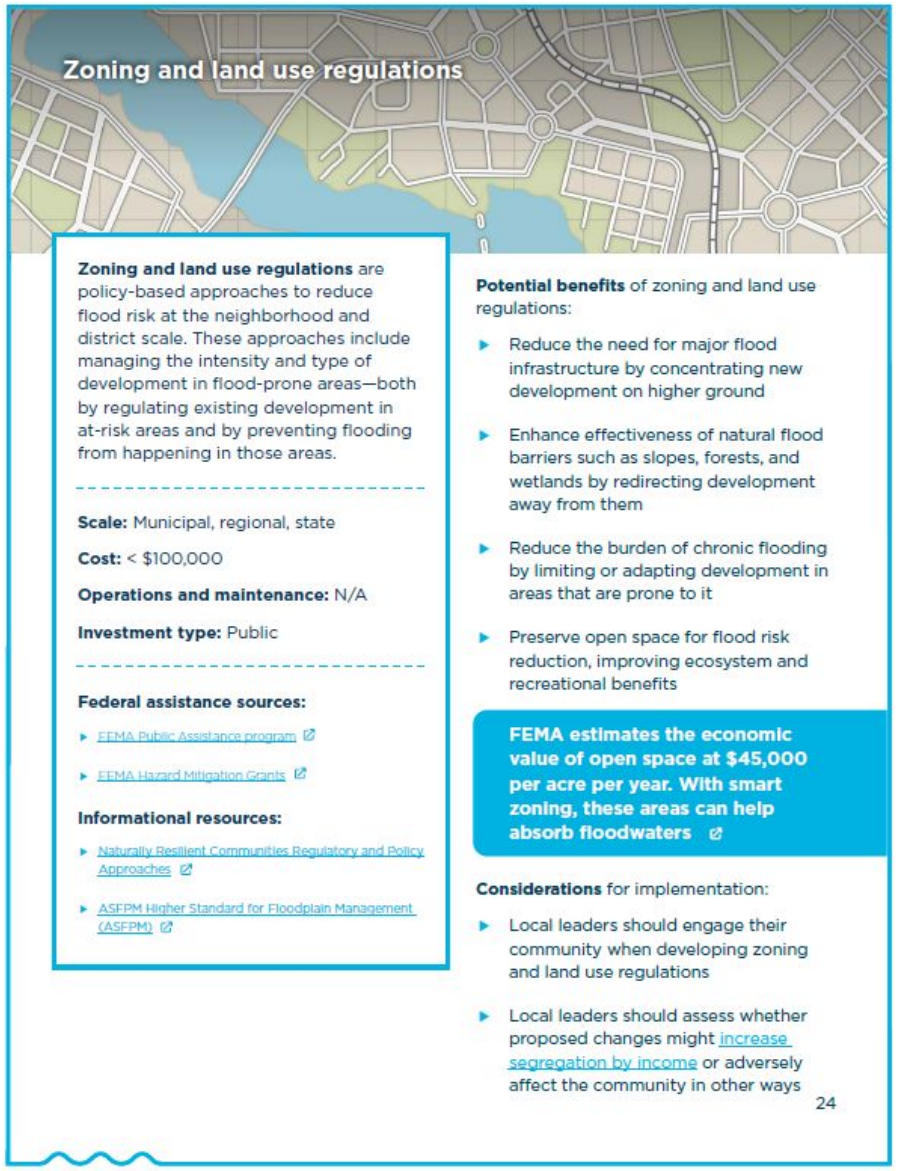
- Zoning and land use regulations are policy-based approaches to reduce flood risk at the neighborhood and district scale. These approaches include managing the intensity and type of development in flood-prone areas

Potential benefits of zoning and land use regulations:

- Reduce the need for major flood infrastructure by concentrating new development on higher ground
- Enhance effectiveness of natural flood barriers such as slopes, forests, and wetlands by redirecting development away from them
- Reduce the burden of chronic flooding by limiting or adapting development in areas that are prone to it
- Preserve open space for flood risk reduction, improving ecosystem and recreational benefits

Considerations for implementation:

- Local leaders should engage their community when developing zoning and land use regulations
- Local leaders should assess whether proposed changes might increase segregation by income or adversely affect the community in other ways



Example Stormwater and Drainage Approach:

Culvert and Drainage Pipes

- Culverts and drainage pipes allow water from rivers and streams, tidal inlets, or storm events to pass underneath a bridge, road, or railway. If properly sized, they reduce flooding by transporting large volumes of water and preventing any backup of floodwater that could spill over onto adjacent roads and properties.

Potential benefits of culverts and drainage pipes:

- Reduce flood damage to roads and properties by transporting large volumes of water, which prevents backup
- Reduce erosion downstream by slowing the speed of flowing water
- Have long lifespans and require little maintenance
- Allow better passage of fish and other aquatic wildlife
- Enhance ecosystem health by facilitating the transport of water and nutrients

Considerations for implementation:

- Engineers must carefully design and size culverts to accommodate peak flows during storm events
- If undersized, culverts can increase flooding and become more easily damaged
- When prioritizing upgrades to culverts, local leaders should consider social, economic, and environmental factors
- Local leaders can incorporate culverts into larger infrastructure projects like bridge replacement and ecological restoration

46

Example Coastal and Shoreline Approaches:

Floodwalls and Berms

- Floodwalls and berms are permanent vertical infrastructure elements that provide continuous lines of protection against coastal and riverine flooding for upland areas. Floodwalls are walls designed to hold back floodwaters. Berms are earthen mounds designed to do the same—they are similar to levees but smaller in size.

Potential benefits of floodwalls and berms:

- Protect against flooding for upland communities and properties
- Reduce flood risk in riverine and coastal environments
- Deliver recreation opportunities and vegetation growth

Considerations for implementation:

- Floodwalls and berms are most applicable for areas with existing structures and infrastructure vulnerable to flooding, in areas with low to moderate exposure to waves
- Berms require substantial land to allow for adequate slopes
- This approach must provide a closed system so water cannot "go around" the structures to the areas it is meant to protect
- When installing floodwalls and berms, engineers should use hydrologic modeling to ensure this approach will not worsen the problem of flooding elsewhere

80

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Scale: Site, Shoreline segment

Cost: < $1 million

Operations and Maintenance: Medium

Investment Type: Public/Private

Federal Assistance Sources:

- HUD Community Development Block Grant (CDBG) Program
- FEMA Hazard Mitigation Grants

Informational Resources:

- FEMA Selecting Appropriate Mitigation Measures for Floodprone Structures
- New York Urban Waterfront Adaptive Strategies

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The Town of Haverhill, Massachusetts, built a 1,200-foot boardwalk along the 30-feet tall, 2,250-foot long flood wall that borders the Merrimack River

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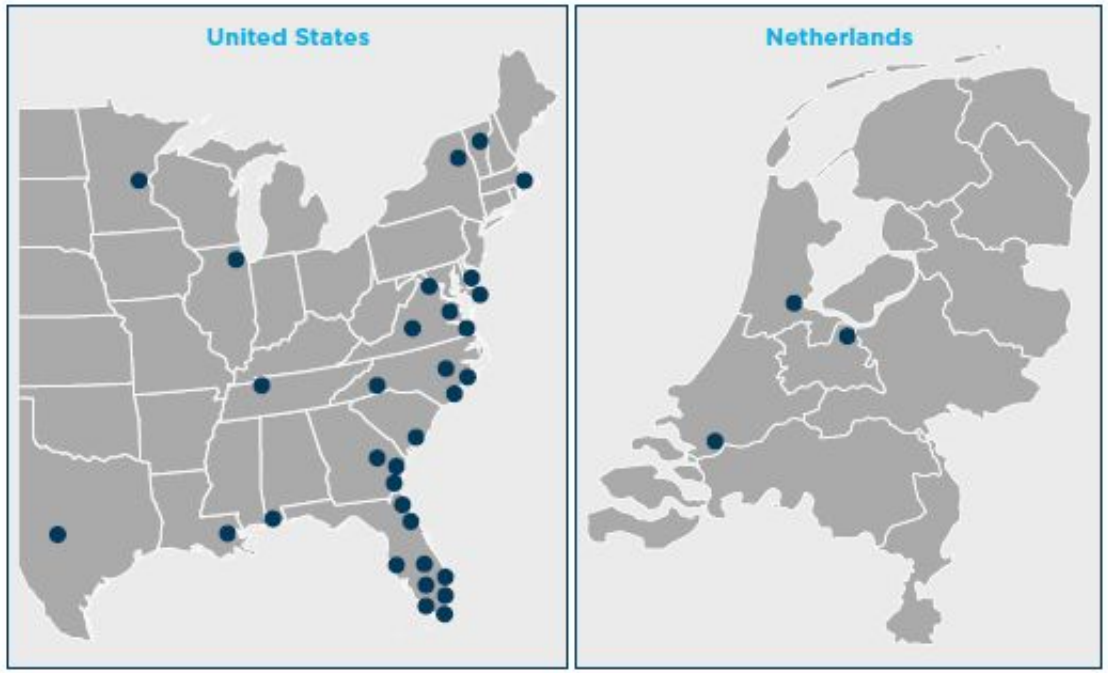
80

Case studies: learning from local examples

- The guide includes examples of resilience and adaptation approaches from both the U.S. and the Netherlands
- These cover a range of project types from successful policy approaches to capital projects that helped communities reduce risk and become more resilient



Example Coastal and Shoreline Approaches:

Floodwalls and Berms

Spakenburg (NL) Self Closing Flood Barrier

Example Coastal and Shoreline Approaches:

Stormwater Parks

- North Miami and Van Alen Institute held a design competition to convert a vacant lot into a stormwater park
- Door-to-door community conversations were essential to the project's success
- The park's retention pond and absorbent landscaping can store 20 times more water than the vacant lot
- The park's features are designed for the two feet of sea level rise expected for North Miami by 2060
- The project took three months to build and opened in December 2019
- The project cost around $150,000 and was funded by grants from Van Alen Institute and the State of Florida

(Image source: **City of North Miami**)

Questions?

Contact Us

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Download: **Adaptation For All Guide**

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Thank you!