



***“Après moi, le déluge”***



# Against the Deluge

## Storm Surge Barriers to Protect New York City

30-31 March 2009

ASCE Met Section Infrastructure Group Seminar 2009

Image MassGIS, Commonwealth of Massachusetts EOE

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Pointer 40°42'19.92" N 74°00'40.28" W

Streaming ||||| 100%

Eye alt 2197 ft

Producer

Jagtar Khinda

Director

Douglas Hill

Angels

Michael Bobker

Bernard Tuchman

Proceedings Editor Jagtar Khinda

Heavy Lifters

Jaimin Amin

Virpal Kaur

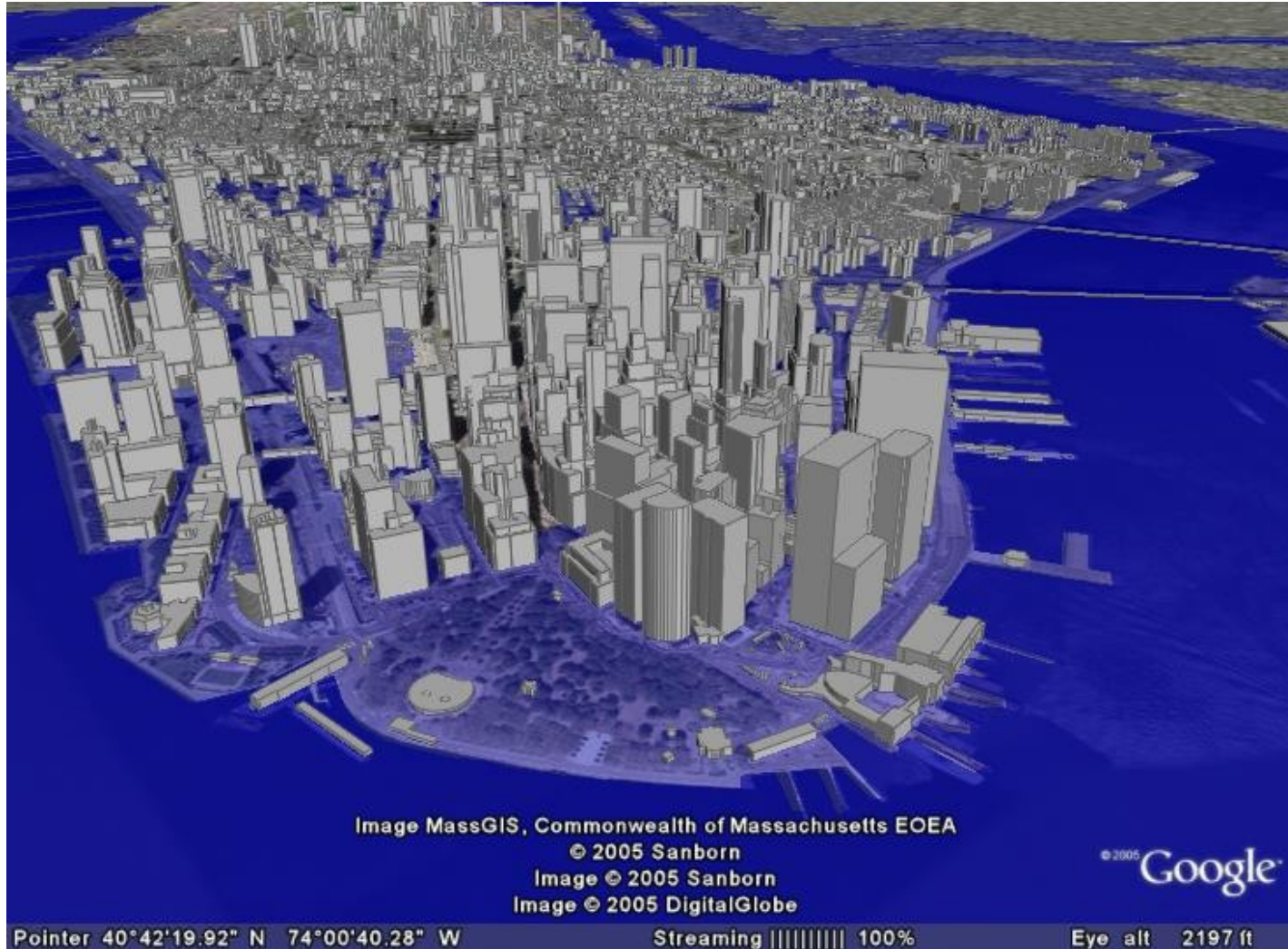
Web Masters

Erik Metzger, ASCE

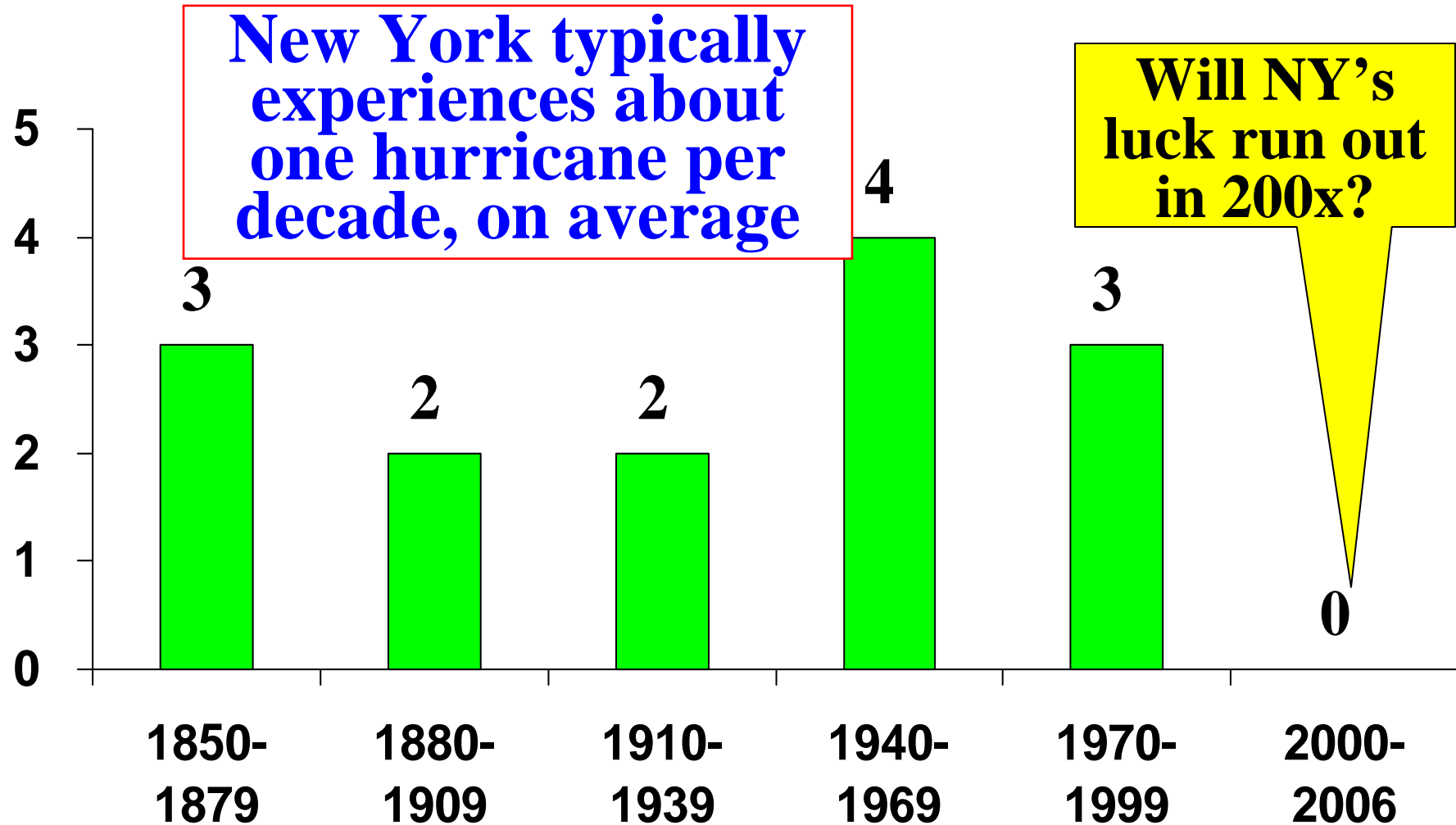
Heidi Perry, NYAS



# Are we on a path to disaster?



# Historical Hurricanes Impacting New York Coast, 1850-2006\*

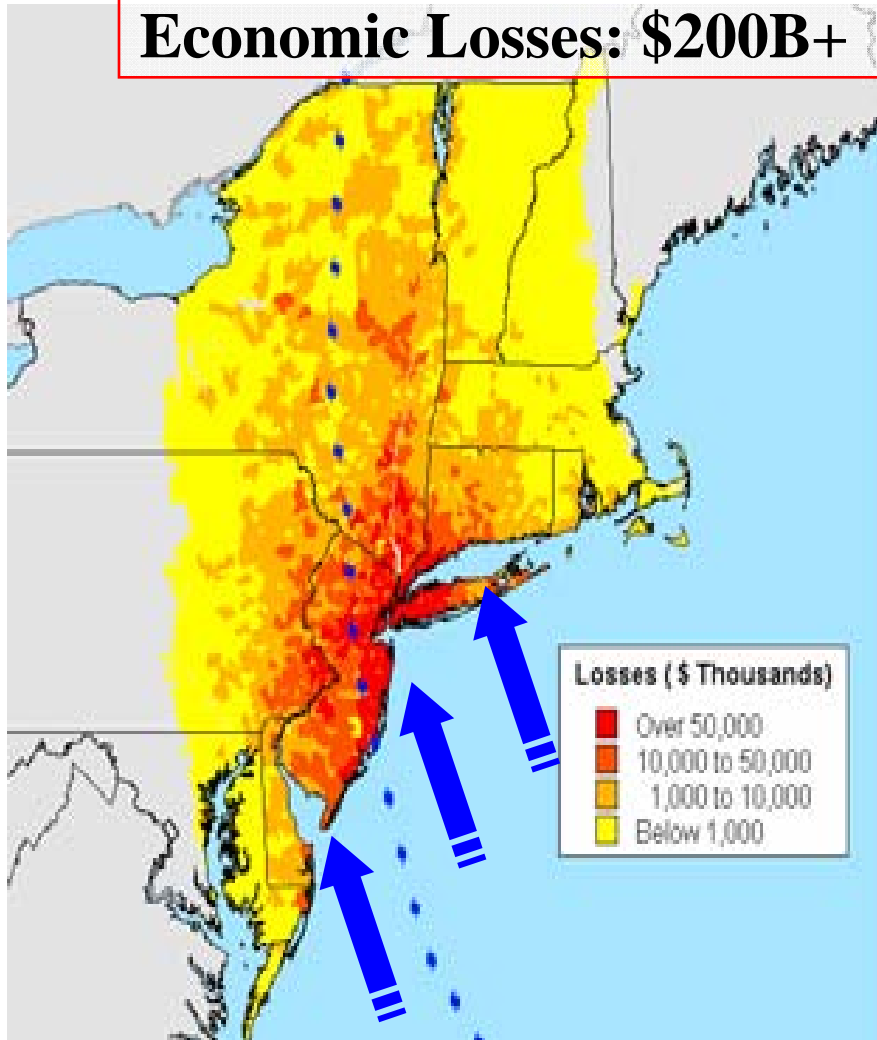


\*Includes significant and notable tropical storms.  
Source: Weather2000.

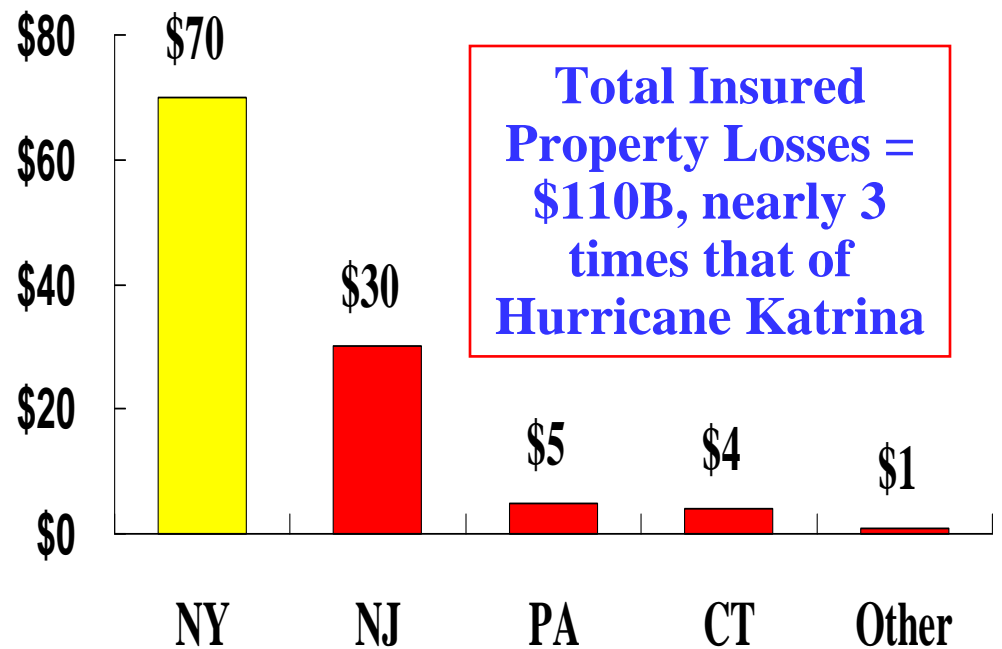
# Nightmare Scenario: Insured Property Losses for NJ/NY CAT 3/4 Storm

**Insured Losses: \$110B**

**Economic Losses: \$200B+**

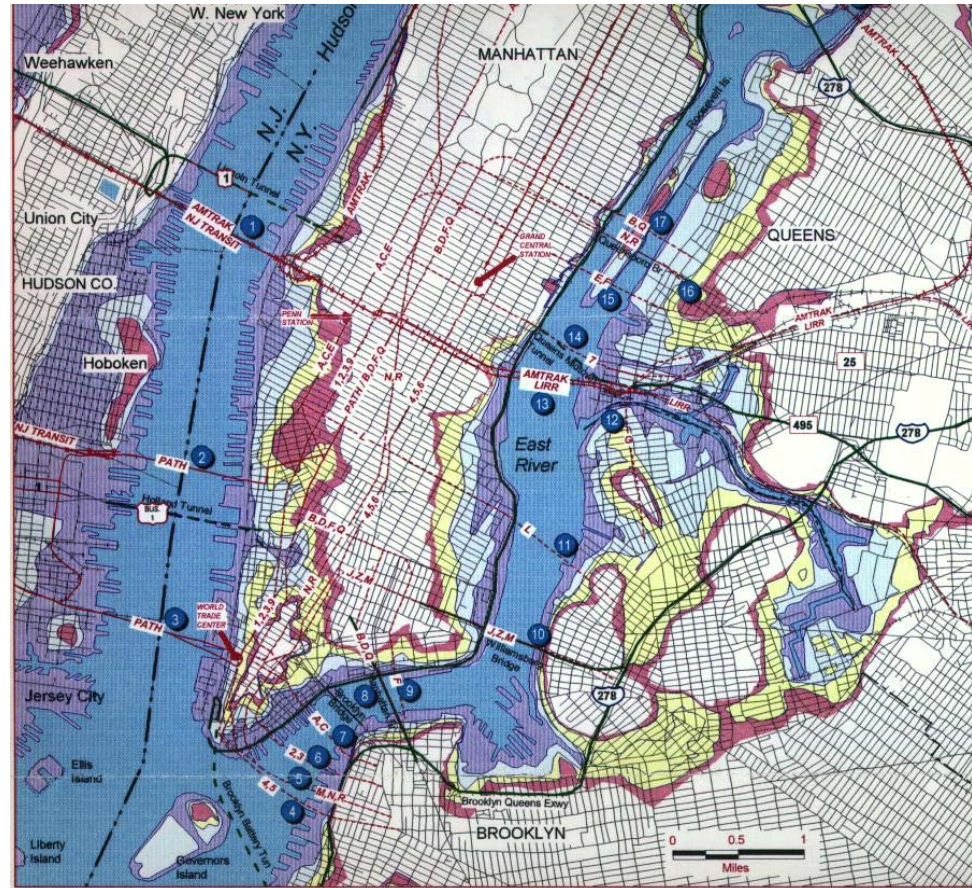


**Distribution of Insured Property Losses,  
by State, (\$ Billions)**



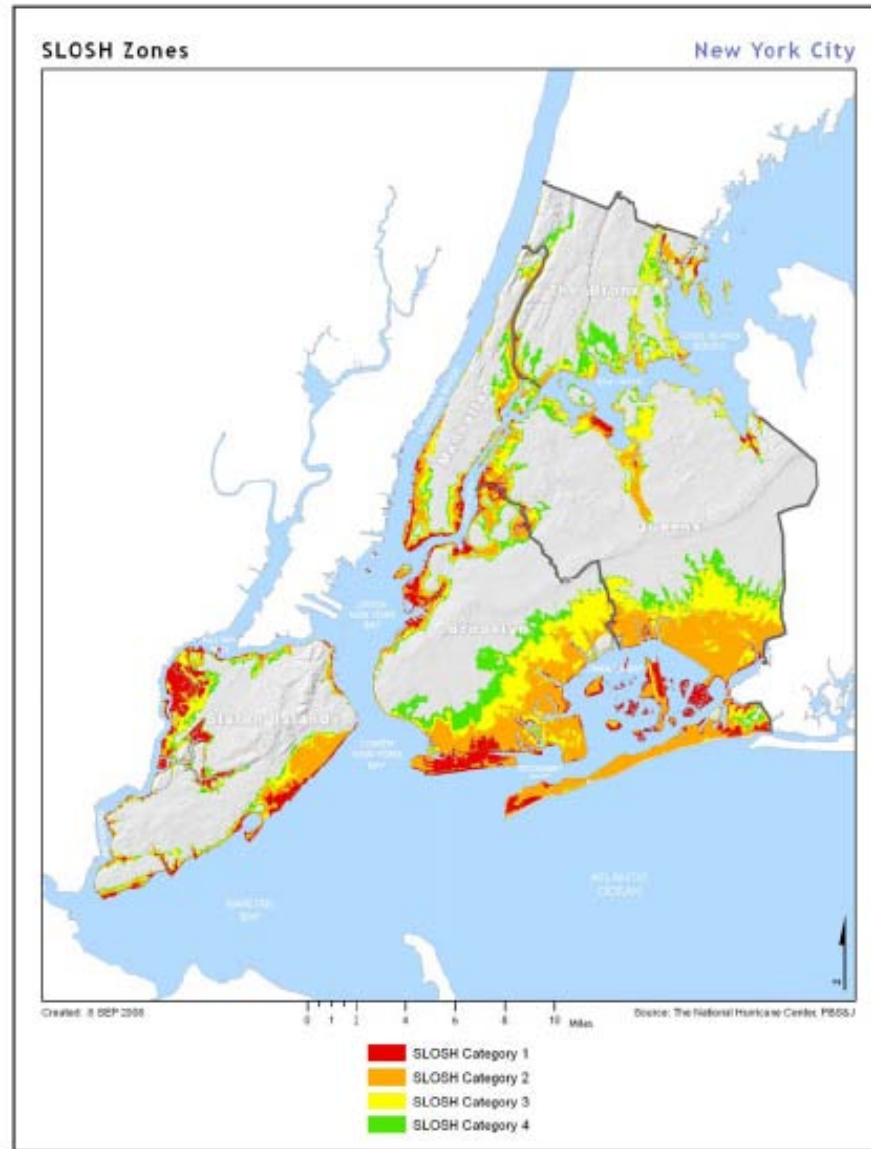


# New York City will be faced with a deluge



Source: U.S. Army Corps of Engineers et al., Metro New York Hurricane Transportation Study, Interim Technical Report, November 1995

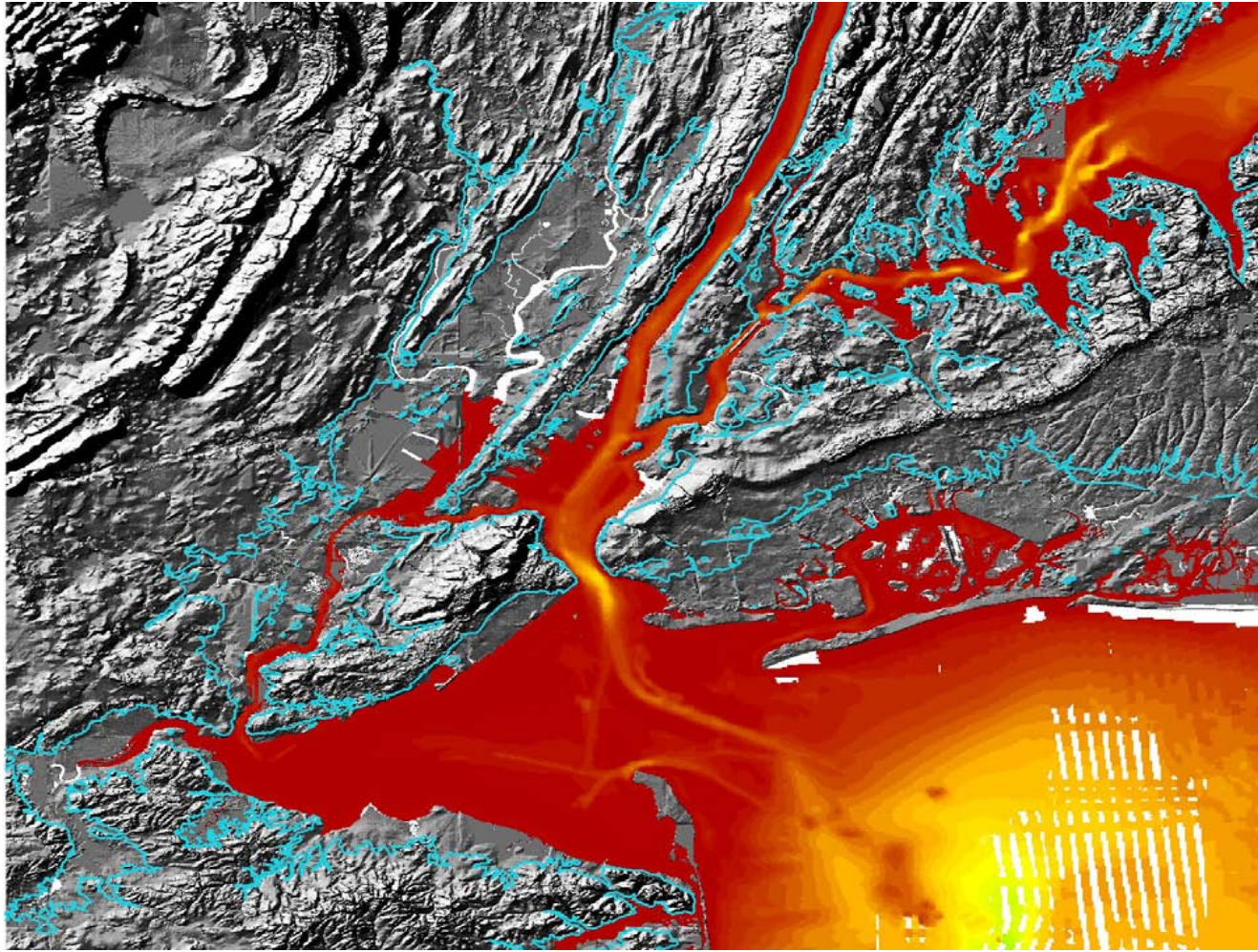
# We must take the lead to protect the city



Source: NYCOEM  
Draft Natural Hazard  
Mitigation Plan,  
September 2008

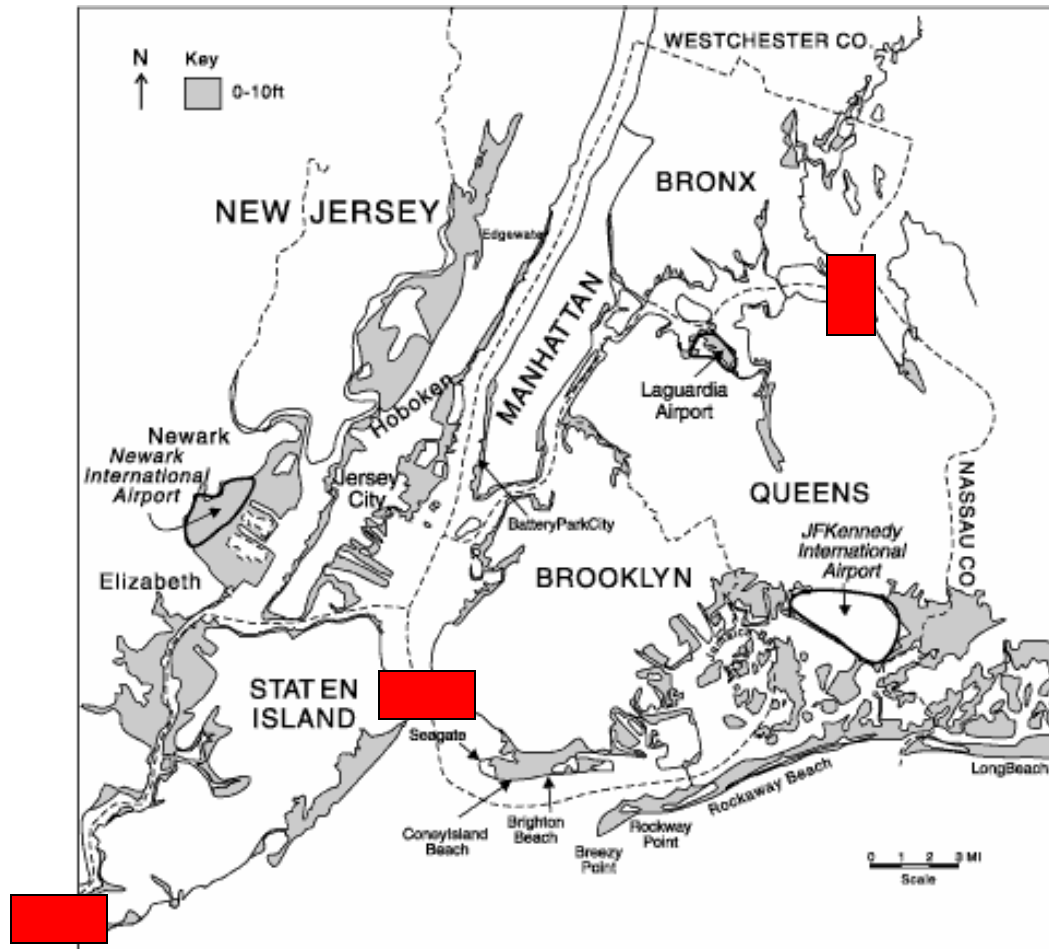


# Topography determines what can most easily be protected



Source: Roger Flood, Stony Brook U.

# Storm surge barriers can protect the heart of the city



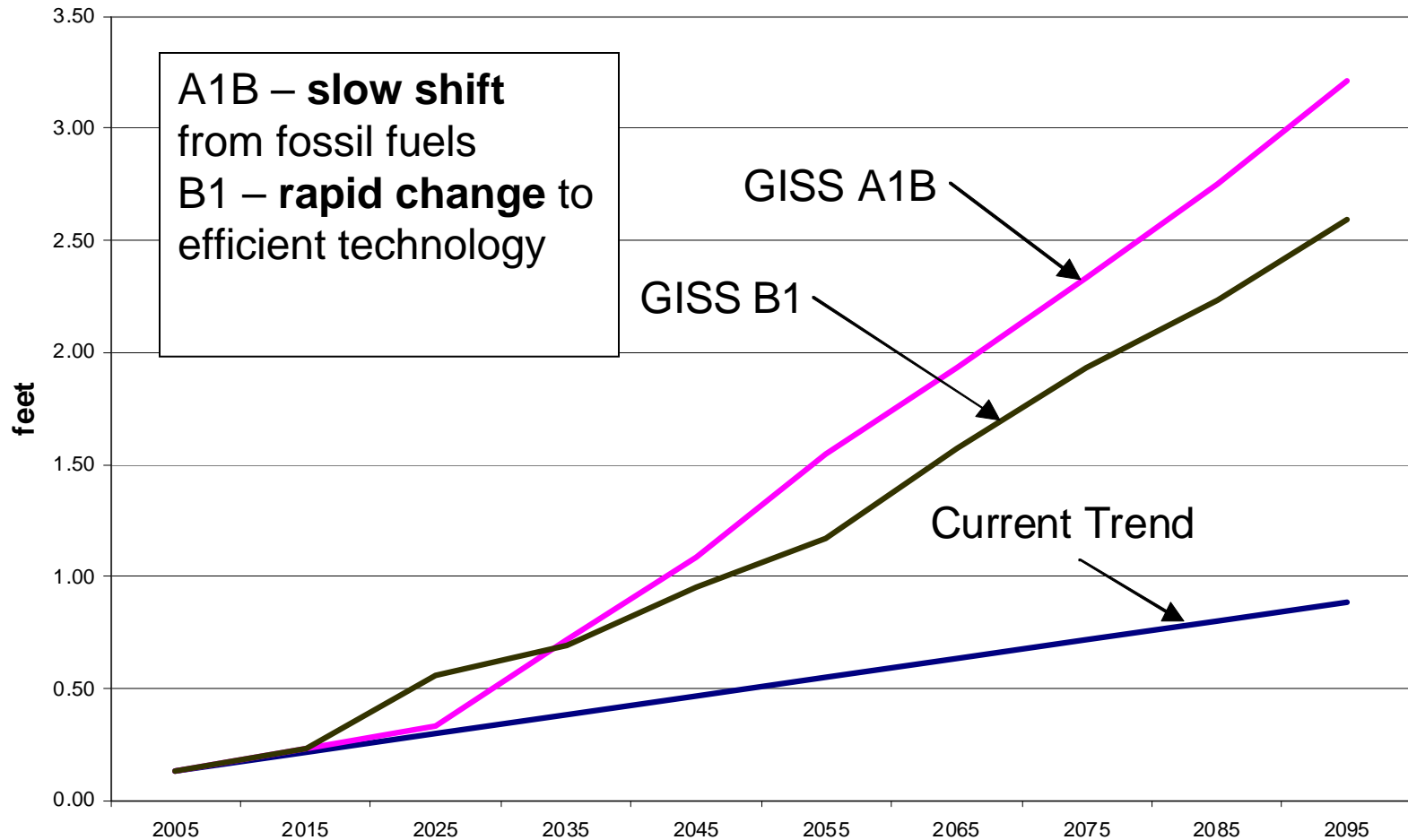
# We must start moving to develop the barriers

<b>Barrier</b>	<b>Flood</b>	<b>Delay (years)</b>	<b>Start</b>	<b>Construction time (years)</b>	<b>Completion</b>
Providence	1938	23	1961	5	1966
New Bedford	1938	24	1962	4	1966
Stamford	1938	27	1965	4	1969
Hollandse Ijssel	1953	1	1954	4	1958
Eastern Scheldt	1953	14-26	1967-1979	7	1986
Maeslant	1953	36	1989	8	1997
Venice	1966	37	2003	8	(2011)



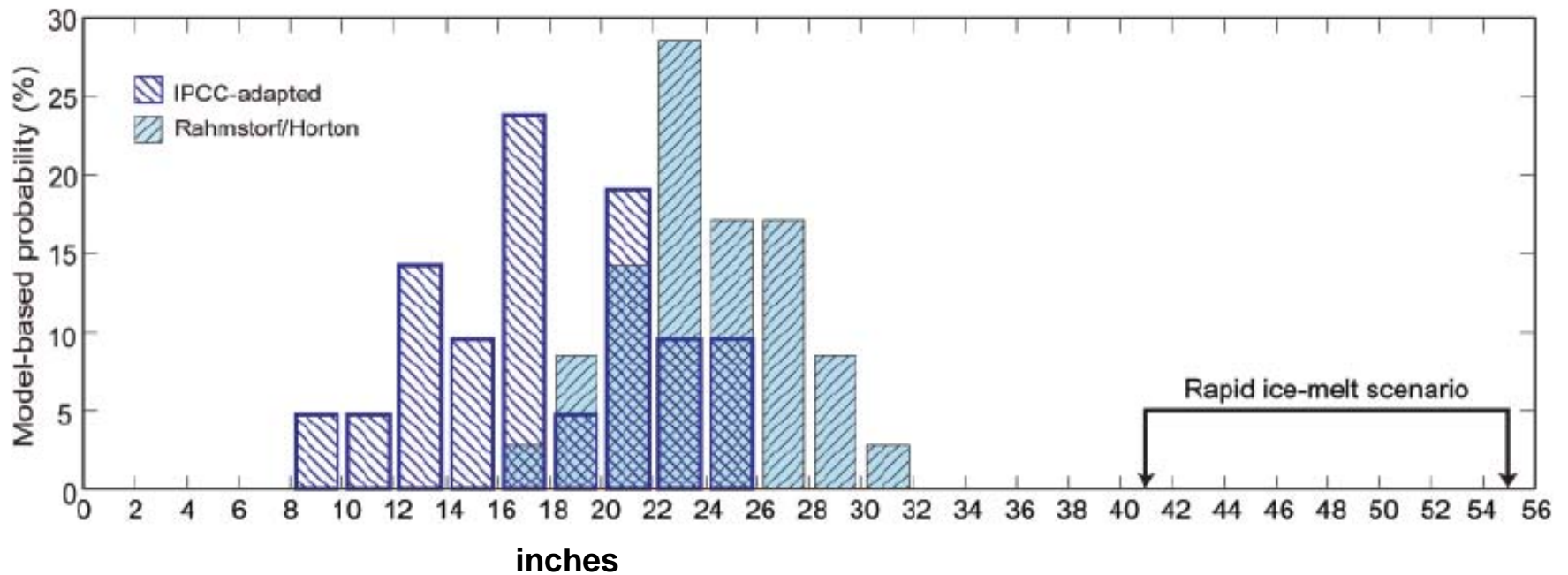
# Sea level rise is accelerating

GISS GCM Projected Change in Sea Level Rise - New York City



# The risk is increasing

## Sea level rise by the 2080s



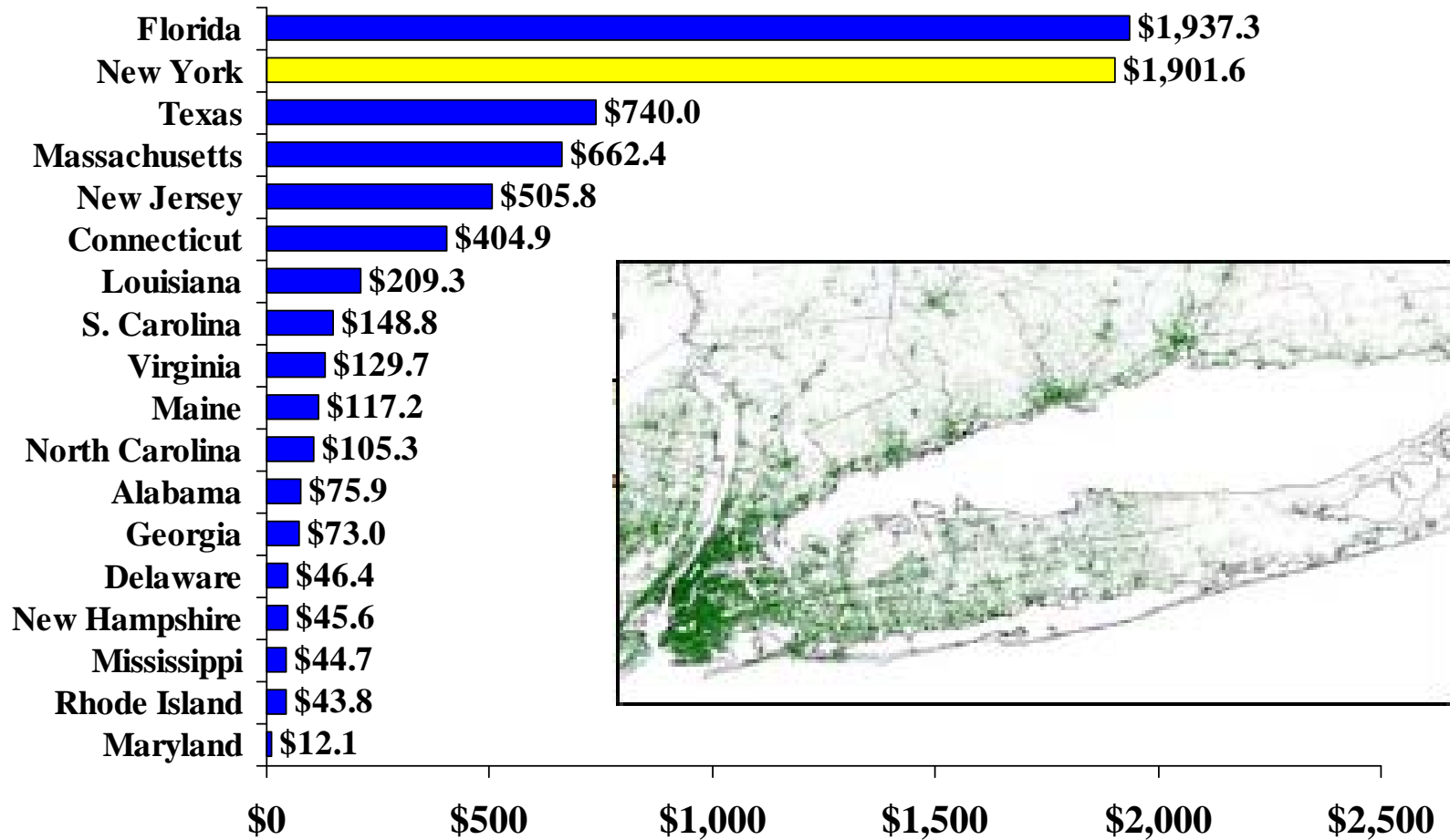
Source: New York City Panel on Climate Change, Climate Risk Information, February 17, 2009

# New York City is vulnerable to a hurricane

- “A few areas are particularly susceptible to the effects from a land-falling hurricane. These areas are **uniquely vulnerable** due to their large population and/or the length of time it would take to evacuate people out of harm’s way... **New York City/Long Island**, and New England are all **especially vulnerable**.” Max Mayfield, Director of the Tropical Prediction Center/National Hurricane Center, May 24, 2006



# Total Value of Insured Coastal Exposure (2004, \$ Billions)



Source: AIR Worldwide

We can't depend upon the process that failed New Orleans



# New York City is planning to be flooded

The city now has no mitigation actions for coastal flooding, according to the NYC Draft Natural Hazard Mitigation Plan (NYC Office of Emergency Management, September 2008), although there are 9 “potential” actions.



# Must NYC have its own Katrina?

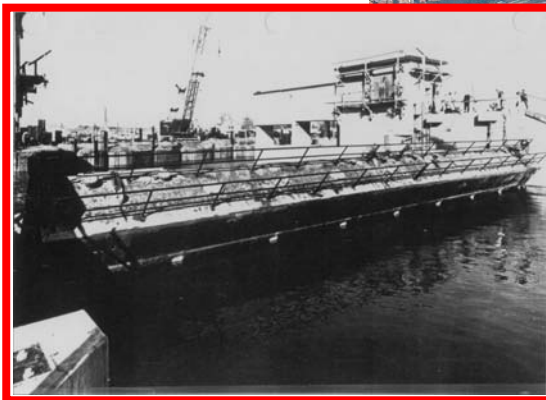
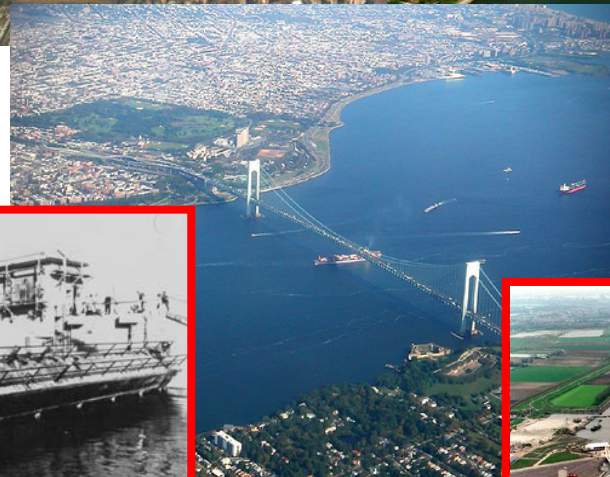


1938 hurricane	682 dead
1953 England	307
1953 The Netherlands	1,835
2005 Katrina	1,836
2xxx NYC	?????

We must start moving to evaluate  
and develop the barriers



# Site-specific designs are needed



We can promote the next steps toward developing the barriers

