During a 2008 panel for the IPCC's launch of a report on water and climate, a hydrologist and an engineer called for additional monitoring and research to understand the effects of climate change. The third member of the panel, a frustrated World Bank infrastructure lender, declared in response,

"I can't wait thirty years for precise science to tell me how much global warming contributed to a particular drought or flood...
I need to make investment decisions now."

RAND JUSTICE, INFRASTRUCTURE, AND ENVIRONMENT

THE WORLD BANK

Working for a World Free of Poverty

Making Good Decisions Under Uncertainty: A Learning By Doing Workshop

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June 4, 2013

Many Policy Decisions Have Long-Term Consequences

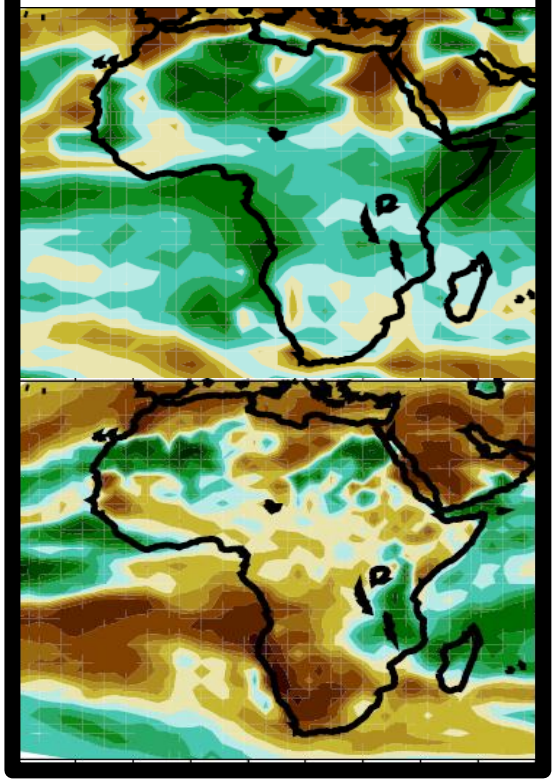
Good Decision Making Is Challenged By Uncertainty and Disagreement

Rapid Changes

Shanghai 1990 vs. 2010

Uncertain Future

Climate Change



Competing Priorities

Conservation vs. Development

104 Comments

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Coastal N.C. counties fighting sea-level rise prediction

Science panel predicts 1-meter sea-level rise by 2100; counties say that could harm economic development

By Bruce Henderson
bhenderson@charlotteobserver.com

Posted: Monday, May. 28, 2012

State lawmakers are considering a measure that would limit how North Carolina prepares

MORE INFORMATION

A North Carolina state science panel projected sea level rise of 1m by 2100. An economic development group argues that the science is flawed, an 8-inches is more likely. This conflict has resulted in planning gridlock.


Levees along Mississippi River created illusion of safety while increasing flood risks
Today, many levees are being removed to create natural space for the river

Good Decision Making Is Important For Green Growth

Use resources wisely

Build consensus around urgent decisions

Adapt to climate change

Make investments that are resilient

Today You Will Learn…

1. **How uncertainty and disagreement challenge decision making**

2. **Ways to make good decisions, despite uncertainty and disagreement**

Today Is The Launch Of This Workshop!

Please help us improve it!

1. **Participate enthusiastically**
2. **Give us your honest feedback, good and bad**
3. **Accept that exercises are simplifications of reality**

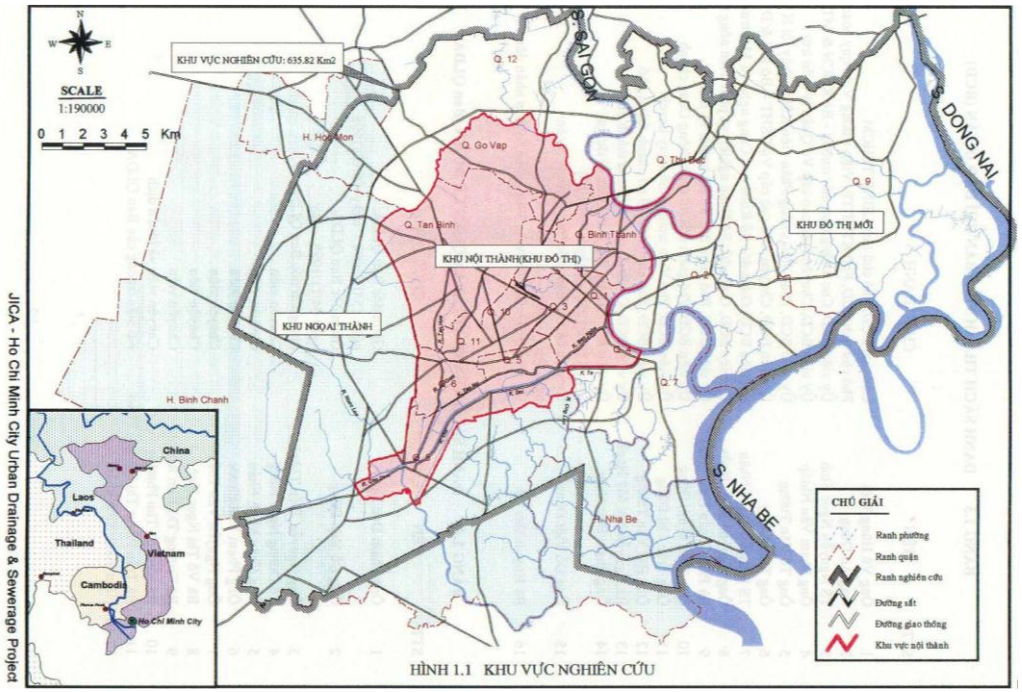
Agenda

- **Discussion and Context**
- **Part 1: Traditional "Predict-then-Act" Planning**
- **Part 2: Scenario Planning**

– Break –

- **Part 3: Robust Decision Making**
- ***Guest Speaker: Dr. Ho Long Phi***

We Are Using Ho Chi Minh City As Context For Our Discussion



Over 15 years, HCMC has planned multi-billion dollar flood investments using best available projections

RAND

Conditions have diverged from projections and the city is at significant risk

RAND

How Can HCMC Develop This Plan?

Today, HCMC seeks an innovative, integrated flood risk management strategy

For The Next 3 Hours, Lets Imagine

Your City:
Faces Flood Risks

You:
Policy Maker

You Are Considering 5 Options For Reducing Flood Risk

"Soft Options"

1. Rely on current infrastructure

2. Raise Homes

4. Manage Groundwater

3. Relocate Areas

5. Capture Rain Water

Risk = Hazard x Exposure x Vulnerability

Hazard

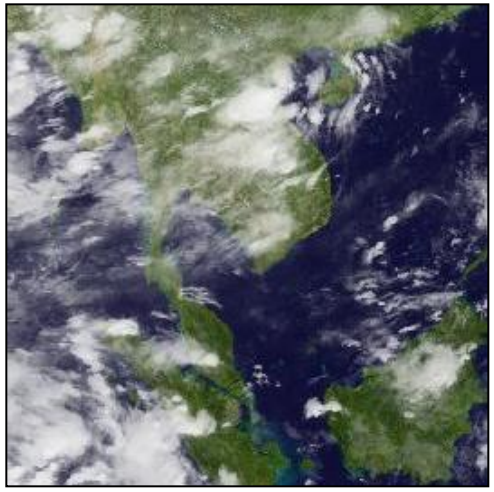
- **Future rainfall intensity**
- **Height of the Saigon River**

Exposure

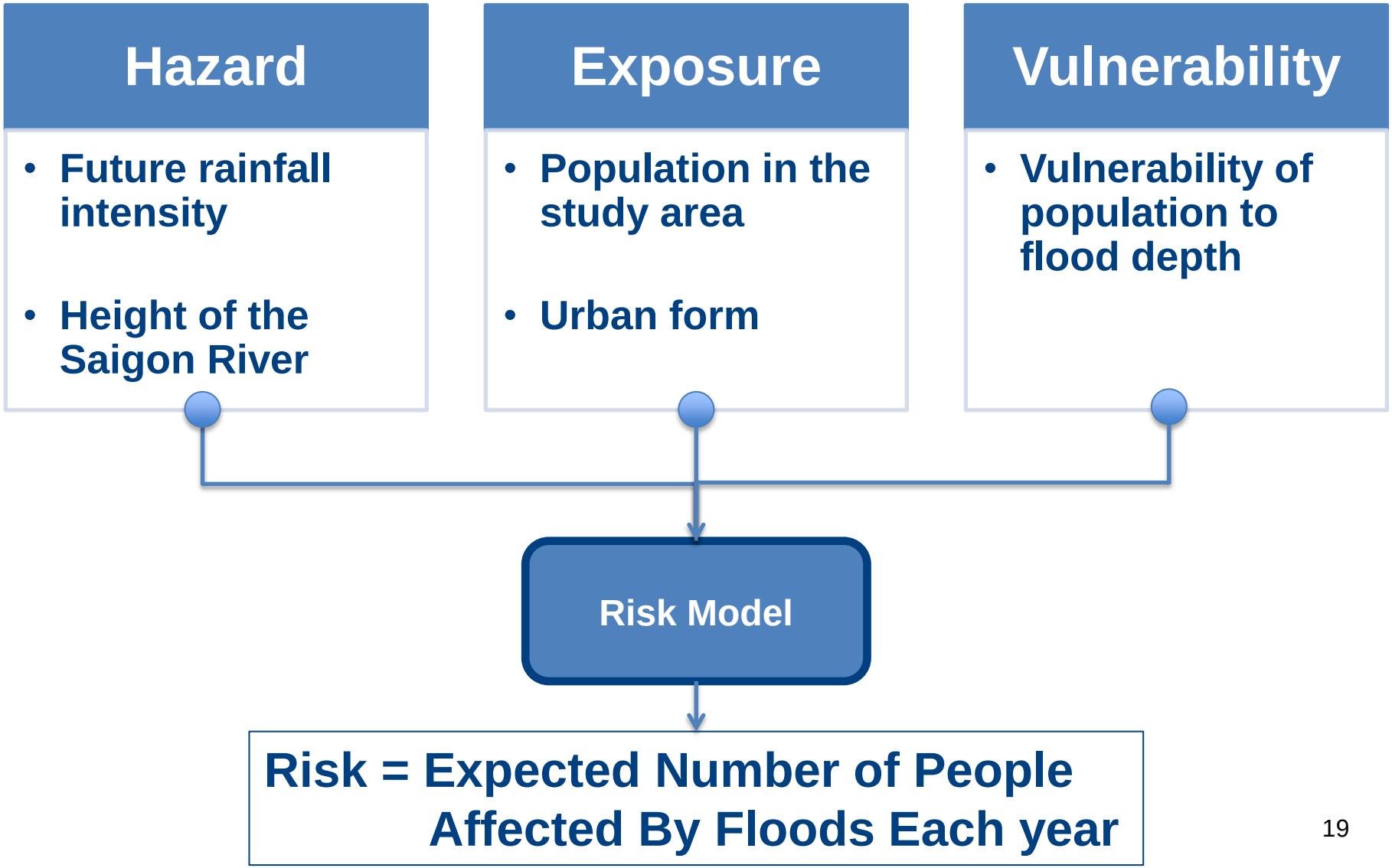
- **Population in the study area**
- **Urban form**

Vulnerability

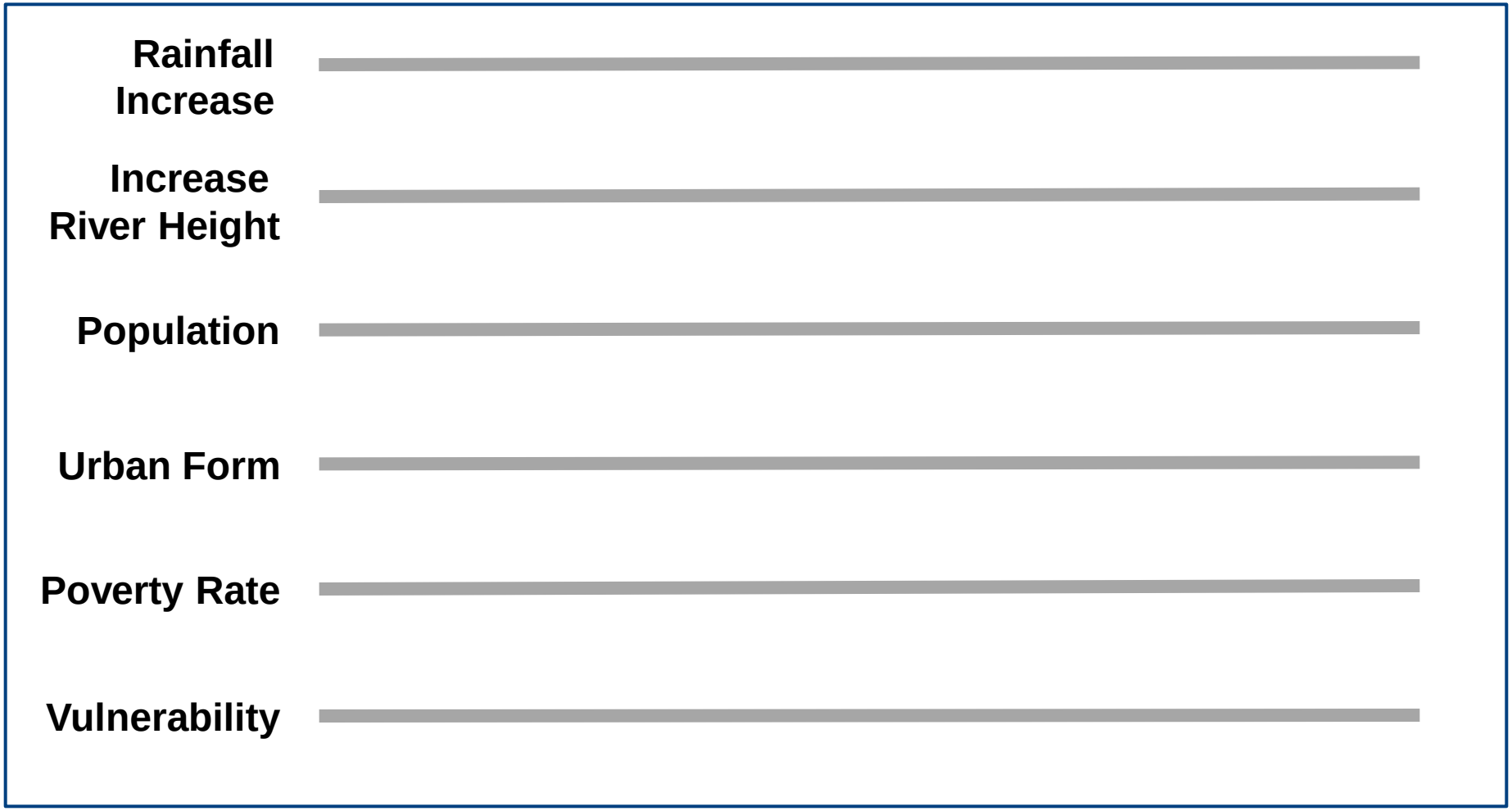
- **Vulnerability of population to flood depth**



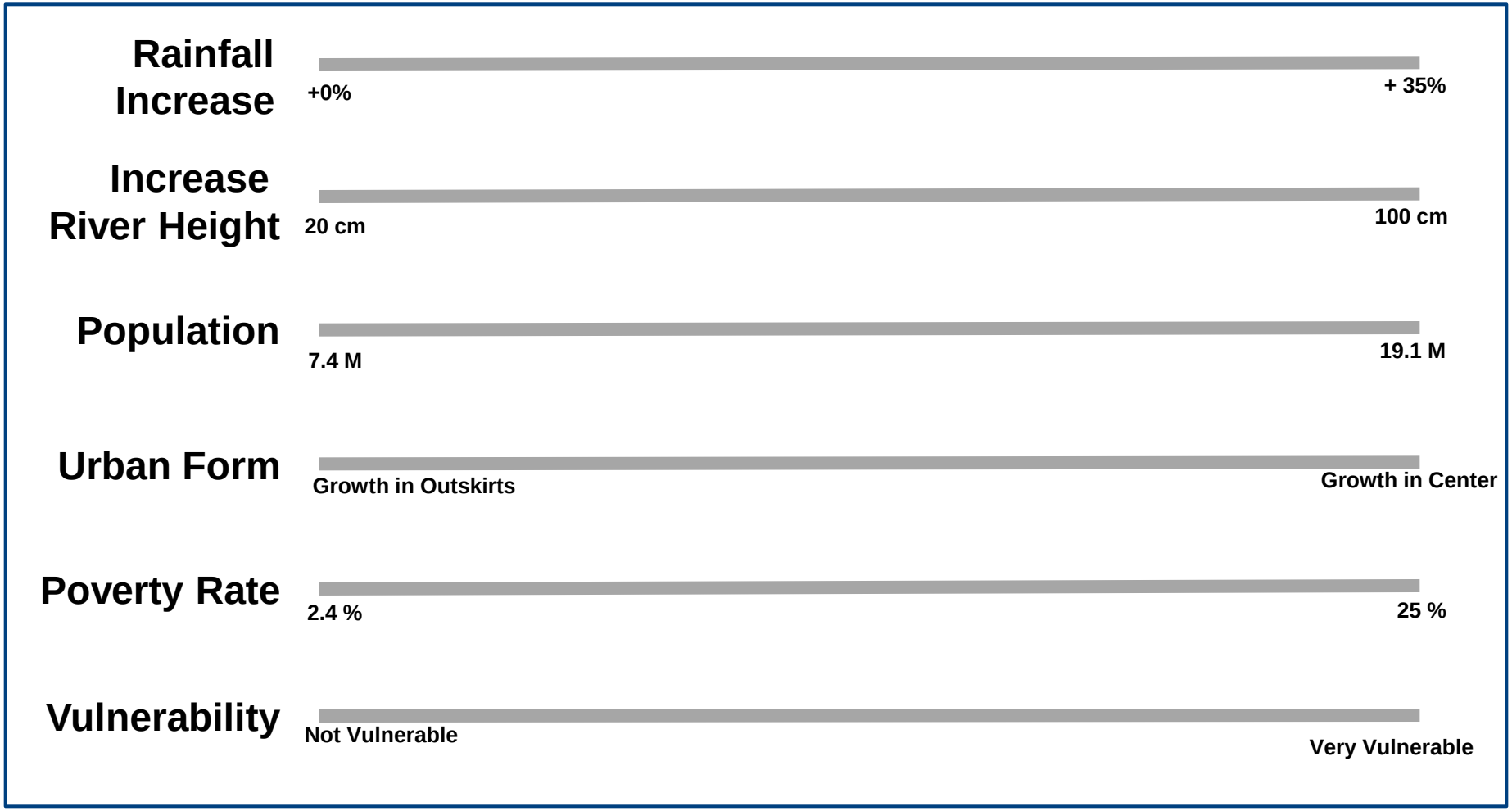
Risk = Hazard x Exposure x Vulnerability



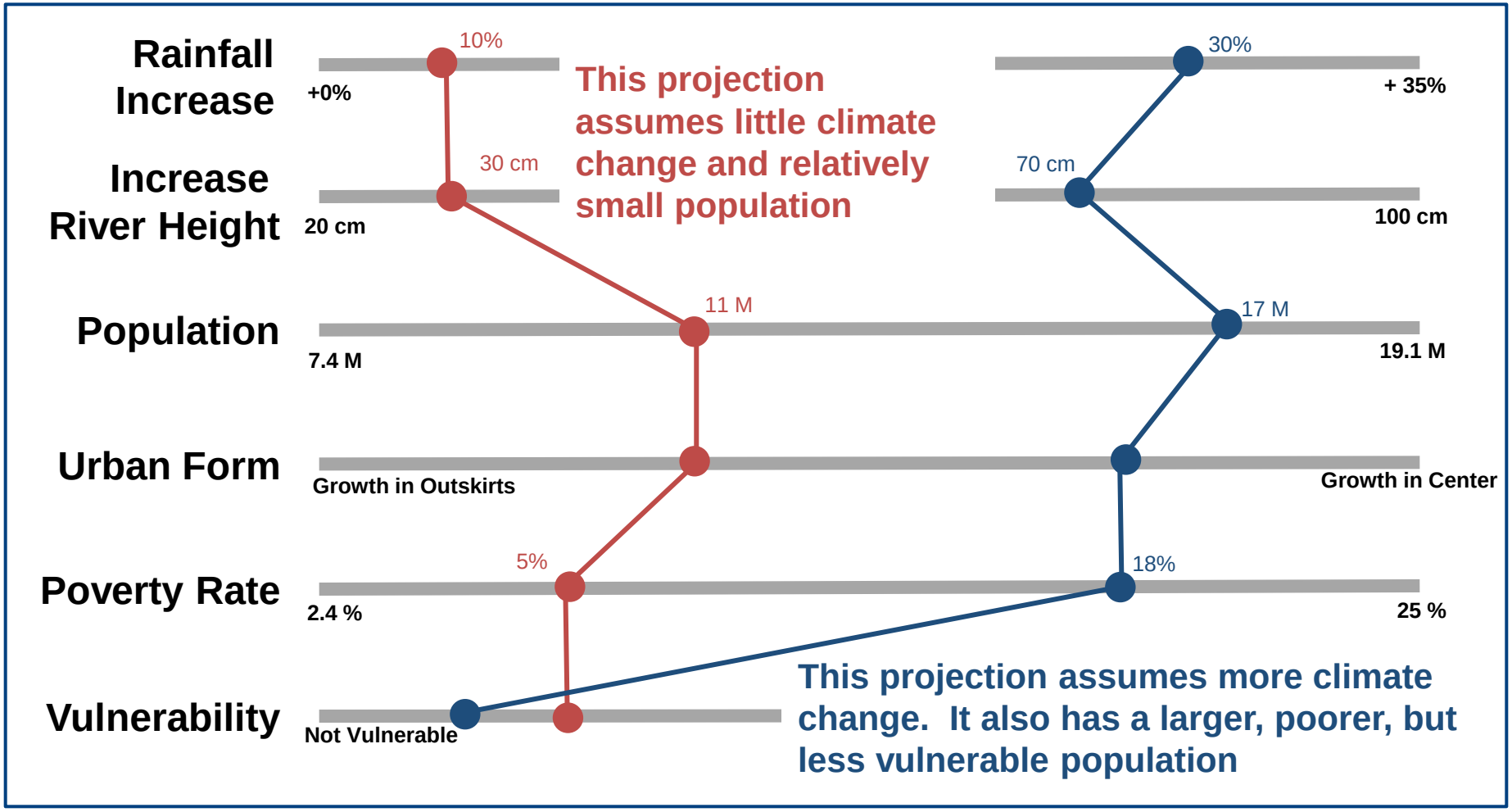
Model Calculates Risk From Six Parameters Of Hazard, Exposure, Vulnerability



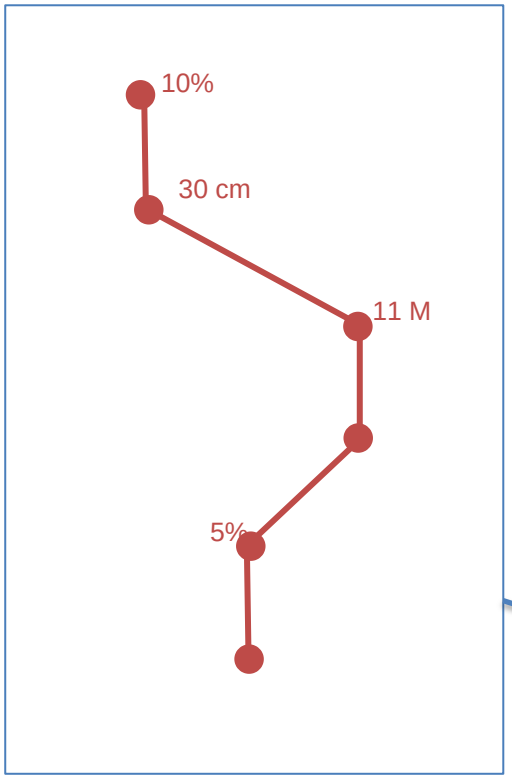
Each Parameter Could Take A Range of Values



We Can Use This To Make Projections



Projection



Policy

Risk Model

Risk From Policy In Projection

Agenda

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– Break –

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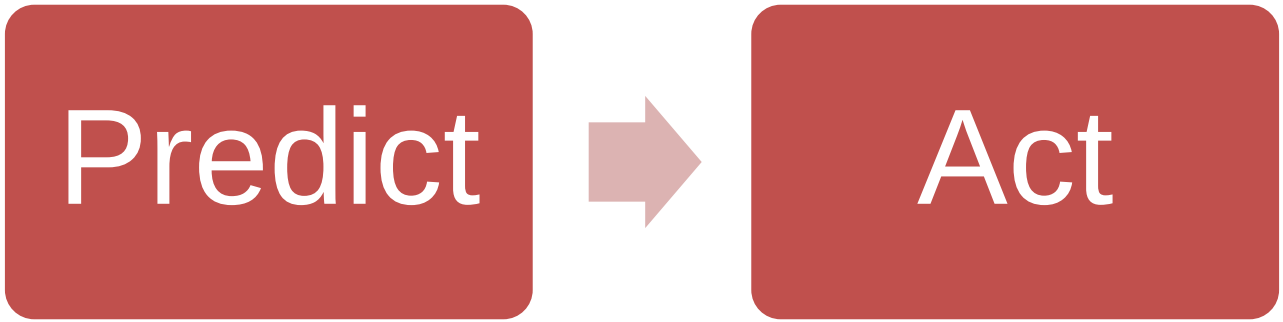
Traditional Planning Asks "What Will The Future Bring?"



Exercise 1: Making Projections

- **Each table is a different government ministry**
- **Each ministry has received a memo requesting its official projection of a condition that might be relevant to flood risk management in the city**
- **Please write your ministry's one projection on the pin board**
- **Choose spokesperson to share your group's conclusions**
- **You have 5 minutes!**

Please Share With Us…

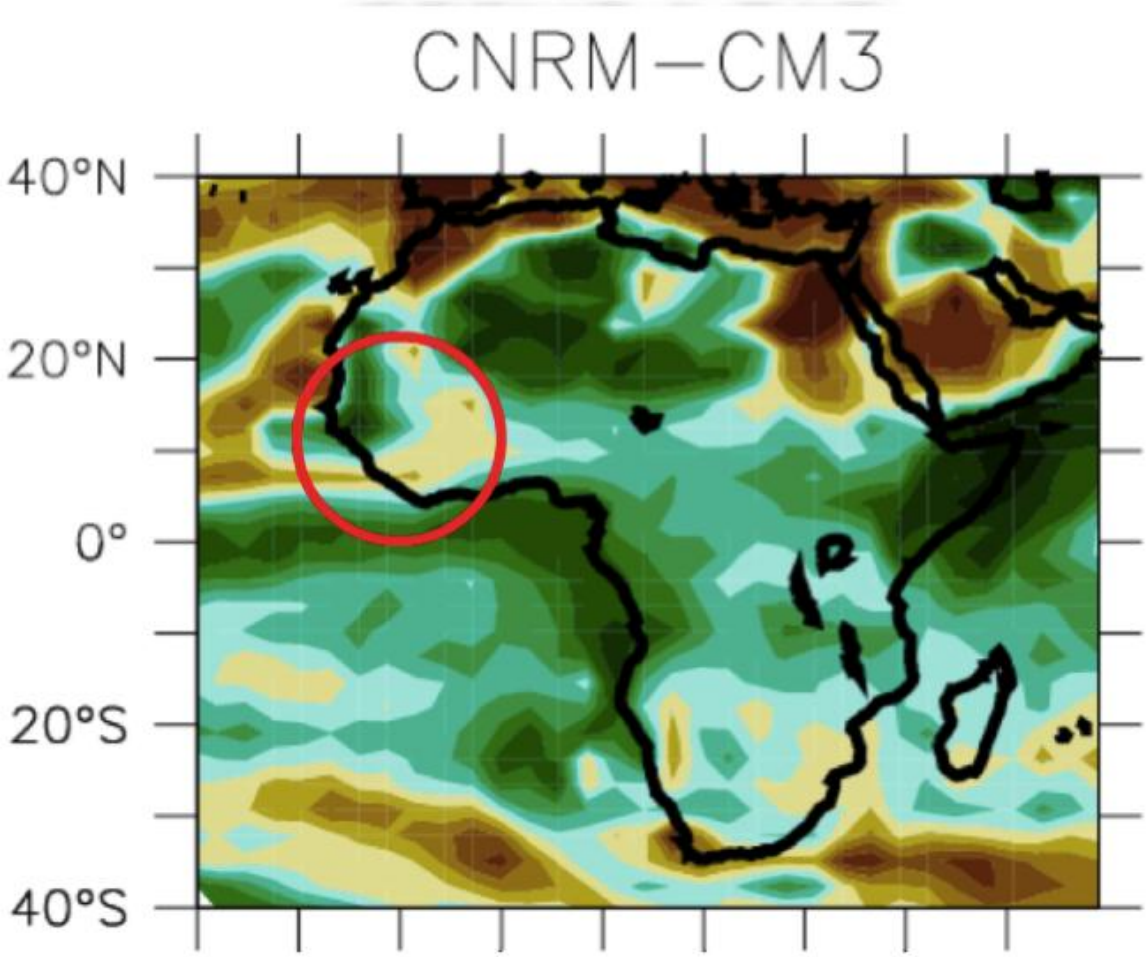
- **Which parameter did your ministry project?**
- **What projection you chose and how?**
- **How confident is your ministry about its choice?**

A Vision Of 2000 From 1900

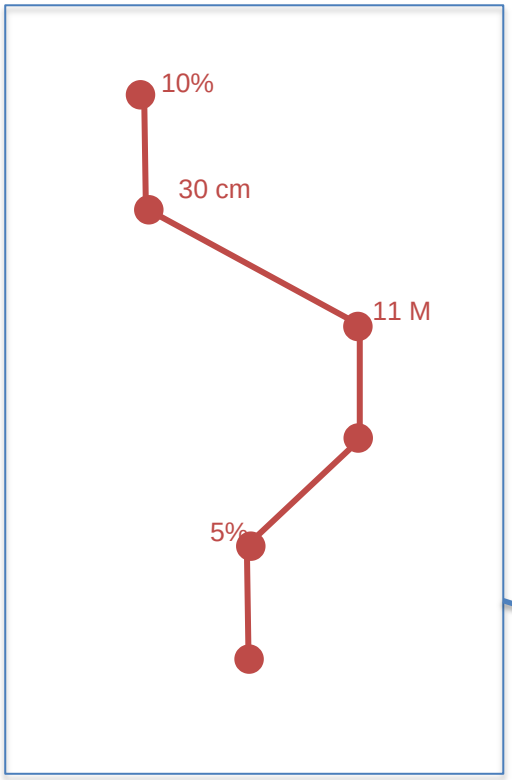
Hildebrands

Few Anticipated The Global Economic Crisis

Climate models try to tell us about future climate...



YOUR Projections



Lets See What Happens When We Use A Single Projection For Decision Making…

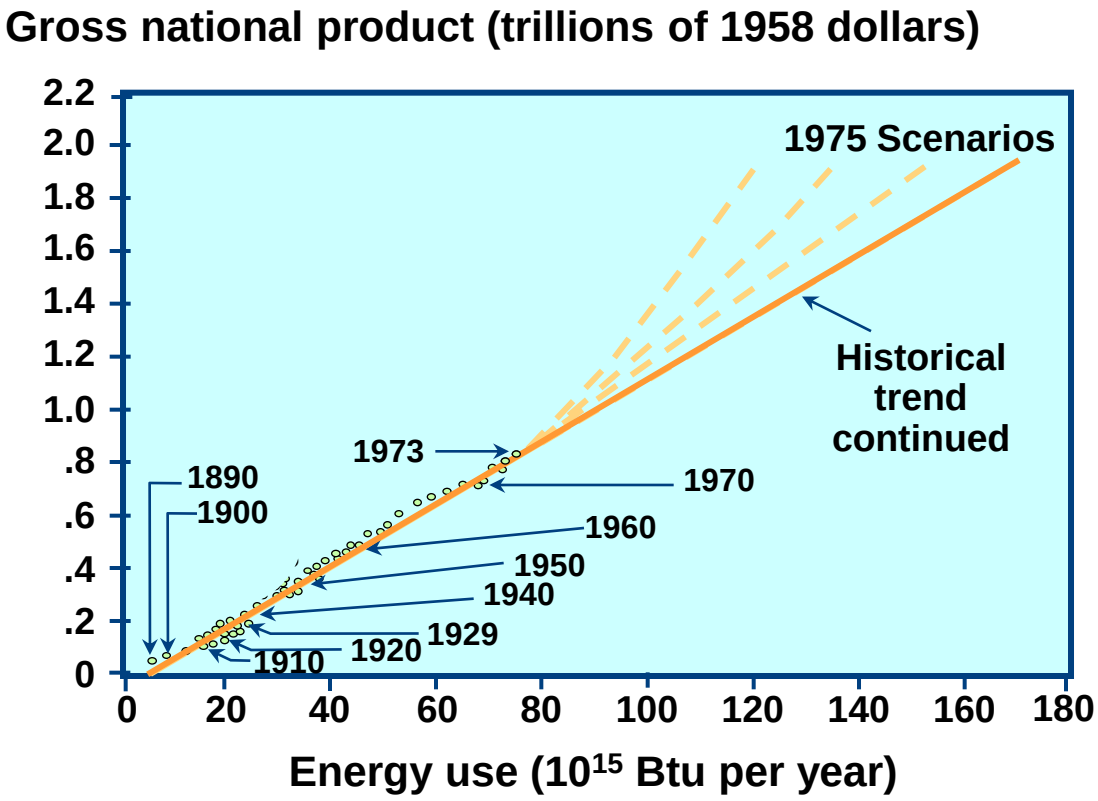
Policy

Risk Model

Risk From Policy In Your Projection

Believing Forecasts of the Unpredictable Can Contribute to Bad Decisions

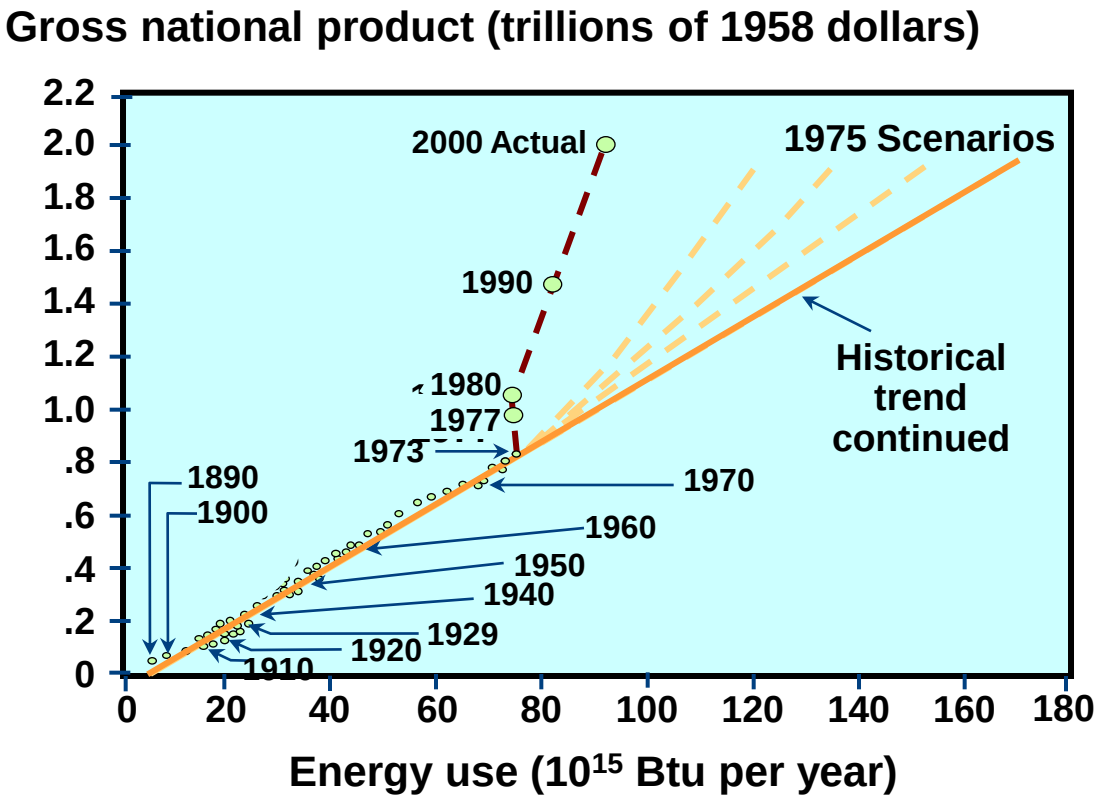
- **In the early 1970s forecasters made projections of U.S energy use based on a century of data**



Believing Forecasts of the Unpredictable Can Contribute to Bad Decisions

- **In the early 1970s forecasters made projections of U.S energy use based on a century of data**

…they were all wrong



Key Message #1:

"Predict-Then-Act" can lead to gridlock and bad decisions

Agenda

- **Discussion and Context**
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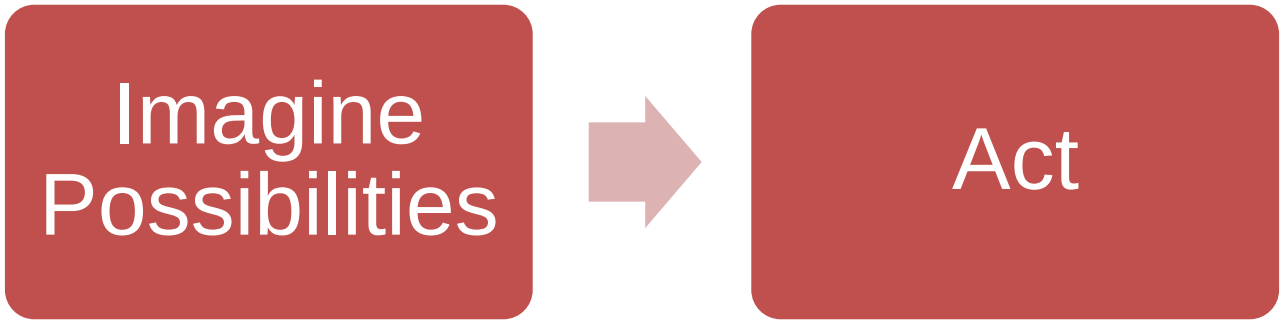
- **Part 2: Scenario Planning**

– Break –

- **Part 3: Robust Decision Making**
- ***Guest Speaker: Dr. Ho Long Phi***

Scenario Planning Asks "What Might The Future Bring?"



Exercise 2: Scenario Planning

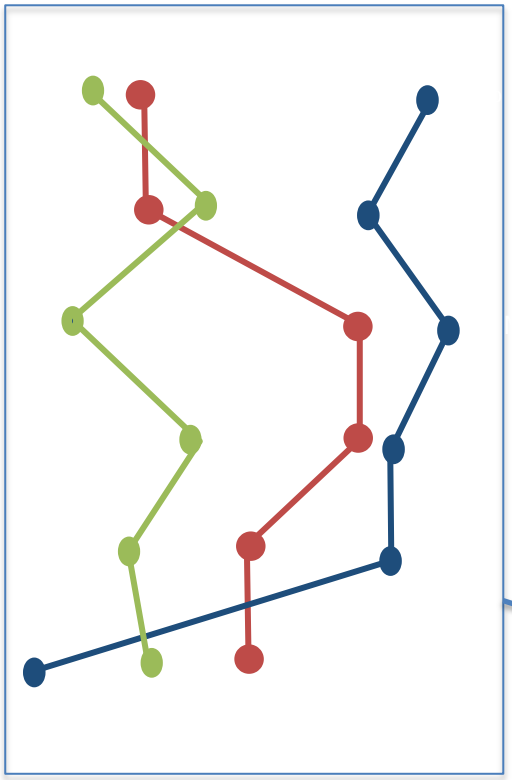
- **Your government recognizes there are deep uncertainties in flood risk planning**
- **Each ministry is asked to give <u>two plausible values</u> for the condition that will be used to develop diverse scenarios**
- **Please write your ministry's <u>two values</u> on the pin board**
- **You have 5 minutes!**

Environmental Hazards

Socioeconomic Exposure Vulnerability

	Low	**High**
Low	Scenario 1	Scenario 3
High	Scenario 2	Scenario 4

YOUR Scenarios



Lets See What Happens When We Use A Few Scenarios For Decision Making…

Policy

Risk Model

Risk From Policy In Your Scenarios

A robust decision performs well in many scenarios even if it not optimal in any single one

Key Message #2:

Robust decisions are good and promote consensus

Examples of Robust Decisions

Get an education even if you hope to be a basketball star

Plant drought-resistant cassava even if water-sensitive maize fetches higher prices

Scenario Planning

Key Message #3:

Scenario planning can help explore robust decisions, but 2-4 scenarios is often not enough

Agenda

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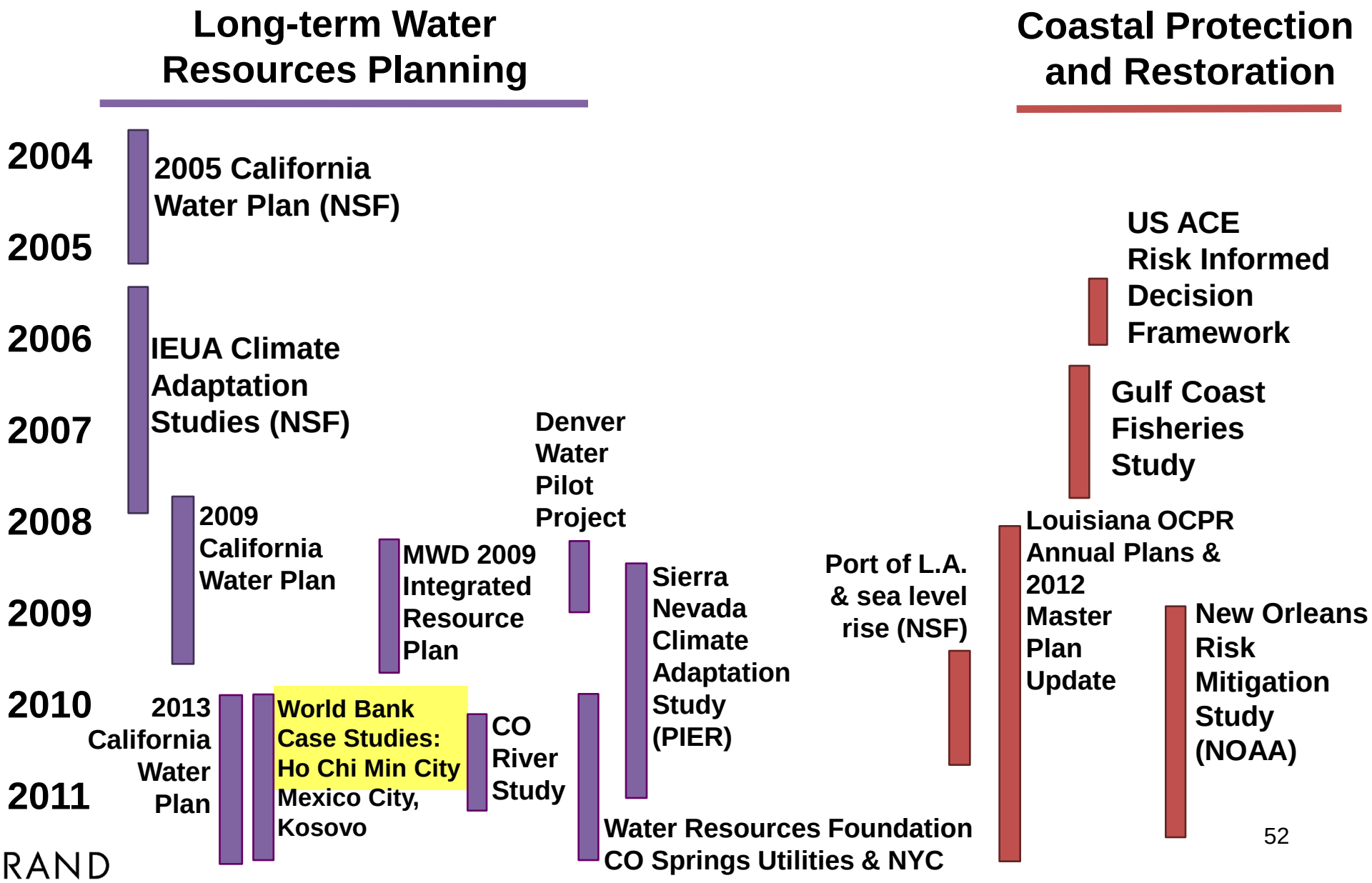
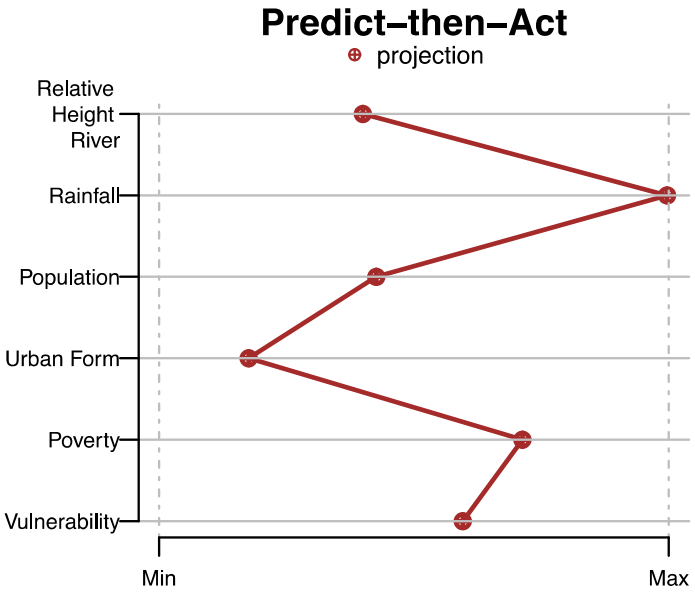
Robust Decision Making Is A Method Increasingly Used In The US

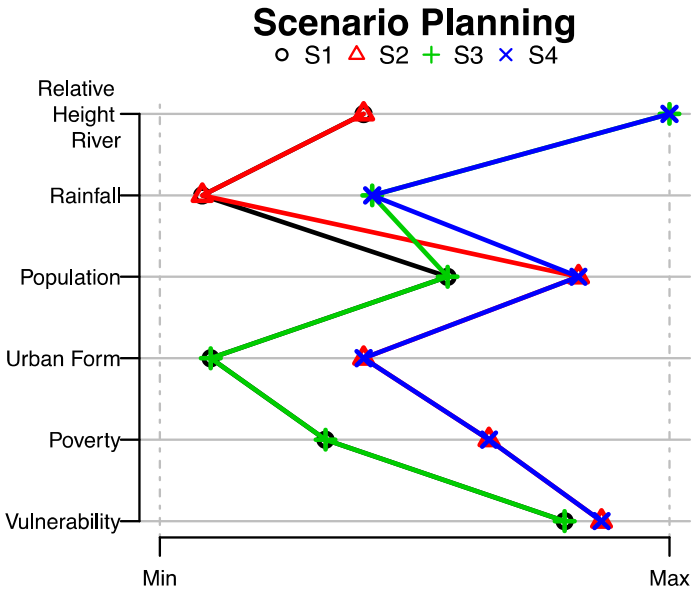
- **Uses very many scenarios to find**
  - ***Limitations* of current strategies**
  - ***Strategies that are truly robust***

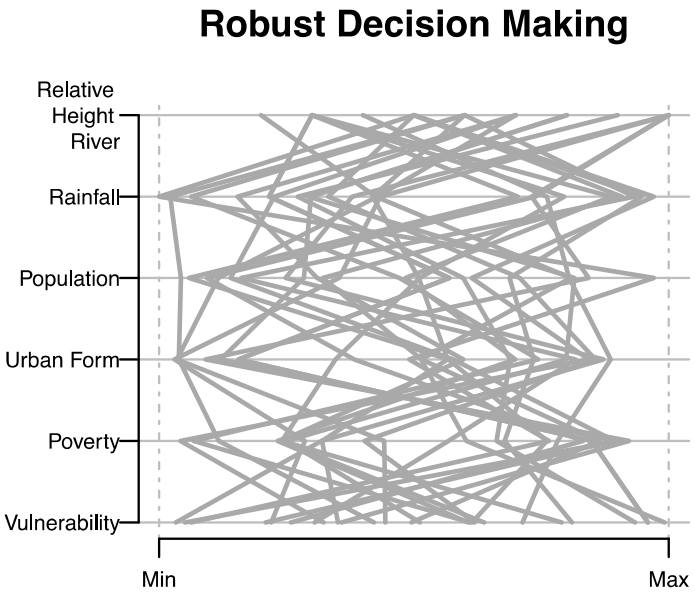
- **Focus on understanding policies, not on making projections**

RDM Has Been Applied Throughout The US

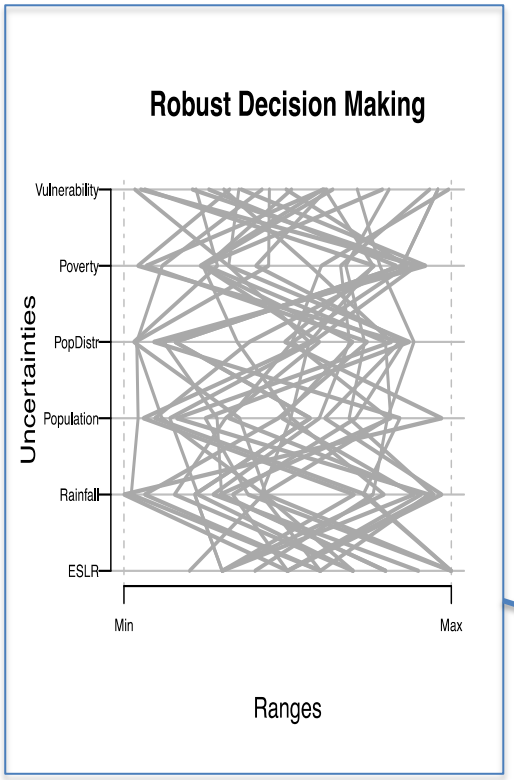



Predict–then–Act
projection
Relative
Height
River
Rainfall
Population
Urban Form
Poverty
Vulnerability
Min
Max


Scenario Planning
S1 S2 S3 S4
Relative
Height
River
Rainfall
Population
Urban Form
Poverty
Vulnerability
Min
Max


Robust Decision Making
Relative
Height
River
Rainfall
Population
Urban Form
Poverty
Vulnerability
Min
Max

1000 Scenarios



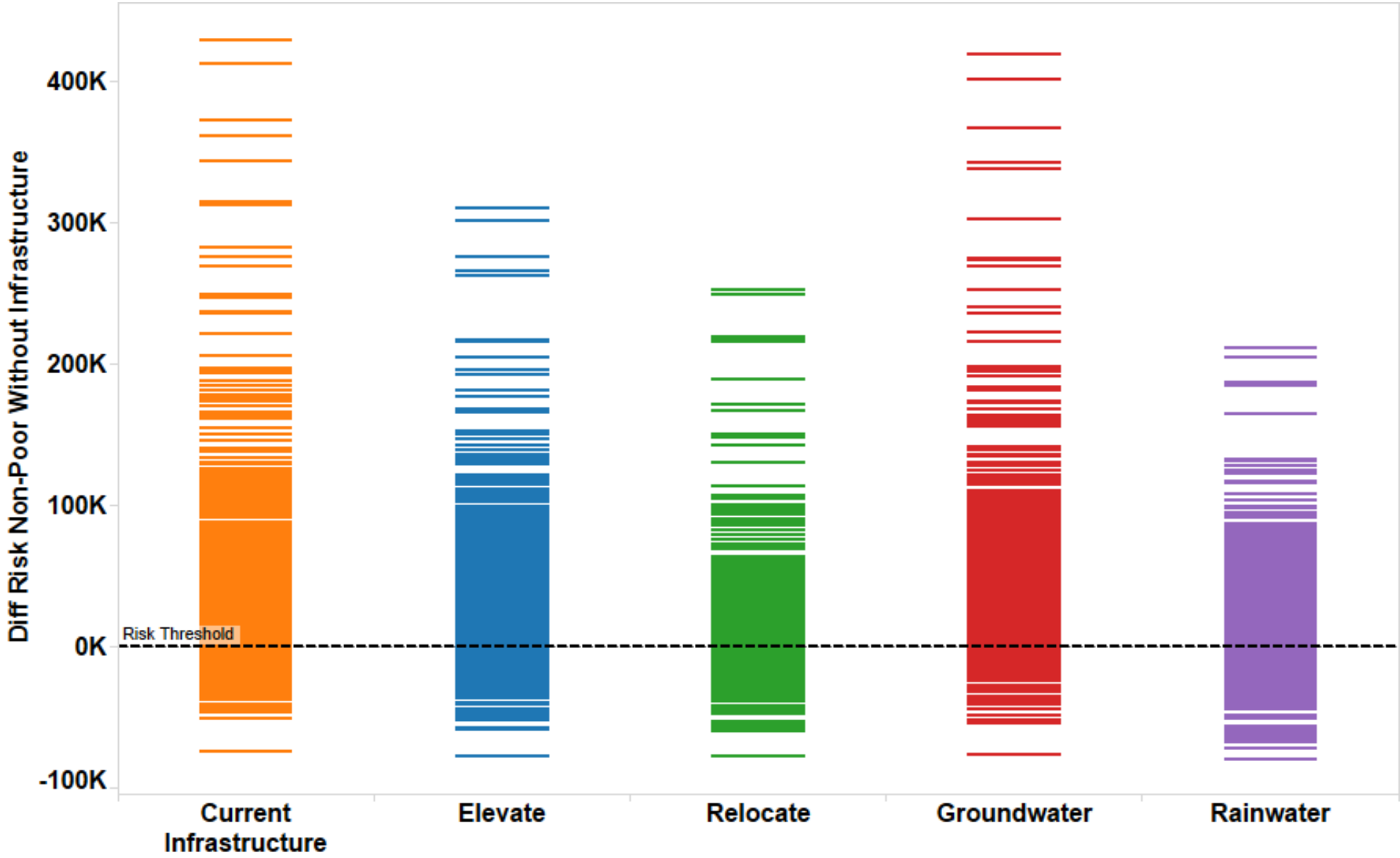
Lets See What Happens When We Use 1000 Scenarios For Decision Making…

Policy

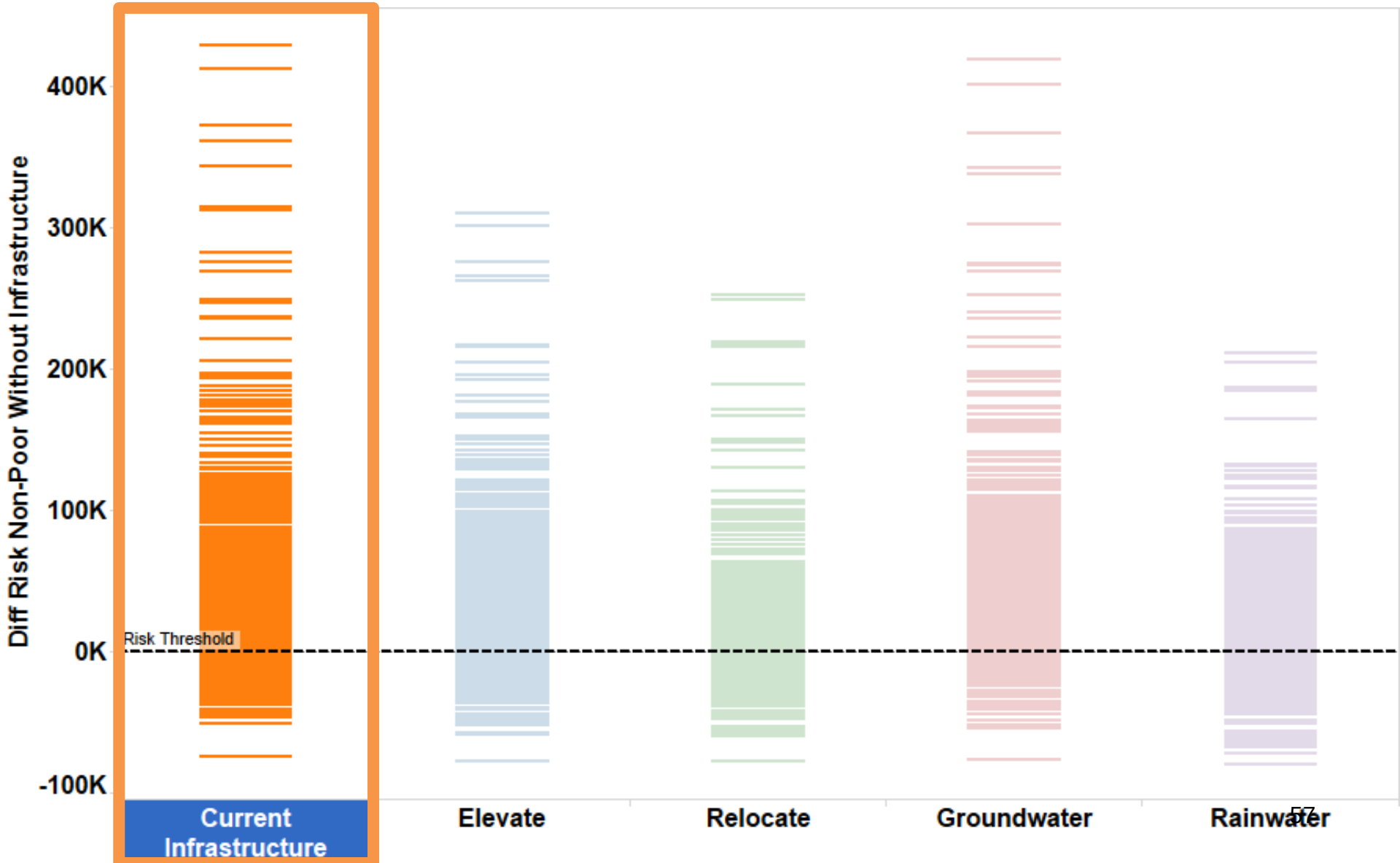
Risk Model

Risk From Policy In 1000 Scenarios

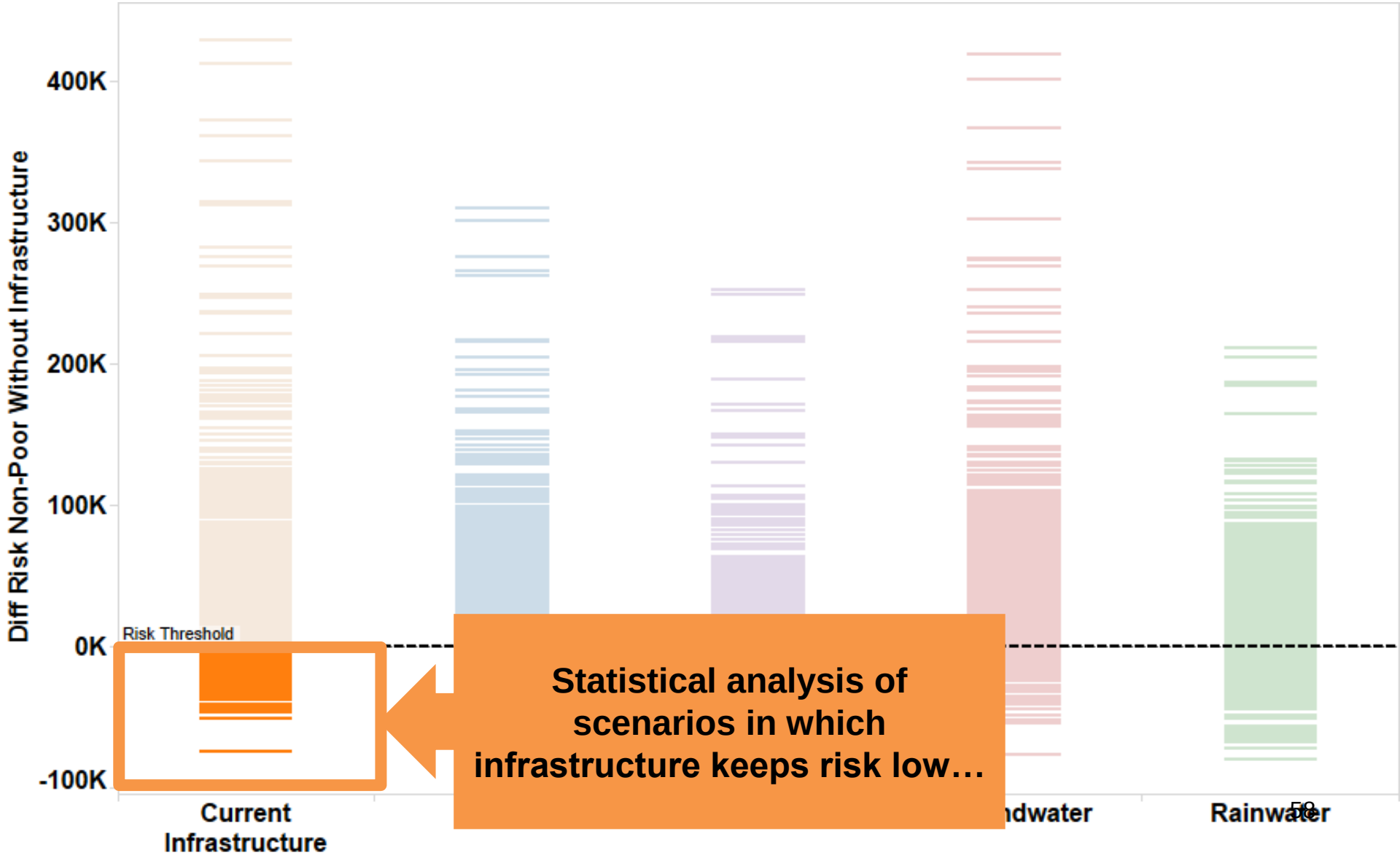
We Evaluate Risk In 1000 Different Scenarios



Lets Start By Better Understanding The Limitations of the Current Infrastructure



Under What Conditions Does The Current Infrastructure Keep Risk Low?



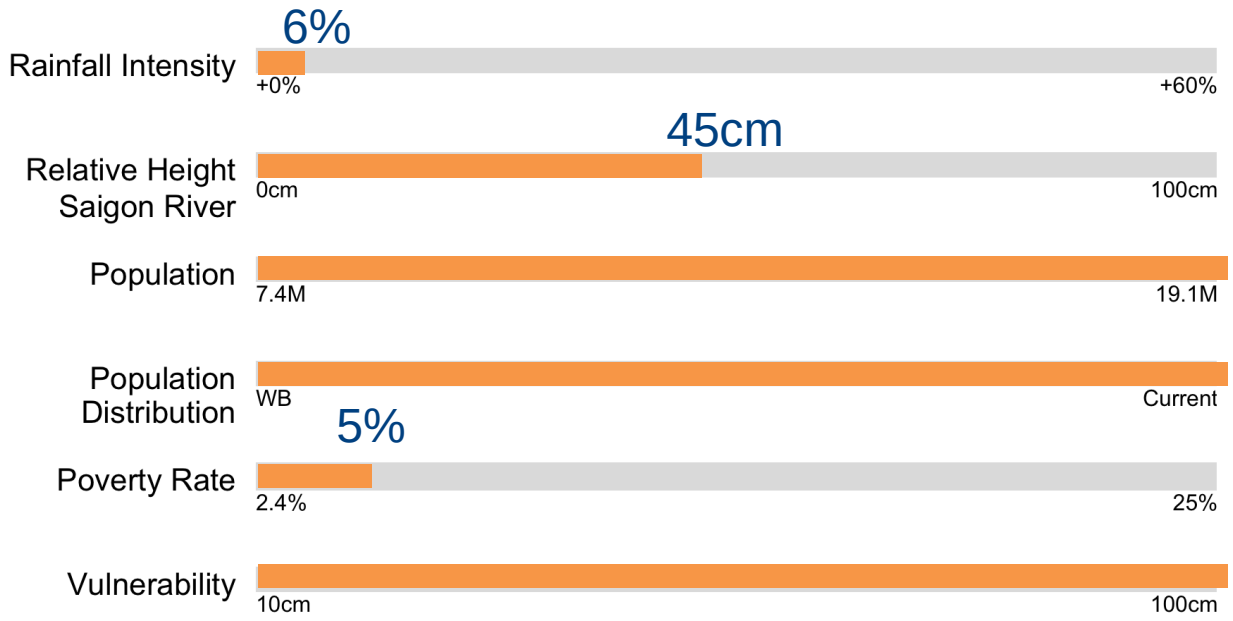
Under What Conditions Does The Current Infrastructure Keep Risk Low?

It protects our city if…

< 6% increase in rainfall intensity

< 45 cm increase in river height

< 5% poverty rate



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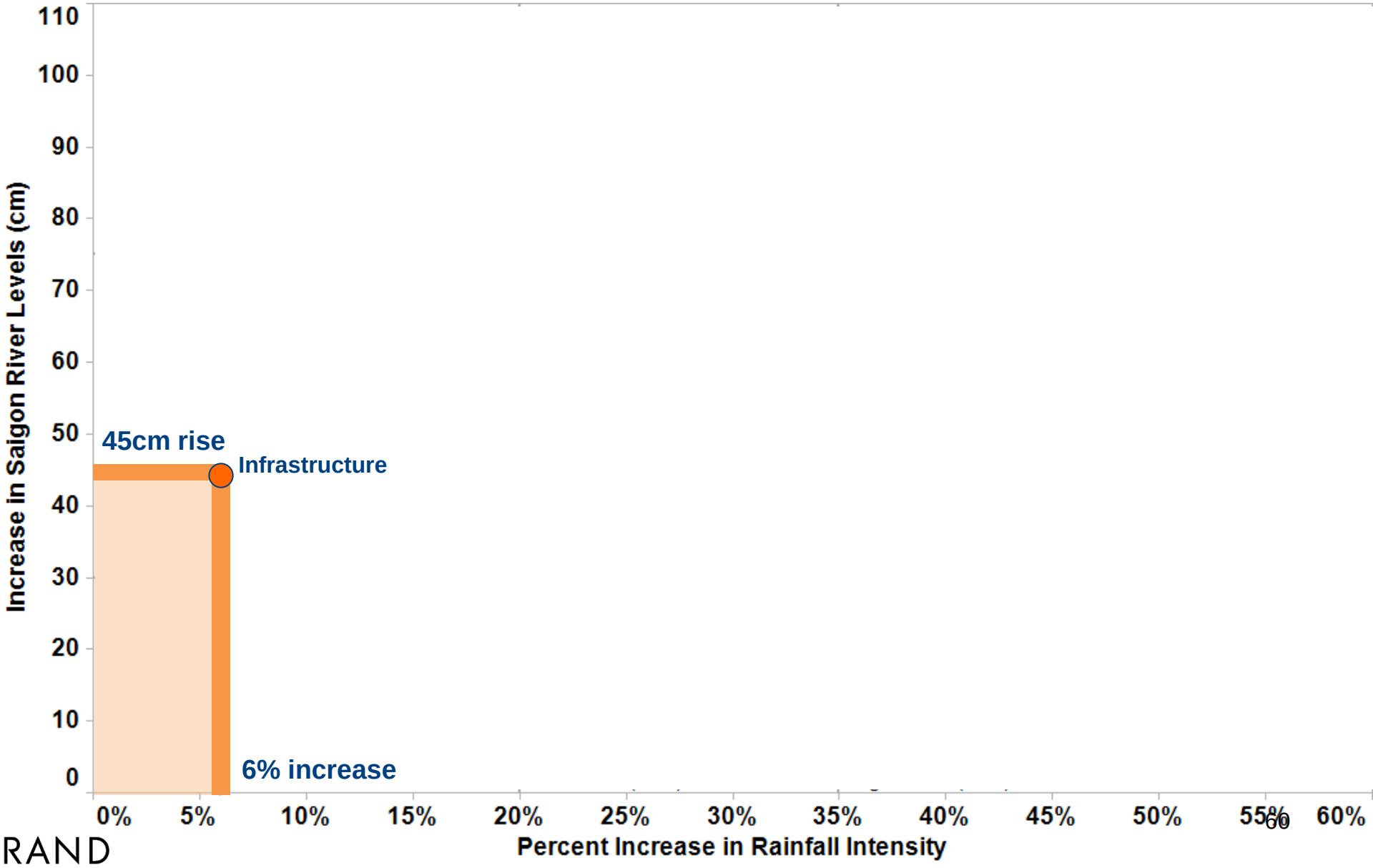

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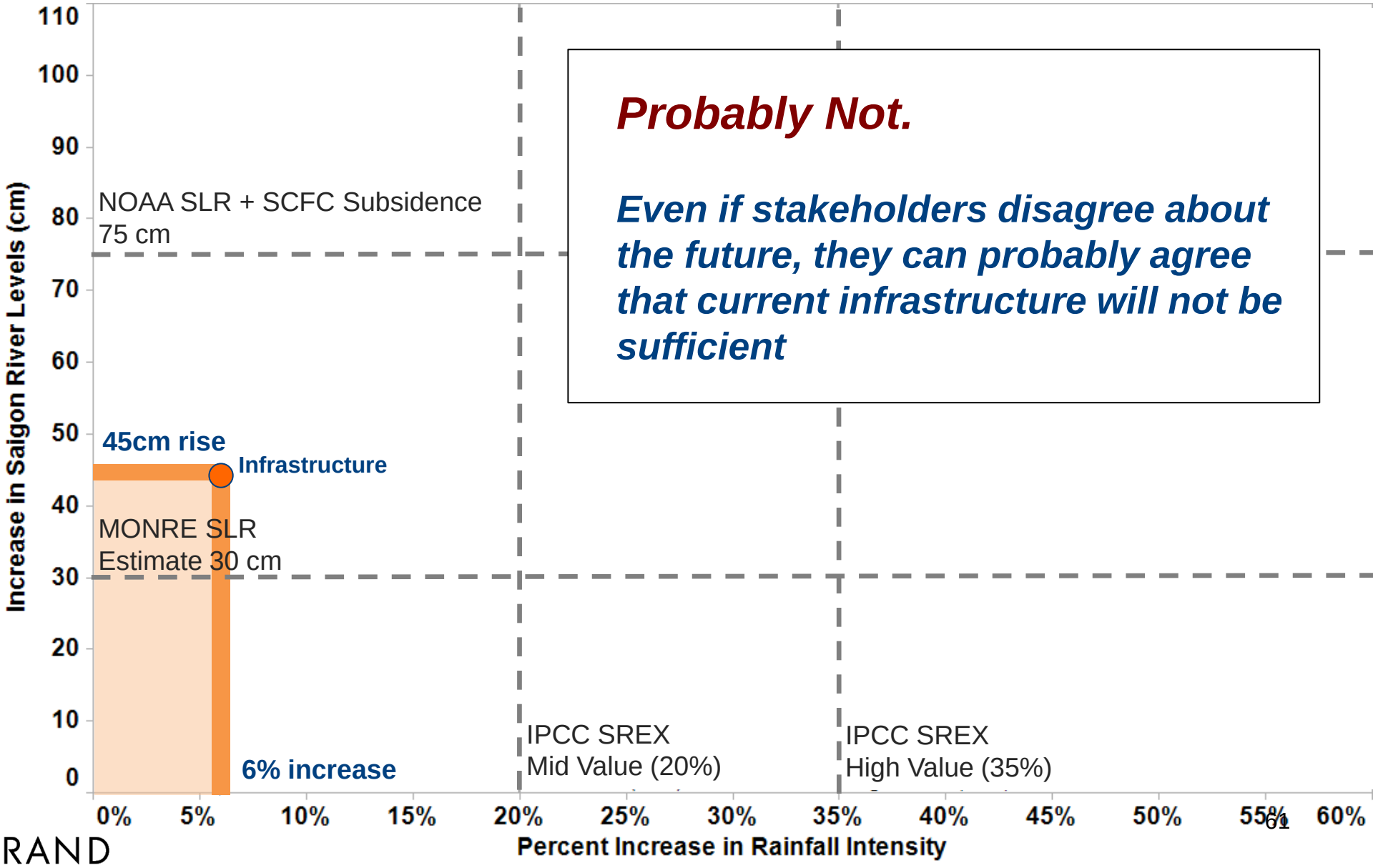
Should We Rely On Current Infrastructure?



Probably Not.

Even if stakeholders disagree about the future, they can probably agree that current infrastructure will not be sufficient

How Will Adding "Soft" Options Improve Our Strategy?

1. Rely on current infrastructure

2. Raise Homes

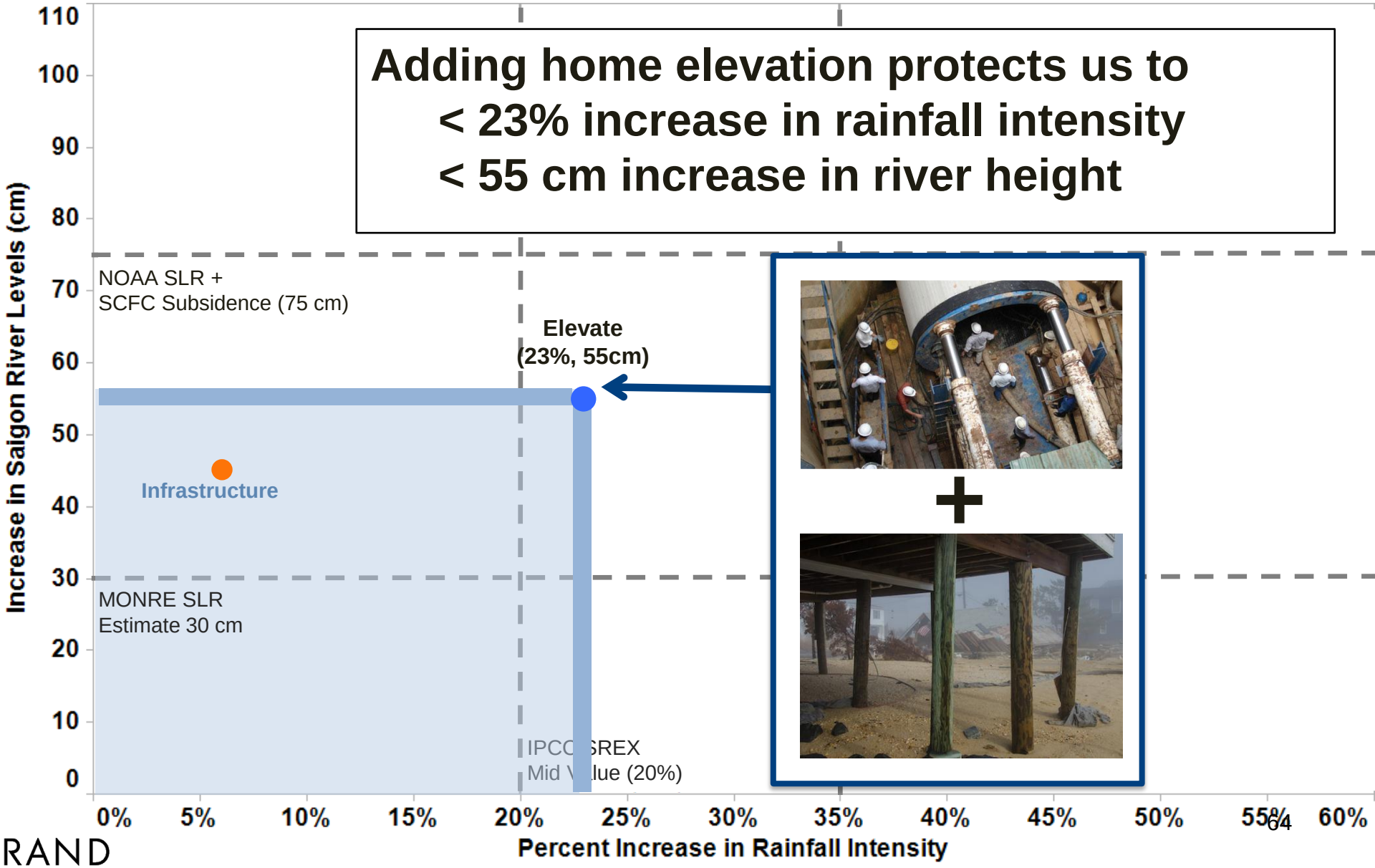
4. Manage Groundwater

3. Relocate Areas

5. Capture Rain Water

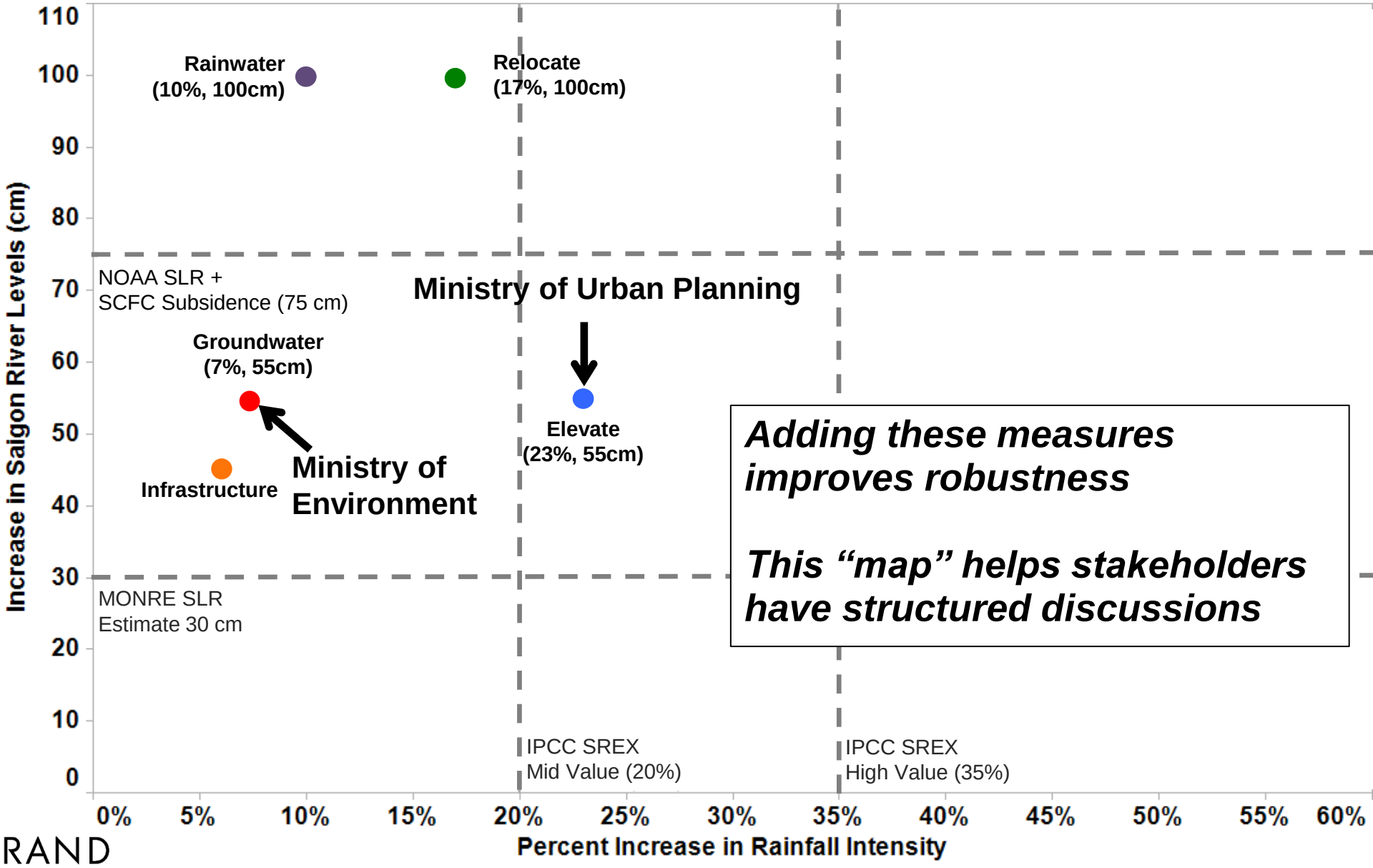
How Will Adding "Soft" Options Improve Our Strategy?

Adding home elevation protects us to
< 23% increase in rainfall intensity
< 55 cm increase in river height



RAND

How Will Adding "Soft" Options Improve Our Strategy?

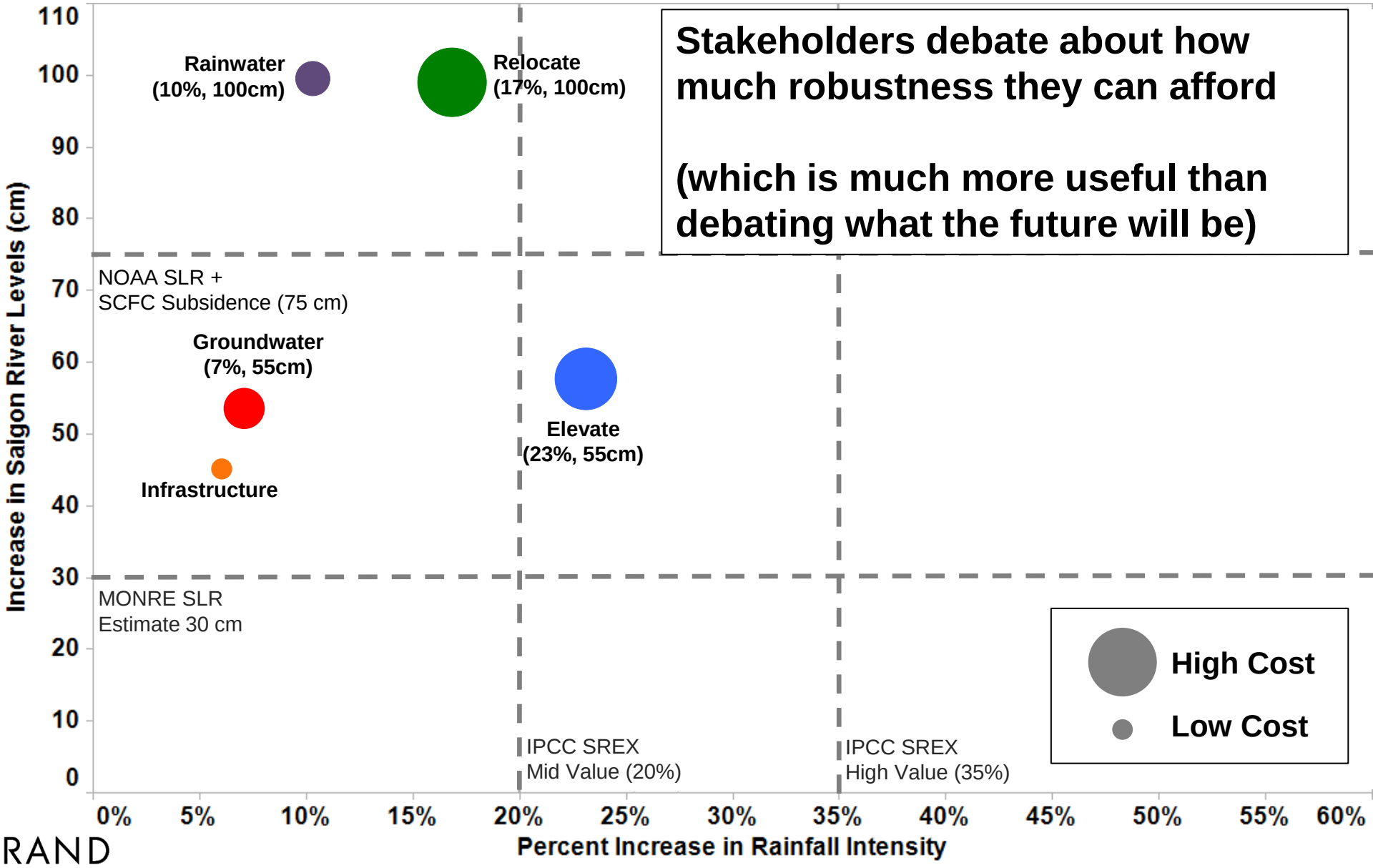


Adding these measures improves robustness

This "map" helps stakeholders have structured discussions

RAND

What Are Tradeoffs Between Robustness And Cost?



RAND

For HCMC, RDM Showed Us…

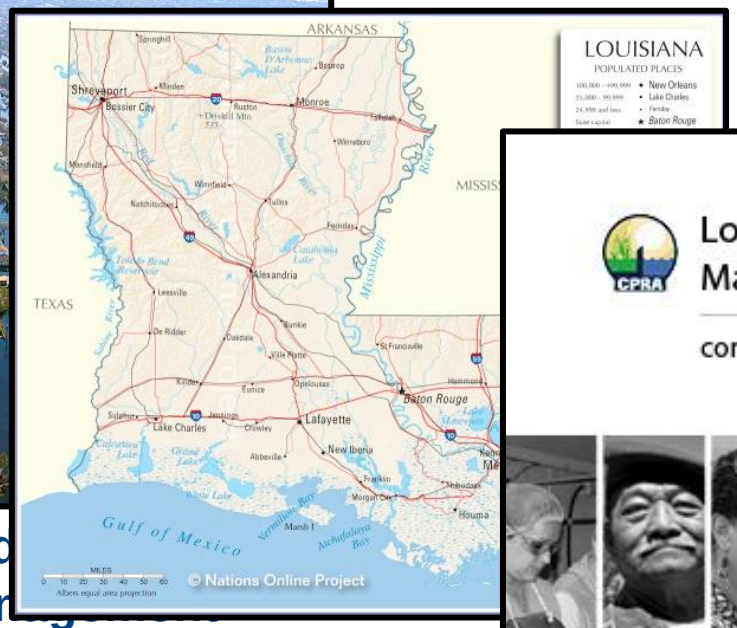
- **The current infrastructure may not be sufficiently robust and the city is right to pursue other policies**
- **"Soft" options can add significant robustness**
- **How different measures offer different robustness**
- **The tradeoff between cost and robustness**

… without requiring us to make predictions of the unpredictable

Key Message #4:

RDM helps decision makers build consensus around robust decisions, without good predictions.

Using These Methods, Good Decisions Can Occur Even In Difficult Political Contexts



Louisiana has needed action on coastal man

Politics are extremely

- **Many top politician climate change / sea level rise**
- **Political control swings between parties**

Using the techniques you will learn today, in 2012 Louisiana unanimously approved an innovative sustainable coastal master plan

Four Key Messages

1. "Predict-Then-Act" can lead to gridlock and bad decisions

2. Robust decisions are good and promote consensus

3. Scenario planning can help explore robust decisions, but 2-4 scenarios is often not enough

4. RDM helps decision makers build consensus around robust decisions, without good predictions

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For More Information….

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Lempert et al., *"Ensuring Robust Flood Risk Management in Ho Chi Minh City,"* Policy Research Working Paper WPS6465, World Bank, May 2013.

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I need to make investment decisions now."