BOK – The BIG Picture

1. Fundamentals -- math, science, and engr science.
2. Technical breadth.
3. Breadth in the humanities & social sciences.
4. Professional practice breadth.
5. Technical depth (specialization).

Climate Change and America's Infrastructure
Engineering, Social and Policy Challenges

CLIMATE CHANGE, ENGINEERING, DISASTERS AND RISK:

It is Time to Do Something!

Tempe, Arizona

January 28, 2013

Fear the Turtle

Gerald E. Galloway, Jr., PE, PhD
Glenn L. Martin Institute Professor of Engineering
Affiliate Professor of Public Policy
University of Maryland

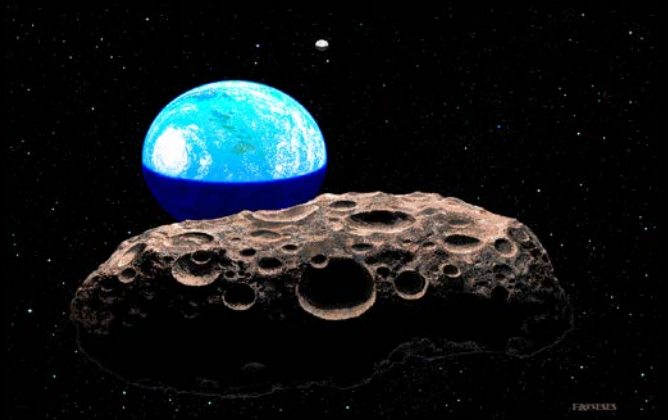
1

21st Century ≠ 20th Century

"Toto, I've a feeling we're not in Kansas anymore”

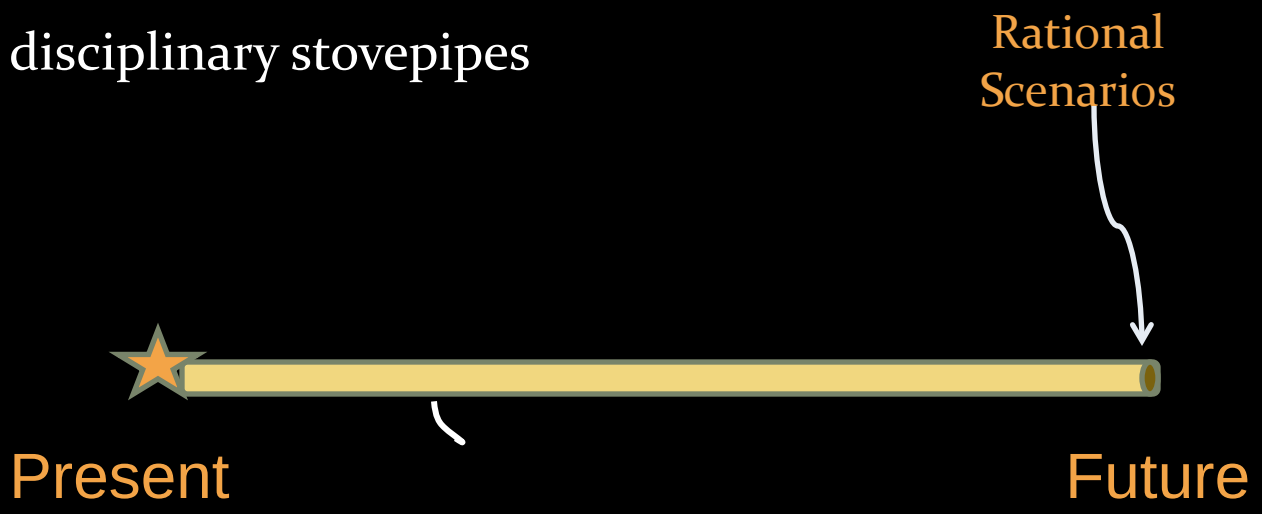
The 21st Century

- Population Explosion
- Pressures for Development
- Water Demand Rise
- Fiscal Austerity
- Climate and Other Change
- Volatile, Uncertain, Complex, Ambiguous National and World Situations



Planning for a Murky Future

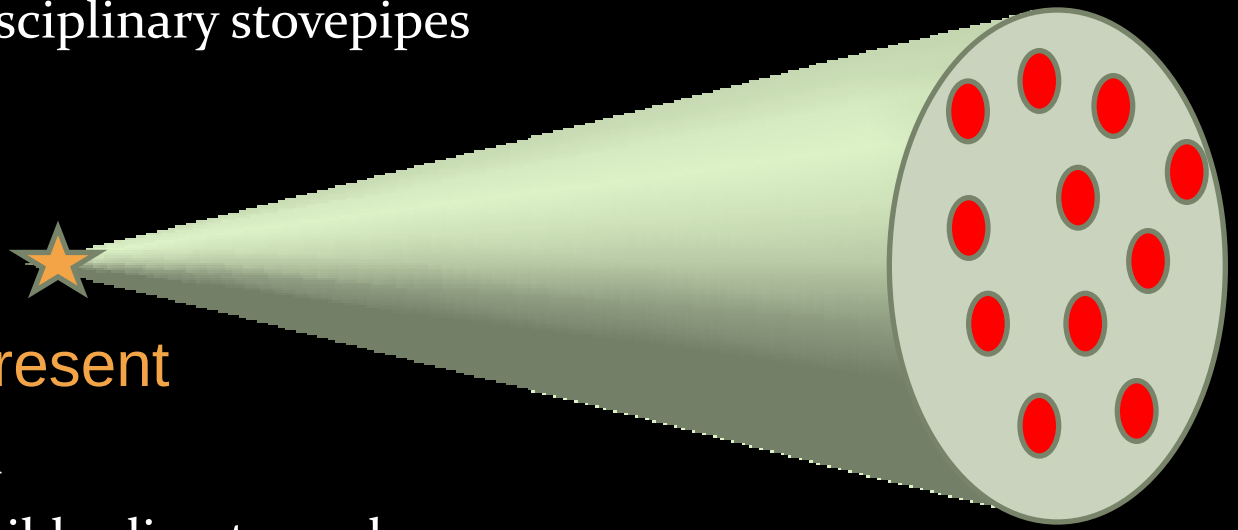
- Traditional Planning
  - Assumed little change – climate and human
  - Operated within a narrow future
  - Stayed inside disciplinary stovepipes



Adapted from Marc Waage , Denver Water

Dealing with a Murky Future

- Traditional Approach
  - Assumed little change – climate and human
  - Operated within a narrow future
  - Stayed inside disciplinary stovepipes

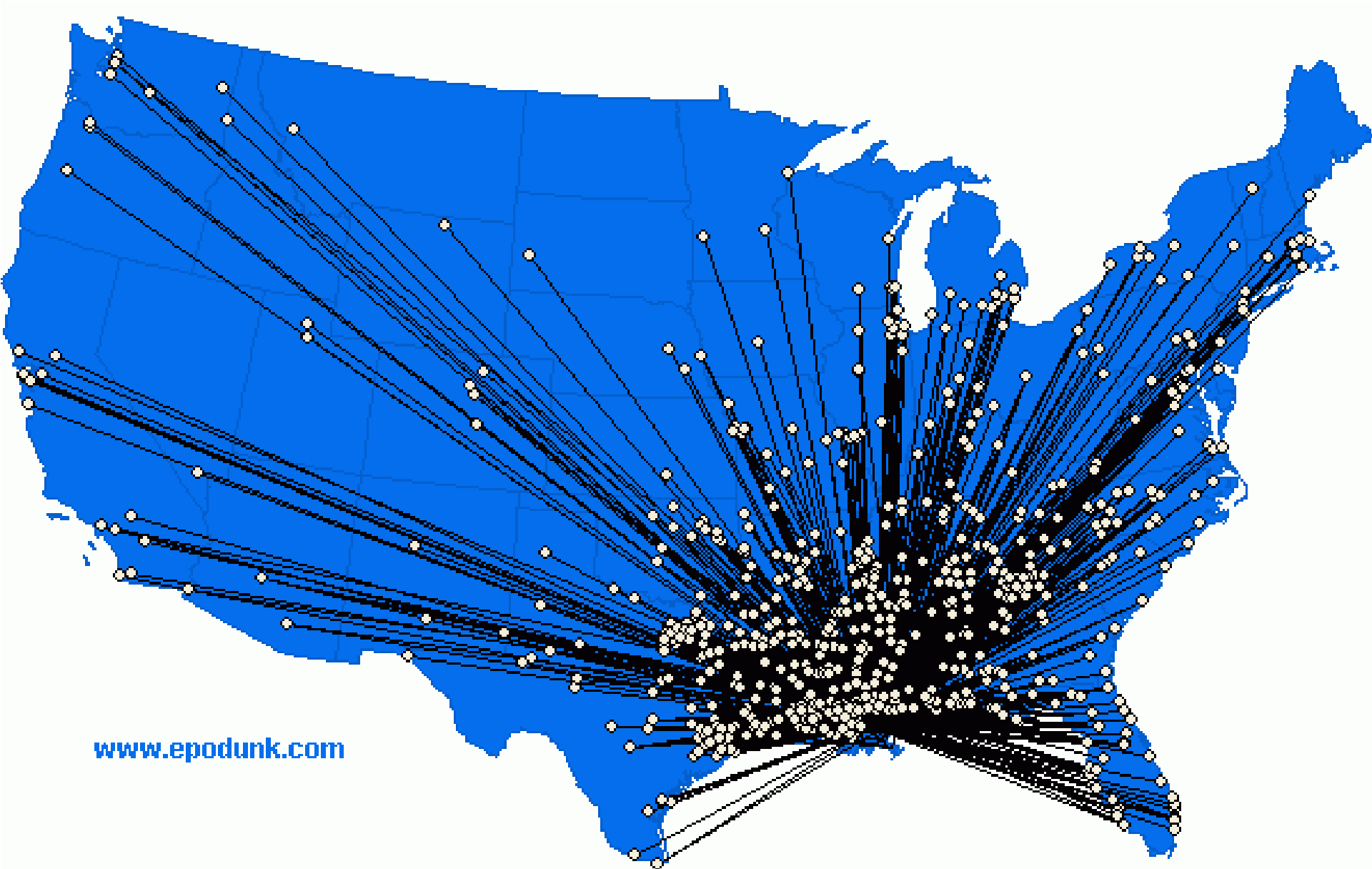


- New Approach
  - Hundreds of possible climate and anthropogenic-driven scenarios
  - Shared responsibilities
  - Adaptive, complimentary efforts

Adapted from Marc Waage , Denver Water


KATRINA!
100
90
80
NOAA
WINDS [KT] AT 13 Z
OBSERVED WEATHER AT 13 Z
TEMPERATURE 0 -10 -20 -30 -40 -50 -60 -70 -80 deg C
HURRICANE IR SECTOR FROM GOES-12 ON 22 SEP 2005 AT 14 Z


SOUTHWEST
PRIME


www.epodunk.com


FOR
SALE
BY OWNER

2008 Midwest Flood


EMERGENCY
ENTRANCE
WHEELCH
MERCY
EMERGE

Mississippi/Missouri Rivers 2011


NEW YORK
The City and the Storm
Starting on p.17
$5.99 USA/CANADA
47
0 71658 01912 6
NYMAG.COM

SANDY!


WATER ST
© Getty Images


© Reuters


© AP

Disaster Risk is on the Rise

2

We Need to Understand Risk

Risk

A Threat to that which We Value

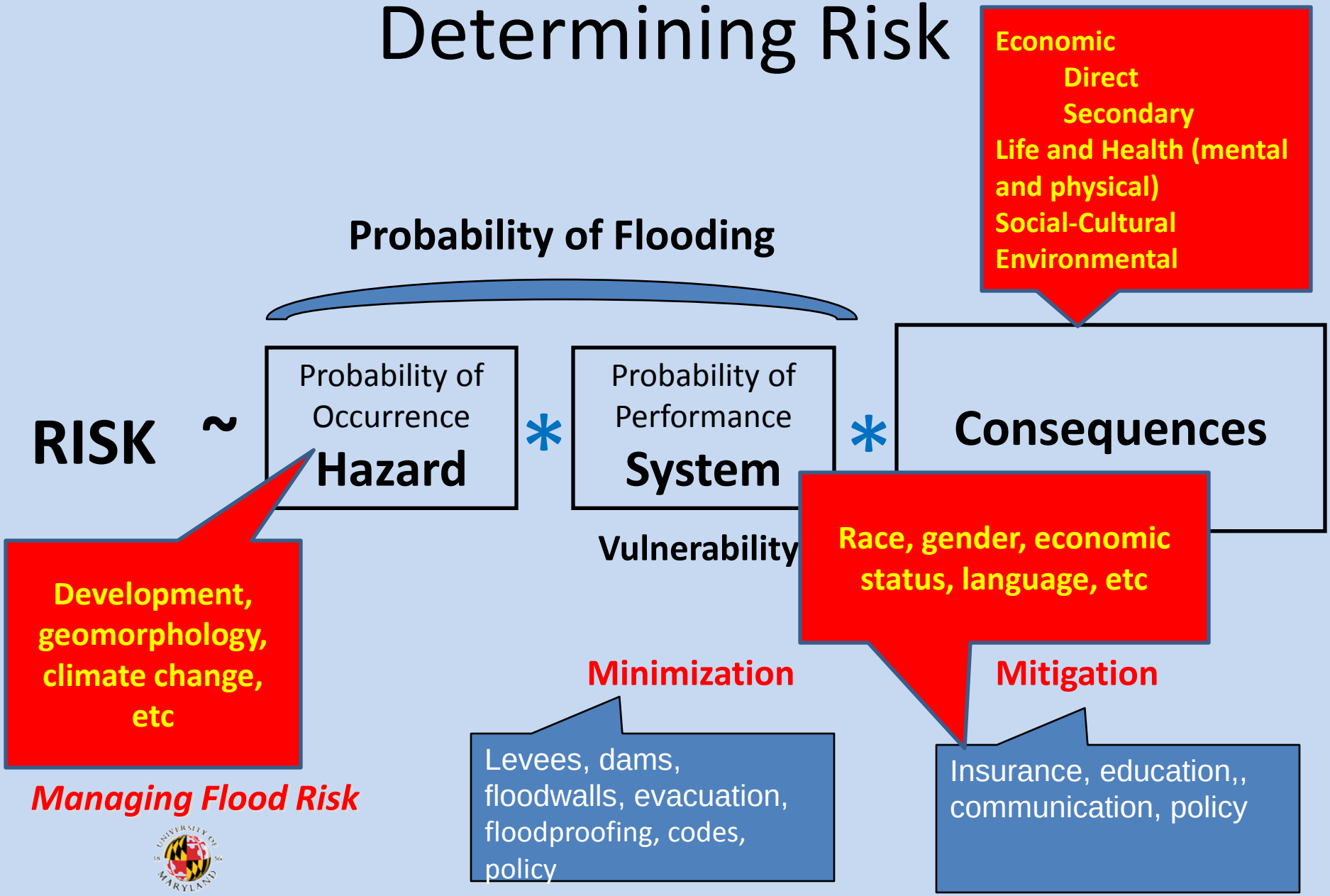
Covello

Risk

RISK ~ Probability of Occurrence Hazard * Consequences

100-Year Flood

Determining Risk

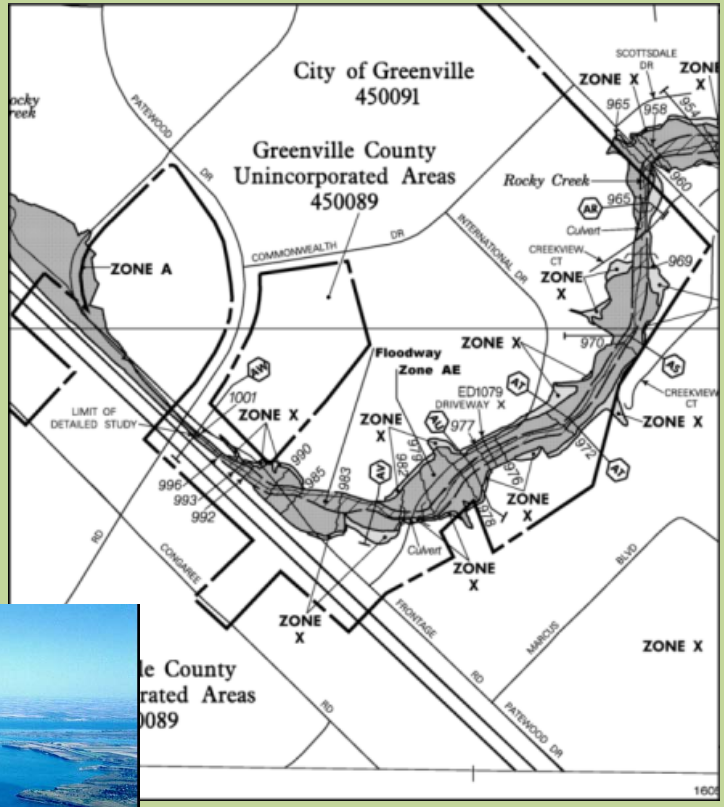


3

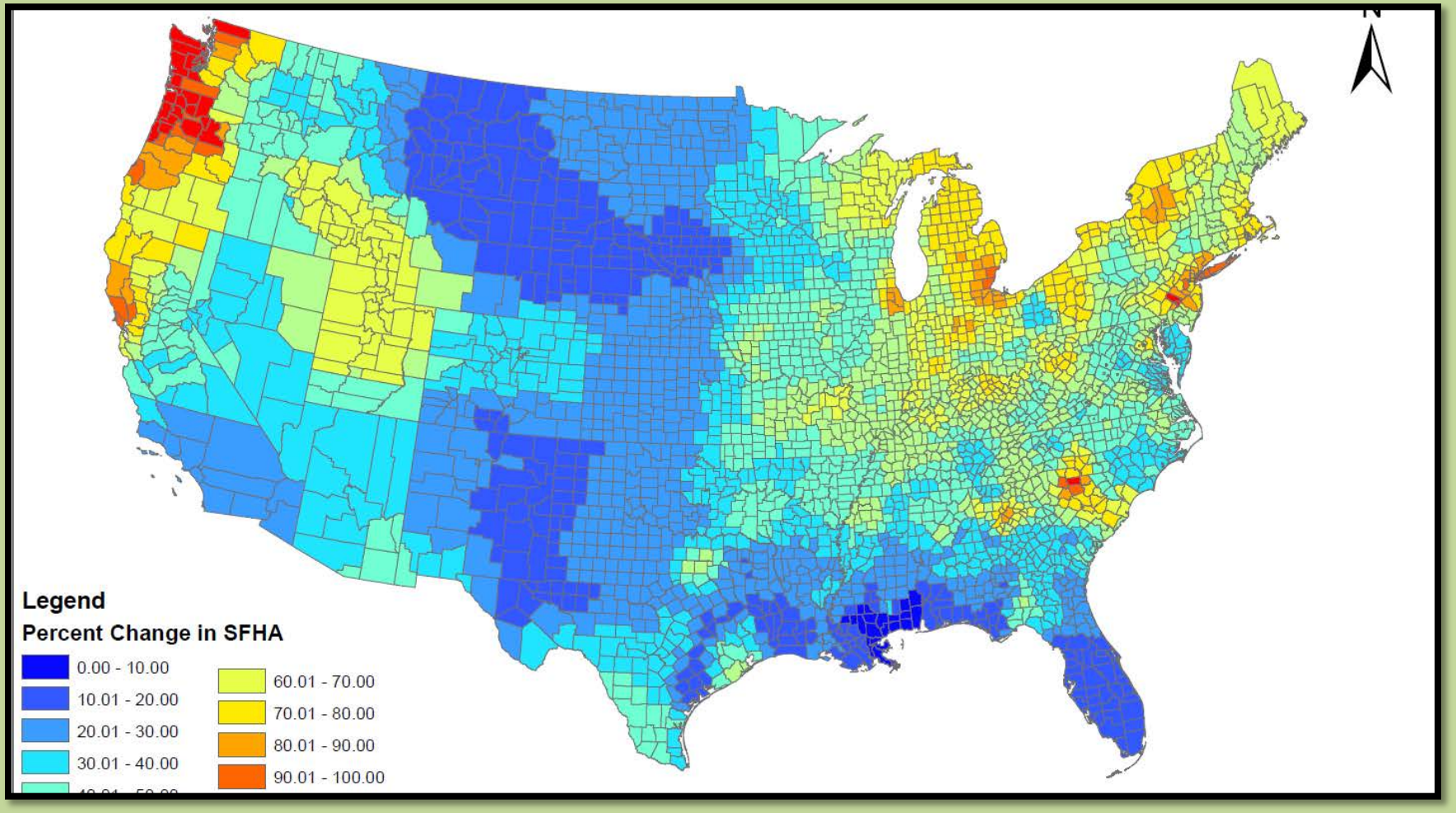
We Need to Know Our Risk

People Don’t Know They Are at Risk

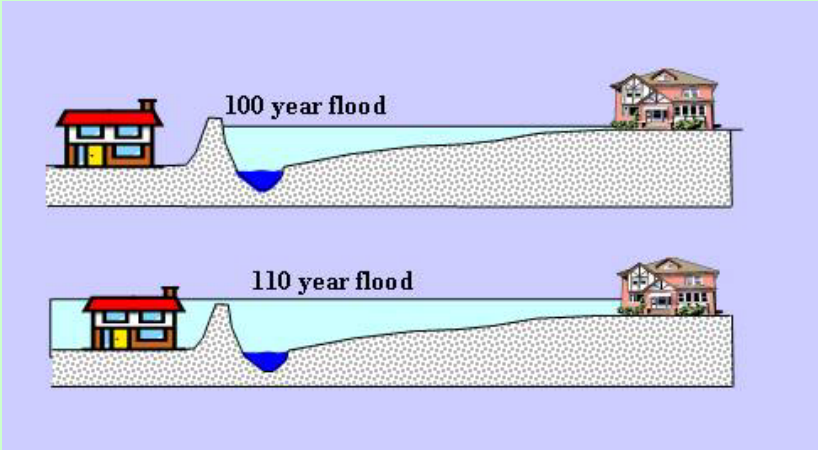
- Maps Tell Wrong Story
- Assume Protection



Or Know It Changes Over Time



And We Are Not Communicating Risk



- People don't understand
  - Their responsibility
  - What is "protection"
  - Insurance (25% penetration)
- Need to:
  - Recognize communication is a primarily a local responsibility - not all Feds
  - Tell it like it is (FEMA Note)
  - Communicate in Non-Technical Terms

    -Time to change – 100year/1% Nomenclature

4

We Need to Deal with Risk

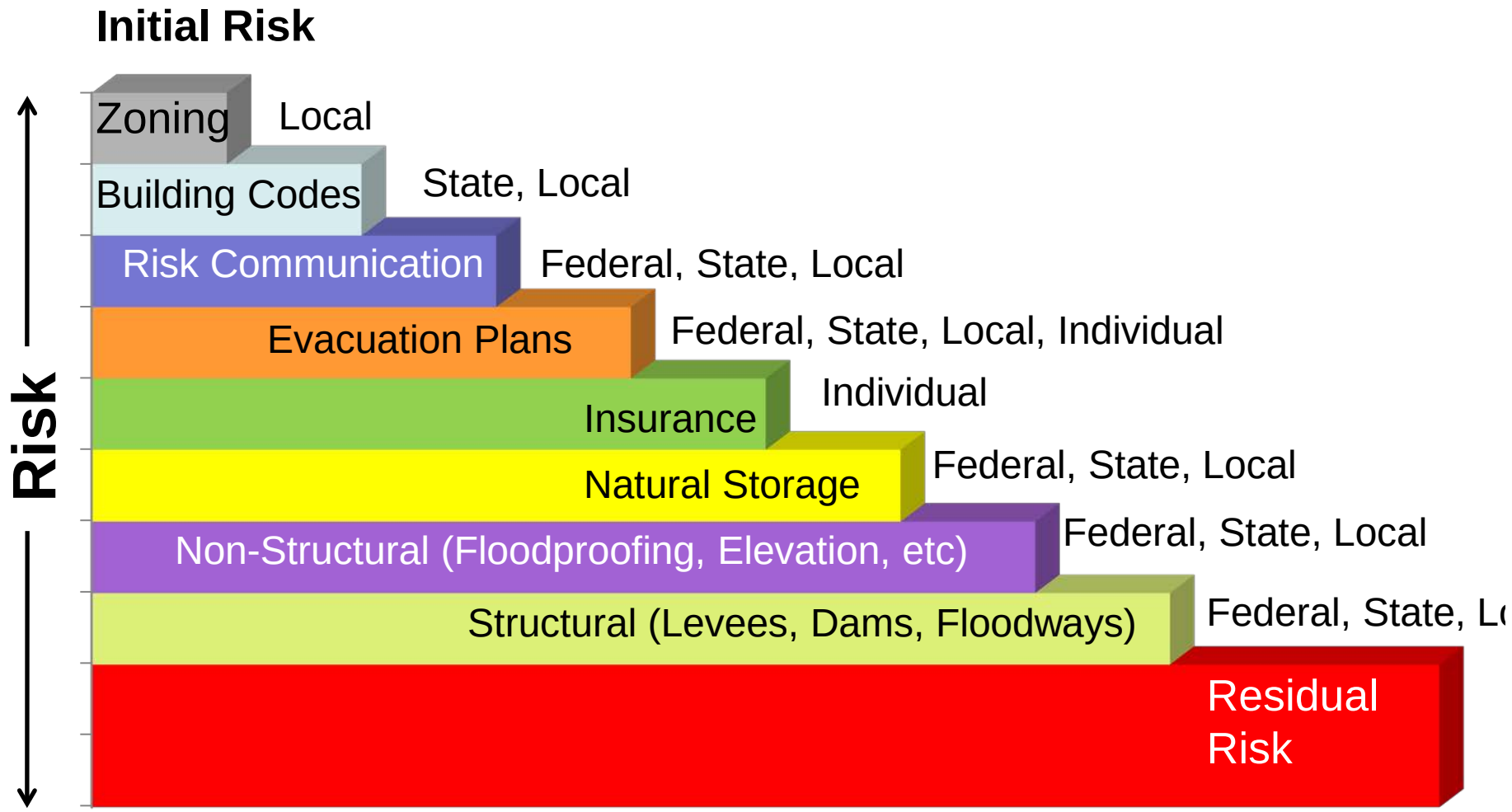
Katrina Vulnerability, Mitigation and Preparedness

- **Hydrologic Reality - the risks** of inundation and flooding **never can be fully eliminated** by protective structures no matter how large or sturdy those structures may be.
- **Protective Structures -** Structural measures such as levees and floodwalls should **not be viewed** as substitutes or replacements for nonstructural measures, but rather as complementary
- **Relocations and Floodproofing:** The voluntary relocation of people and neighborhoods out of particularly vulnerable **should be considered** as a viable public policy option… [Nonstructural] measures should be an essential complement to protective structures

Committee on New Orleans Regional Hurricane Protection Projects

National Research Council

Reducing Risk and Increasing Resilience

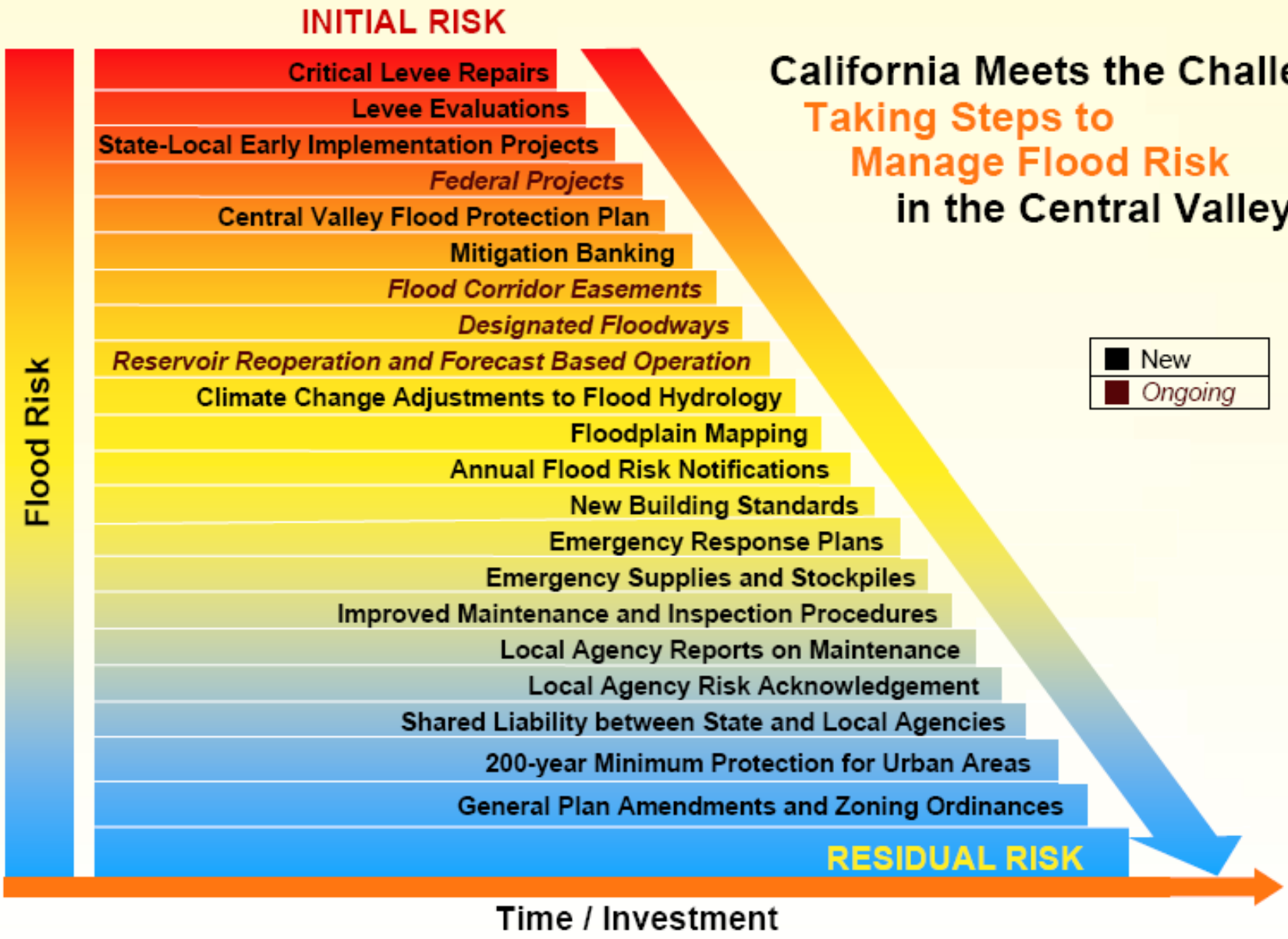


Illustrative Risk Reduction Tools
(Cumulative) Effects

Modified from USACE

FloodSAFE CALIFORNIA

California Meets the Challenge:
Taking Steps to Manage Flood Risk in the Central Valley



5

We Need Policy

Why Do We Let People Live Here?

Or Here –without Mitigation?

Missing?

National Vision, Objectives, and Policy

Unless you consider the jumble of laws, regulations and procedures that deal with the water as policy or vision, the United States is operating without a national flood vision or objectives or policy.

And they do not seem to be coming!

Public Policy - UK

- **Government will act proportionately and consistently in dealing with risks to the public**

  Government will base all decisions about risks on what best serves the public interest. Action taken to tackle risks to the public will be proportionate to the level of protection needed and targeted to the risk.

  Managing risks to the public: appraisal guidance

  HM Treasury 2005

The Royal Netherlands Embassy - Washington DC

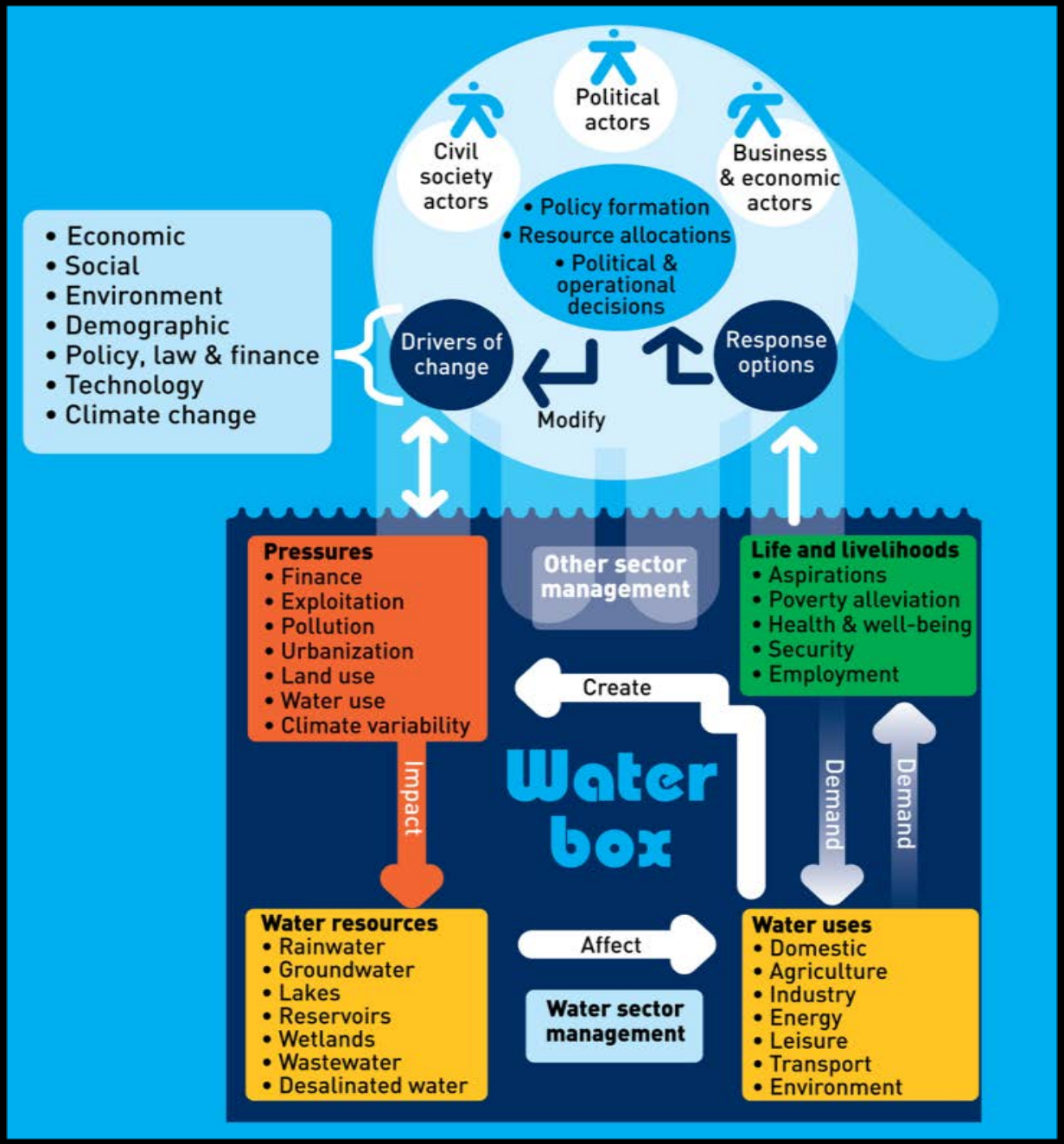
September 16, 2008

The Government of the Netherlands requested an independent Committee of State (the Delta Committee) to give its advice on flood protection and flood risk management in the Netherlands for the next century,..Large parts of the Netherlands lie below sea level and are even now experiencing the effects of climate change and sea level rise. The Netherlands delta is safe, but preserving this safety over the long term involves action now..

Before 2050:
The present flood protection levels of all diked areas must be improved by a factor of 10.

The Bottom Line?

- 21^{st} Century ≠ 20^{th} Century
- We Need to Understand Risk
- We Need to Know Our Risk
- We Need to Deal with Risk
- We Need Policy


Political actors
Civil society actors
Business & economic actors
• Policy formation
• Resource allocations
• Political & operational decisions
• Economic
• Social
• Environment
• Demographic
• Policy, law & finance
• Technology
• Climate change
Drivers of change
Response options
Modify
Pressures
• Finance
• Exploitation
• Pollution
• Urbanization
• Land use
• Water use
• Climate variability
Other sector management
Life and livelihoods
• Aspirations
• Poverty alleviation
• Health & well-being
• Security
• Employment
Create
Water box
Impact
Demand
Demand
Water resources
• Rainwater
• Groundwater
• Lakes
• Reservoirs
• Wetlands
• Wastewater
• Desalinated water
Affect
Water sector management
Water uses
• Domestic
• Agriculture
• Industry
• Energy
• Leisure
• Transport
• Environment

As We Move Forward, Engineers and Scientists Need to be Involved in More than Engineering and Science

Technically – Understanding the Compelxities

Educationally – Explaining the Message to Others

Ethically – Speaking When King Has No Clothes; Speaking for those who can't ot don't know

Politically/Institutionally - Becoming Involved in the Decision Process

We cry out desperately for time to pause in her passage, but time is deaf to every plea and rushes on... over the bleached bones and jumbled residues of numerous civilizations are written the pathetic words: “Too Late”

Jane Lubchenko, NOAA Administrator
quoting Rev M.L. King
National Academies Climate Change Response Meeting


Thank You