




Public Perceptions of Flood Risk in the Sacramento-San Joaquin Delta




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Introduction


Flooding is the number one natural hazard in the United States




Sacramento, CA 1850




Arkansas City, AR, 1927




Olivehurst, CA 1997



Jones Tract, CA 2004



Mableton, GA 2009



Nashville, TN 2010

Despite a policy aimed at reducing risk

Flood **damages** are rising

NOAA photo library



New Orleans 1927



New Orleans 1965

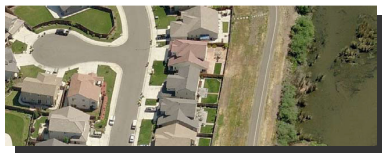


New Orleans 2005

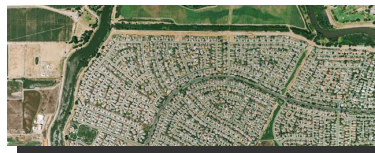
Despite a policy aimed at reducing risk

Flood **damages** are rising,
because land behind levees no longer considered **official "floodplain"**

→ increasing development (risk) behind the levees.



San Joaquin County, California, 2010



San Joaquin County, California, 2010

Introduction

*Most residents believe they would not be allowed to live behind a levee if it were not **safe**.*

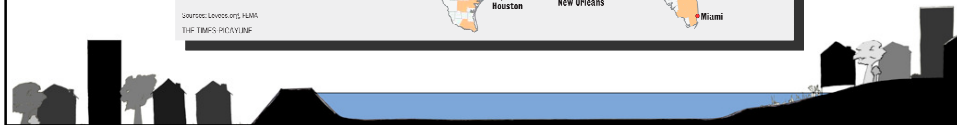
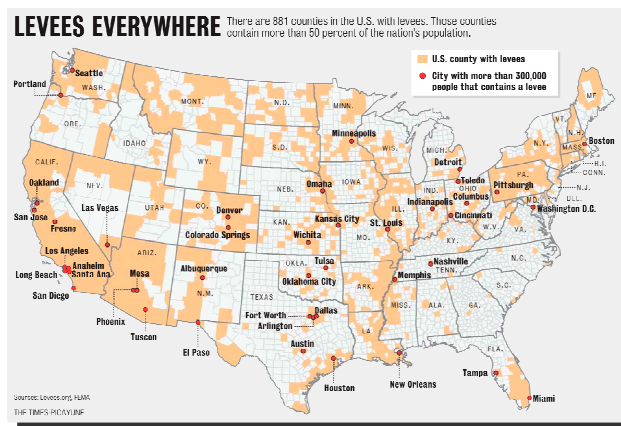
(Assc'n of State Floodplain Managers 2007)



Introduction

55% of the US population lives in counties protected by levees

(Times-Picayune 2010)



Introduction

GIVEN:

Flooding is likely to **increase** in the future.

Rapid floodplain urbanization puts **more people** at risk without hazard warning.

Behavior *is* tied to **perception**.



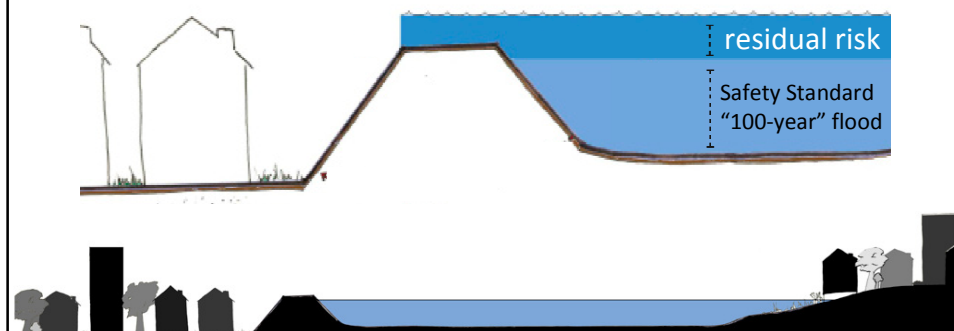
Introduction

How well do residents “protected” by 100-year levees understand their true level of risk?



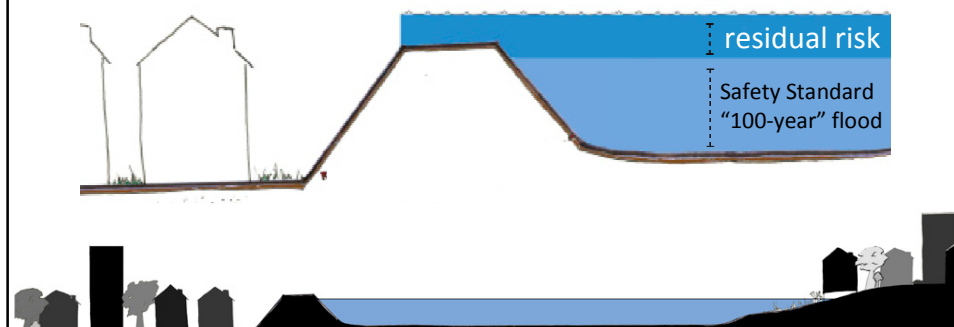
Residual Risk

Residual risk from larger floods is 26% over 30 years.



Residual Risk

Residual risk from larger floods is 26% over 30 years
Including human factors, risk is 78% over 30 years



Sacramento-San Joaquin Delta

Residual Risk



Sacramento-San Joaquin Delta

Residual Risk

Sacramento, San Joaquin, American

Drains 40% state

1800 km of dykes and levees

Mostly below sea-level

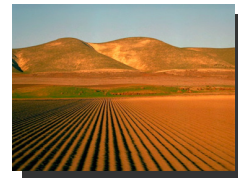
Still subsiding

Critical agriculture, infrastructure, ecology

Drinking water to 2/3 state

1.8 million people in Central Valley

160 Levee Failures in 100 years



Temperature



Gulf of Mexico, New Orleans



Sacramento River, upstream of the Delta

National Flood Insurance Program (NFIP)

Flood Insurance Act 1968

Goals: Offer flood insurance to those already at risk
Prevent further development in floodplains

Flood Hazard Mapping



Floodplain Management



Flood Insurance



National Flood Insurance Program

How the NFIP Works

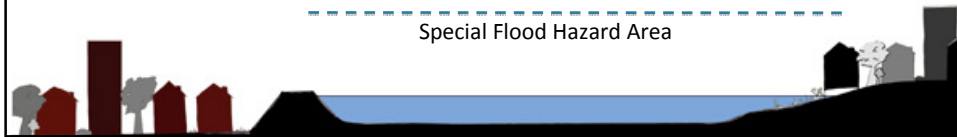
Administered by Federal Emergency Management Agency (FEMA)

“Out of the floodplain”
No insurance required
No building requirements

“In the floodplain”
No new development
Insurance required
“floodproof” houses

100-year floodplain

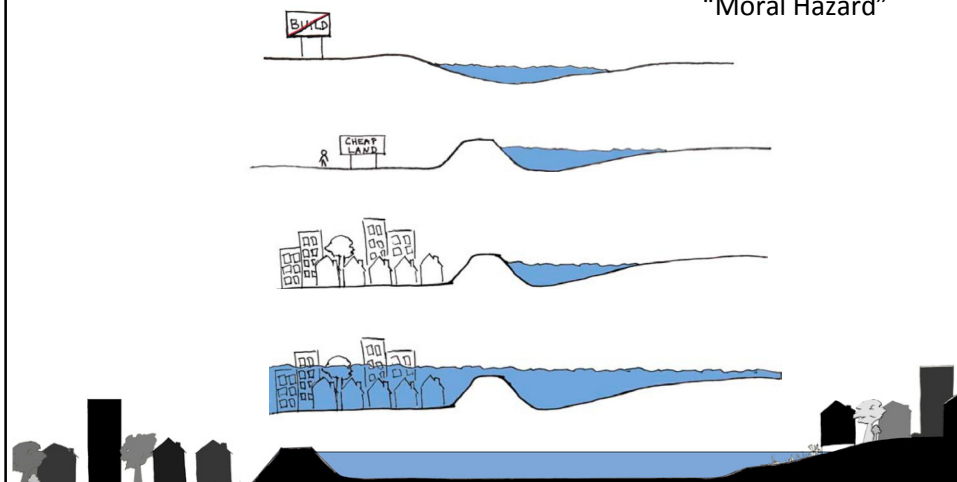
Special Flood Hazard Area



National Flood Insurance Program

Criticisms of the NFIP

“Moral Hazard”



Criticisms of the NFIP

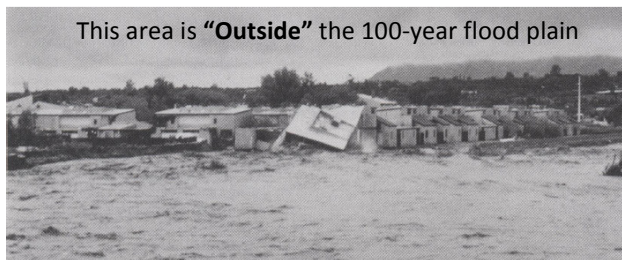
1% annual chance safety standard is **inadequate**
and based on **uncertain science**

25% insurance claims come from areas outside the
“Special Flood Hazard Area”



Criticisms of the NFIP

This area is “**Outside**” the 100-year flood plain



Rio Rillito, Tuscon, Arizona 1983



Risk Perception

Factors influencing risk perception

Experience



Trust in structures



Media



Misunderstanding terminology

"100-year flood?"

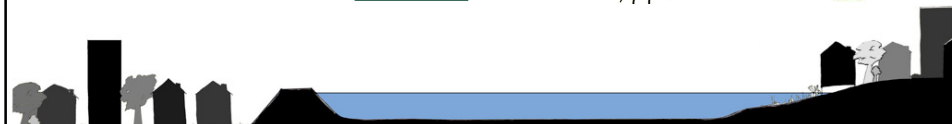
Trust in administration



Benefits



Denial



Methods

Spanos Park West

New development (2000)

1-4m below Sea-level

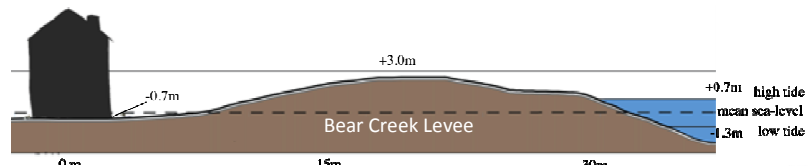
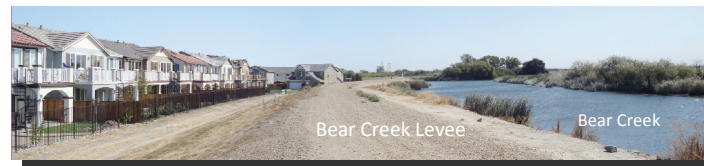
Protected by recertified
"100-year" levee

Rapid growth region



Methods

Spanos Park West

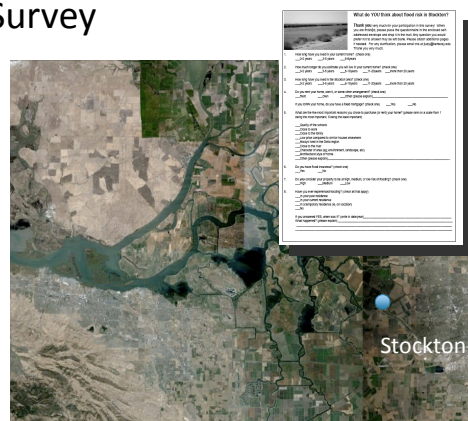


Methods

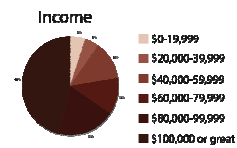
Survey

Sampled 500
20 questions
24% return rate

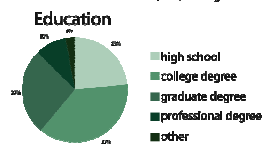
Flood risk perception?
Flood **preparation**?
Flood risk **Information**?



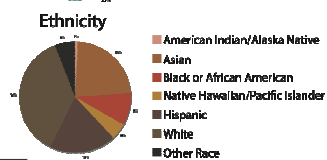
Development Characteristics



Most households earn \$80,000/yr



Most households have a college education



Ethnically diverse

Survey Results

Residents **not aware** of flood risk

Not told they are at risk

Unprepared for a flood

Results

Risk Perception



Results

If a levee broke and your property flooded, how deep would it get?



50 % were correct
50% underestimated or were unsure

Damage

"hardly any, maybe just the front lawn"

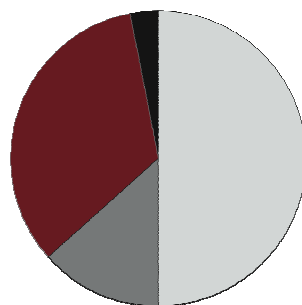
"six inches at best, I'd think"

"carpet, floors, walls, insulation..."

"gone...everything...Total loss".



Understanding of a "100-year flood"



- yes
- think yes, but no
- somewhat
- no



“100-year flood” ... defined in their own words

“Levees were made to protect us for 100 years”

“A major flood that comes every 100 years, it’s a worst—case scenario.”

“The last flood came in 1950—the next one will be in 2050”



Access to information

60% have not been informed
60% rarely hear about flooding
30% never hear about flooding
6% spoke with a real estate agent



Preparation

20% households have flood insurance

13% residents took “precautionary measures”:
*evacuation plans, valuables on 2nd story,
disaster supply kit.*

No boats.

RESUE BOATS

Level of flood risk awareness was found to be
independent of education and income.

Results

Residents are exposed to involuntary risk

Likely that similar flood-prone developments elsewhere also unaware of risk

Lack of awareness exacerbates damage and loss of life



Recommendations

Policy

Land behind levees should be treated as
“floodplain.”

Map residual risk.

Raise the safety standards in appropriate areas.

Flood insurance: rates based on actual risk

Mandatory insurance behind levees?



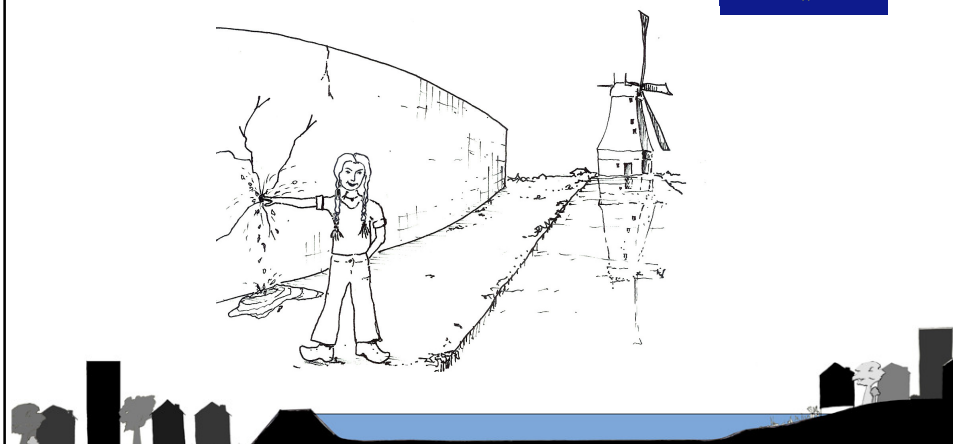
Recommendations

Policy: What can we learn?
European Union Floods Directive (2007)



Recommendations

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Recommendations

Policy: What can we learn?

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Prevention, Protection, Preparedness

- flood risk assessments
- flood hazard maps
- flood risk management plans



Recommendations

Memories of floods



Elbe River, Dresden



Köln, Germany



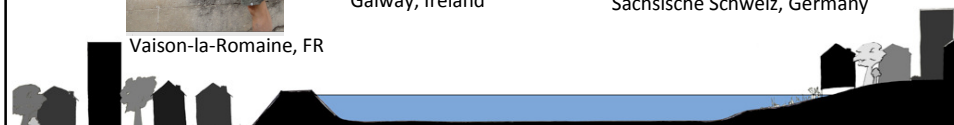
Vaison-la-Romaine, FR



Galway, Ireland



Sächsische Schweiz, Germany



Recommendations

Memory-free development

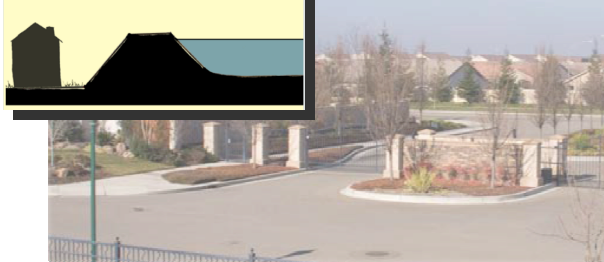


Stockton, California, USA

Recommendations

Post *future* flood levels

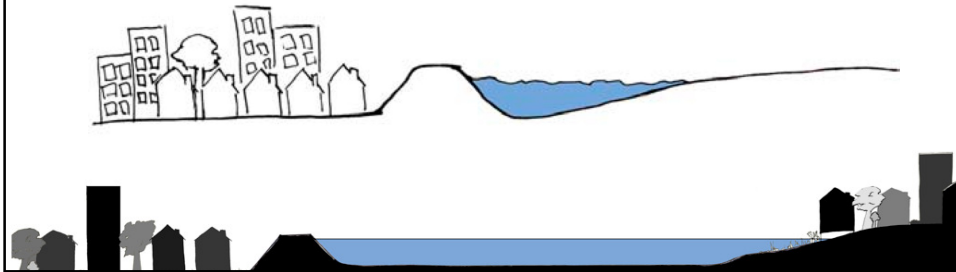
CAUTION! This area protected by levee



Recommendations

Whose responsibility is it to protect populations from flooding?

Does urban development belong in floodplains?



Acknowledgements

Dank u voor uw aandacht!

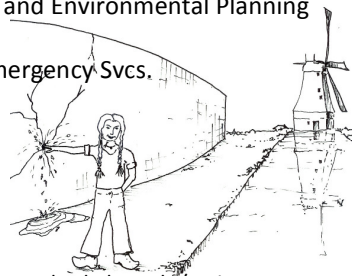
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