

Disaster Resistant Housing for Mitigation and Sustainability

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Disaster Impacts on Communities

- Through planning and design, it is possible to reduce the impact of disasters on our communities
- Mitigation through construction is more expensive
- Mitigation through remediation is very expensive

It can take decades for a community to recover from a disaster. Think of the lost opportunities in that time!



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Concepts

- **Mitigation**
 - **Avoid or reduce losses through planning or design**
- **Sustainable**
 - **Strategies to minimize life cycle or environmental costs**
 - **Efficiency**
 - **Durability**
 - **Utility**
- **Resilient**
 - **Facilities able to withstand impacts of disasters**
 - **Strength**
 - **Protection strategies**

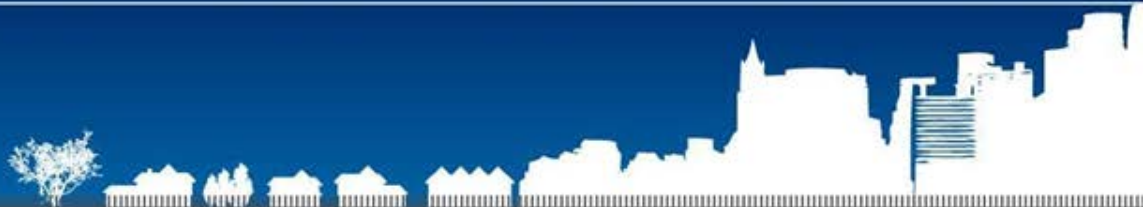


What are we trying to Accomplish?

- **Disaster Resistance**
- **Mitigation of Disaster Damage**
- **Sustainability**
 - **Energy**
 - **Water**
 - **Carbon**
 - **Land**
- **Resilience**
 - **Community**
 - **State**
 - **Region**



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What do we know?

- In a post disaster environment, there are many challenges
- What have we learned from past disasters?
 - Good design is good design
 - Bad locations will remain bad locations
 - Disaster housing is just housing
 - Design, durability, sustainability, and resilience have many overlaps
 - Opportunities for decisions and building improvements are fleeting – leaders must seize the moment
- Information for enhancing building performance is available
- Planning early will help address many problems



Disaster Resistance Elements

Materials and Construction

Design

Location



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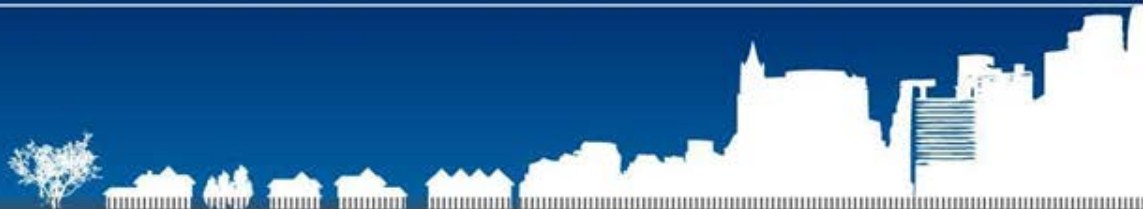
The Disaster Housing Challenge

- “Normal” housing blends quality, speed and cost
- Disaster housing adds quantity to the mix (and puts the speed component to the top)

**Makes the old contractor’s saying
“You can have it good, fast or cheap
... pick two”, seem easy!**



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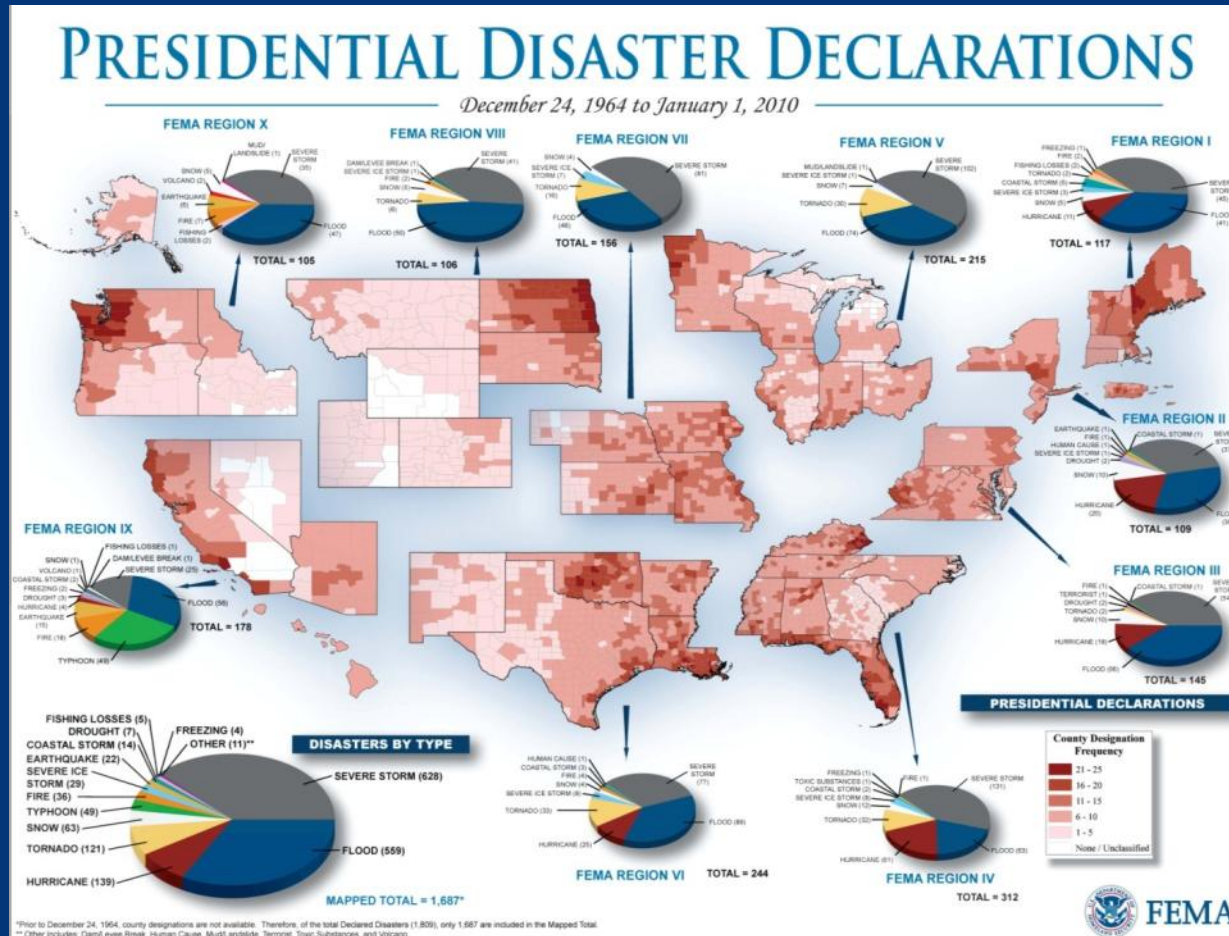


Relevance

- Disasters are not limited to any particular region
- Entire nation is involved, regardless of disaster location
 - Impacts to commerce, materials and labor costs
 - Introduction of unproven materials (Chinese drywall)
 - Issues demanding attention and action (formaldehyde)
- Design and planning professions can harden communities during planning and design to include:
 - Affordability
 - Durability
 - Integration into community plans
 - New construction provides an opportunity to address these approaches

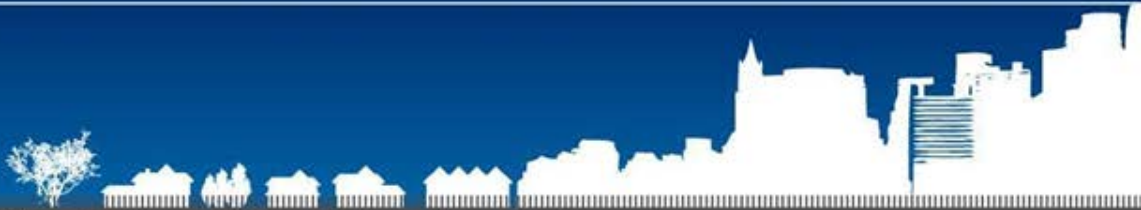


Disaster Declarations – 1964-2010



Disaster Declarations

- Most federal disaster assistance requires a presidential declaration
- Map shows 46 years of declarations
- Many areas are not considered “disaster prone”
- Declared disasters included severe storms, floods, hurricanes, tornadoes, snow, typhoons, fire, severe ice storms, earthquakes, and other causes
- 70% of all declared disasters were for severe storms or floods, and 15% for hurricanes and tornadoes
- Only 48 of over 3,000 counties have not received a declaration



This Could Be Your Community!



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Impact to Communities

- **Disasters will affect long-term community viability**
 - **Reconstruction efforts takes resources away from other community activities**
- **Assistance for repairs to housing or public facilities may be limited or delayed**
 - **Assistance will not cover all losses**
- **Community viability is controlled by recovery of businesses, services and property owners**



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Disaster Housing “Truths”

- Temporary housing isn't temporary
 - Earthquake “shacks” from 1906 San Francisco quake still in use
- Temporary housing is slow and expensive
 - Site development
 - Purchase, install, and maintain
 - Dispose (or refurbish), store and maintain
- Alternatives (to temporary) may be better
- Housing is essential for recovery



Hurricane Katrina Experience

- Don't say "Can't happen here!"
- Concepts discussed are relevant to areas affected by other than hurricanes
- To a community or property owner, the impact means a property was damaged or not, regardless of the size of the disaster (a single home fire is devastating to the family)



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Katrina's Impact on Gulf States

- Storm surge damage in coastal areas
 - Extensive damage in coastal Mississippi
 - Flooding in New Orleans from levee failures
- 1.3 million homes damaged, 300,000 with major/severe damage
- Cost of damage about equal to next four largest major disasters from past 20 years (Hurricanes Andrew and Ike, Midwest floods and Northridge earthquake)
- Extensive damage to property
- \$19.7 billion HUD CDBG funding

Damage still remains six years later!



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Community Impacts

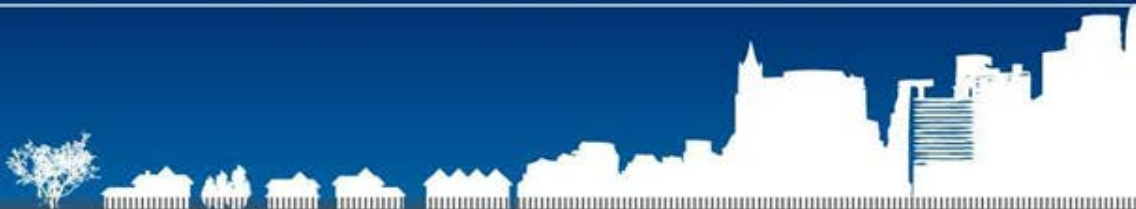
- Housing losses
- Community and housing demographics
 - High homeownership
 - Modest income and resources
- Existing community systems overwhelmed
- Permanent community impacts



Competing Community Demands

- Shortage of critical community staff
 - May be survivors as well as responders
 - Overwhelmed by surge requirements
- Management of reconstruction processes
 - Outside contractors or volunteers
 - Demands for increased tempo
 - Balance speed, cost and quality
 - Management of code inspection and permitting processes
- Disasters may cause population shifts

Early planning will help with the recovery effort

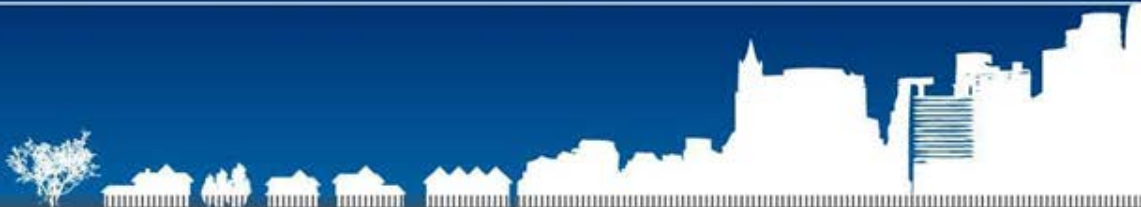


Challenges to Development

- **Competing interests – cost, affordability, sustainability, design, etc.**
- **How to finance rehab and reconstruction**
- **Reconstruction may be underfunded by insurance and other assistance**
- **Increased costs of reconstruction due to competition**
- **Elevation or other mitigation requirements**
- **Severely compressed planning timelines**



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Affordable Housing

- **May not be the lowest first cost**
- **Incorporates design, construction and maintenance**
- **Durability, maintenance and future disaster resistance is critical**
- **Energy efficiency is an opportunity with reconstruction**
 - **Reduce life cycle costs**
 - **Improve affordability**
- **Emphasis on green favors life cycle costing**



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Housing Requires Effective Planning

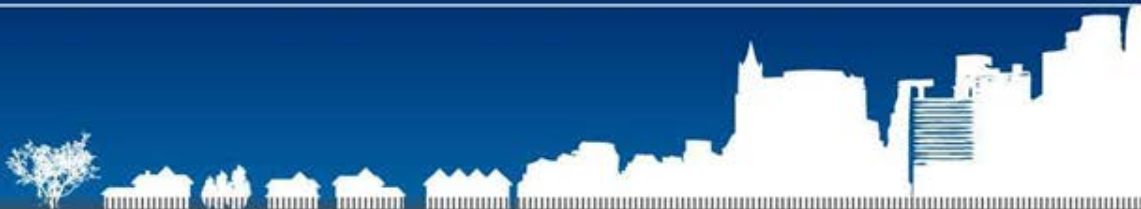
- **Combination of:**
 - **Community and Land Use Planning**
 - **Building Codes and Design**
 - **Construction**
- **Position community for resilience**
- **Can't wait for a disaster to begin**
- **Must be done early and often**
- **Mitigation demands effective planning**
- **FEMA will seek state (and local) input on post disaster housing strategies**

Design, planning and housing professionals must be involved!



Land Use Planning

- **Some areas may present too great a risk**
- **Land use changes are difficult and quite political**
- **Local land use decisions critical**
 - **Lengthy process – must start early**
 - **Decisions must be local**
- **New development techniques can support changes in land use**
 - **Increased density**
 - **Create open space in high risk areas**



Building Codes



- **Widely accepted and achievable standards**
- **Modern codes, effectively enforced, protect families and communities**
- **Building code process provides opportunities for involvement**
- **Building codes only enhance new construction or substantial rehabilitation – little impact on homes with no/modest damage**
- **Code minimums may not always be adequate**
 - **Design to higher standards as appropriate for situation**
 - **Look to other regions for ideas**



Possible Design and Code Opportunities

- Hurricane clips
- Window shutters
- Impact resistant windows
- Reinforce garage doors
- Look to other regions for ideas



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Steel Framing

- Recyclable and recycled
- Termite resistance
- Won't rot
- Must address thermal requirements



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Structural Insulated Panels

- Panels speed construction
- Energy Star
- R25–R40 walls provide energy performance
- Structural skin
- Metal, wood or fiber cement skins



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Insulating Concrete Forms

- Insulated walls with concrete core
- Stronger construction
- Disaster resistance
- Energy efficiency

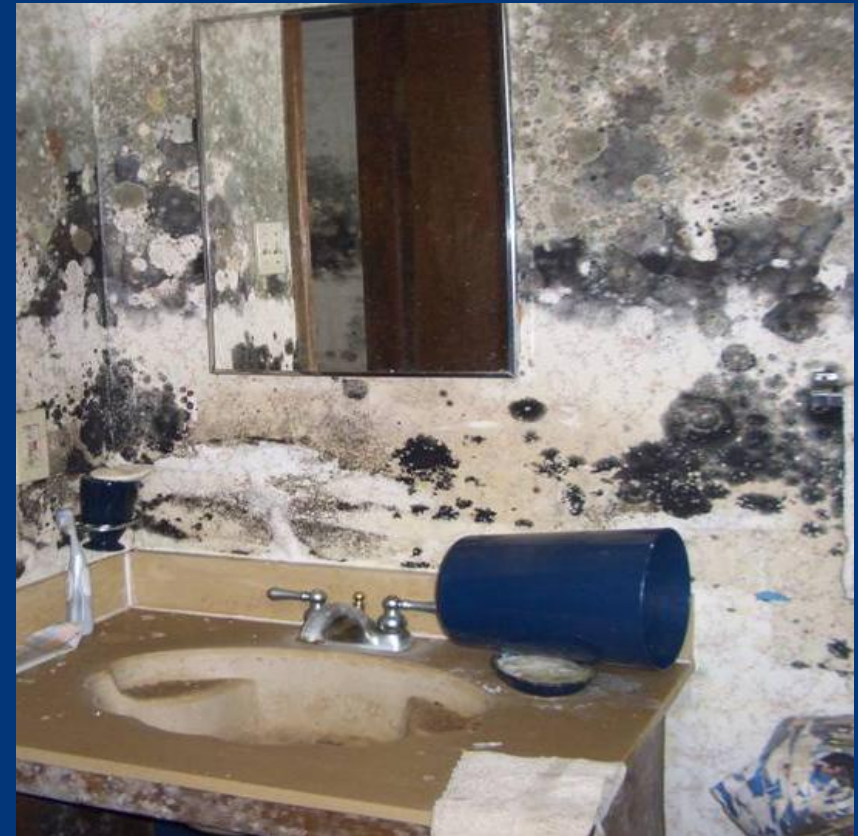


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Moisture Resistance and Durability

- **Moisture is the enemy**
- **Good design and construction critical**
- **Attention to details critical**
- **Design – protect the walls and building envelope**
- **Product selection – some materials resist moisture better than others**



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Elevation

- Elevation and building envelope are critical
- Must balance accessibility and elevation (consider alternatives)
- Multifamily housing may make accessibility easier
- Flood Maps provide design information

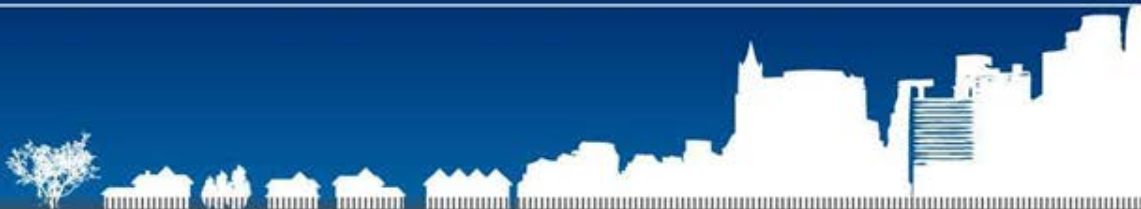


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Technology Based Resilience

- **New construction technologies may build on the resilience provided by land use planning**
- **Cannot be an alternative to planning**
- **Technology-only approach (without planning) will likely be unaffordable and will likely fail**
 - **Validate claims for new or unknown products**



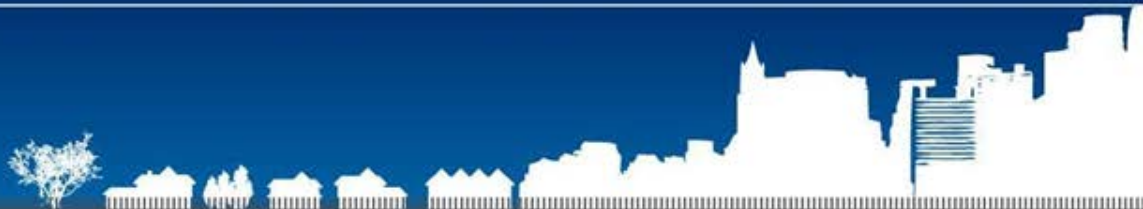
Design and Material Considerations

- **Building Design**
 - Designs protect the structure and occupants
 - Homes in flood-prone areas should be designed with living spaces above flood-plain elevation
 - Simple designs are more affordable and durable
- **Building Materials**
 - Products that provide strength and durability
 - Resistant to damage from bulk water intrusion including floods and major rain events
- **Planning**
 - Higher density planning can shift housing to less flood-prone areas



Mitigation is Our Friend

- Mitigate probable hazards during design, construction and repair
- Identify opportunities and requirements
- No time is more affordable than before construction
- Mitigation can provide multiple benefits
 - Performance – stronger construction may provide improved energy efficiency
 - Durability – fiber cement is more durable and impact resistant
- Good land use is a mitigation approach



Mitigation by Design



Concrete home in Utah

Concrete home in Mississippi



Mitigation by Location



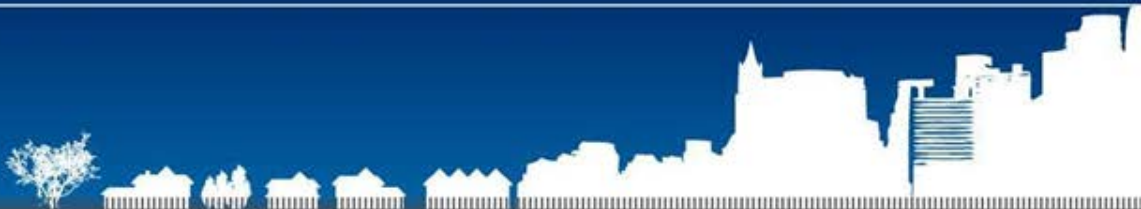
Homes built above flood level

Similar homes elevated above flood level



Keys to Affordability

- **Build permanent and adaptable housing**
- **Design for future growth in home and community**
- **Understand the community expectations and concerns**
 - **Waste less time/money “getting to yes”**
 - **Avoid exotic designs**
- **Make sustainable homes**
 - **Durability reduce maintenance costs**
 - **Stronger and tighter can also be energy efficient**
 - **Modest (small) homes will reduce construction costs**
 - **Simple designs often more resistant to disasters**



Results of Mitigation

- Affordable disaster housing is the result of:
 - Good designs with smaller footprints
 - Simple, well constructed homes
 - Durable materials
 - Adaptability
 - Strength
 - Energy efficiency and green(er)
 - Appropriate siting
 - Recognition of community needs and hazards
- Planning before the disaster is critical

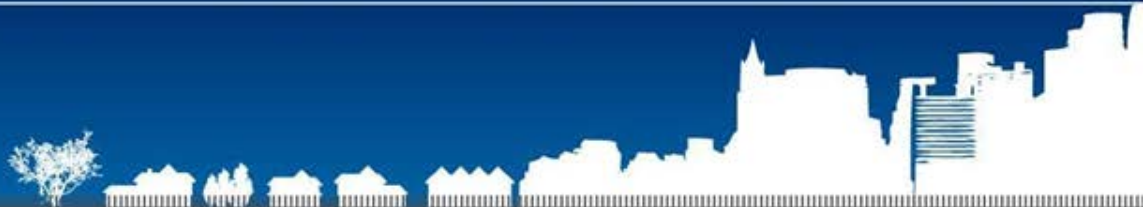


Information Tools for Enhancing Disaster Performance

- Many of the questions about performance have been answered – no need to do the research
- Information sources include:
 - HUD Office of Policy Development and Research
 - www.huduser.org
 - FEMA Mitigation
 - Institute for Business and Home Safety (IBHS)
 - Federal Alliance for Safe Homes (FLASH)



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What Have We Learned

- **Affordable disaster housing is possible**
- **Must blend durability, permanence and adaptability**
- **No “silver bullet” solution**
- **Will need to blend planning, design and execution**
- **Community involvement and acceptance is critical**
- **Look for opportunities to plant “seeds” of recovery**
- **Don’t repeat mistakes of the past**



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