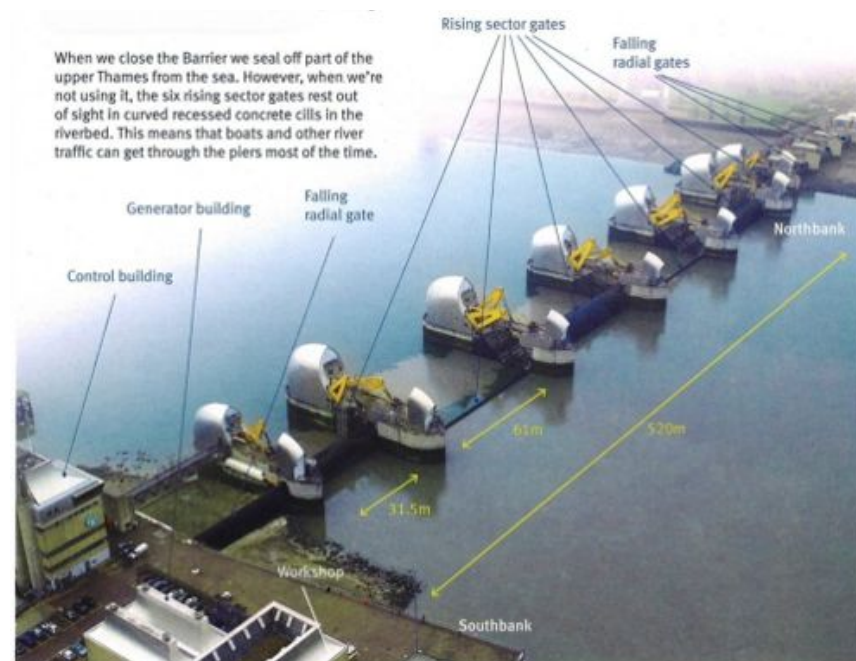


# Adaptation as an Innovation Challenge

**Roger A. Pielke, Jr.**  
**University of Colorado**

**CSPO – BTI Workshop**  
**Washington, DC**  
**10 December 2013**



# Outline

---

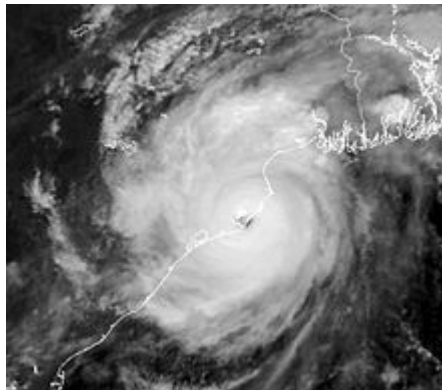
- **An opening case study**
- **Adaptation as conventional wisdom**
- **Adaptation as innovation**
- **Various examples**
- **Concluding thoughts**

# Spot the difference

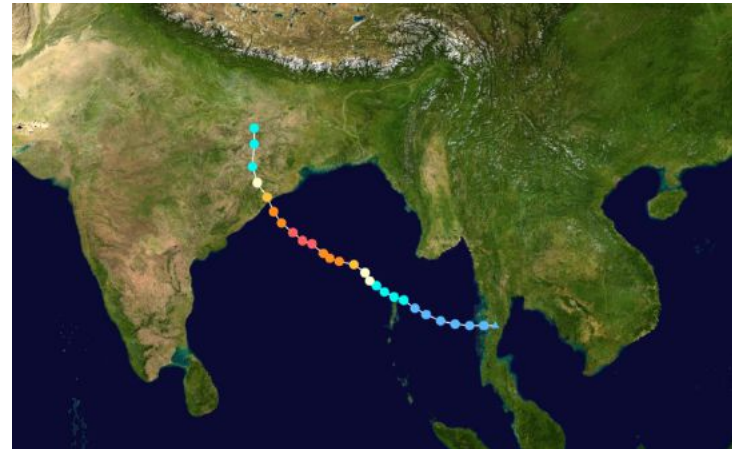
**1999 Super cyclone "Paradip"**



**Peak winds = 160 mph  
~10,000 deaths**



**2013 Super cyclone "Phailin"**



**Peak winds = 160 mph  
~40 deaths**



# Adaptation as innovation

"[T]his was no miracle. This was an effort of epic proportions in making sure the horrors of 1999 would not be revisited. The Chief Minister of the State of Odisha had right at the onset declared that the entire state government was working to make sure there would be zero casualties. Close to a million people were evacuated. Evacuating a million people means, you need to know where you will be housing them or sending them to safer locations inland. These decisions are not taken ad-hoc. . .

The state over the past decade has been investing in building cyclone shelters and strengthening other coastal infrastructure. . . additional 285 cyclone shelters are being built (150 in Odisha and 135 in Andhra Pradesh), more than 1000 kilometers of evacuation roads and 23 bridges to enhance connectivity and evacuations are being constructed, around 200 km of existing coastal/saline embankments are being strengthened and a new early warning system that will help disseminate warnings down to the "last-mile" community level is being set-up in Odisha and Andhra Pradesh. Cyclone shelters under the project are being constructed as multi-purpose buildings to be used as schools or community centers during regular time to ensure that the building is in working condition when needed in an emergency period."

Saurabah Dani, World Bank 2013

<http://blogs.worldbank.org/endpovertyinsouthasia/never-again-story-cyclone-phailin>

# Understanding Adaptation Depends Upon Understanding the Concept of “Climate Change”

What is “climate change”?

Two different definitions:

IPCC . . . change arising from any source.

FCCC . . . a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.



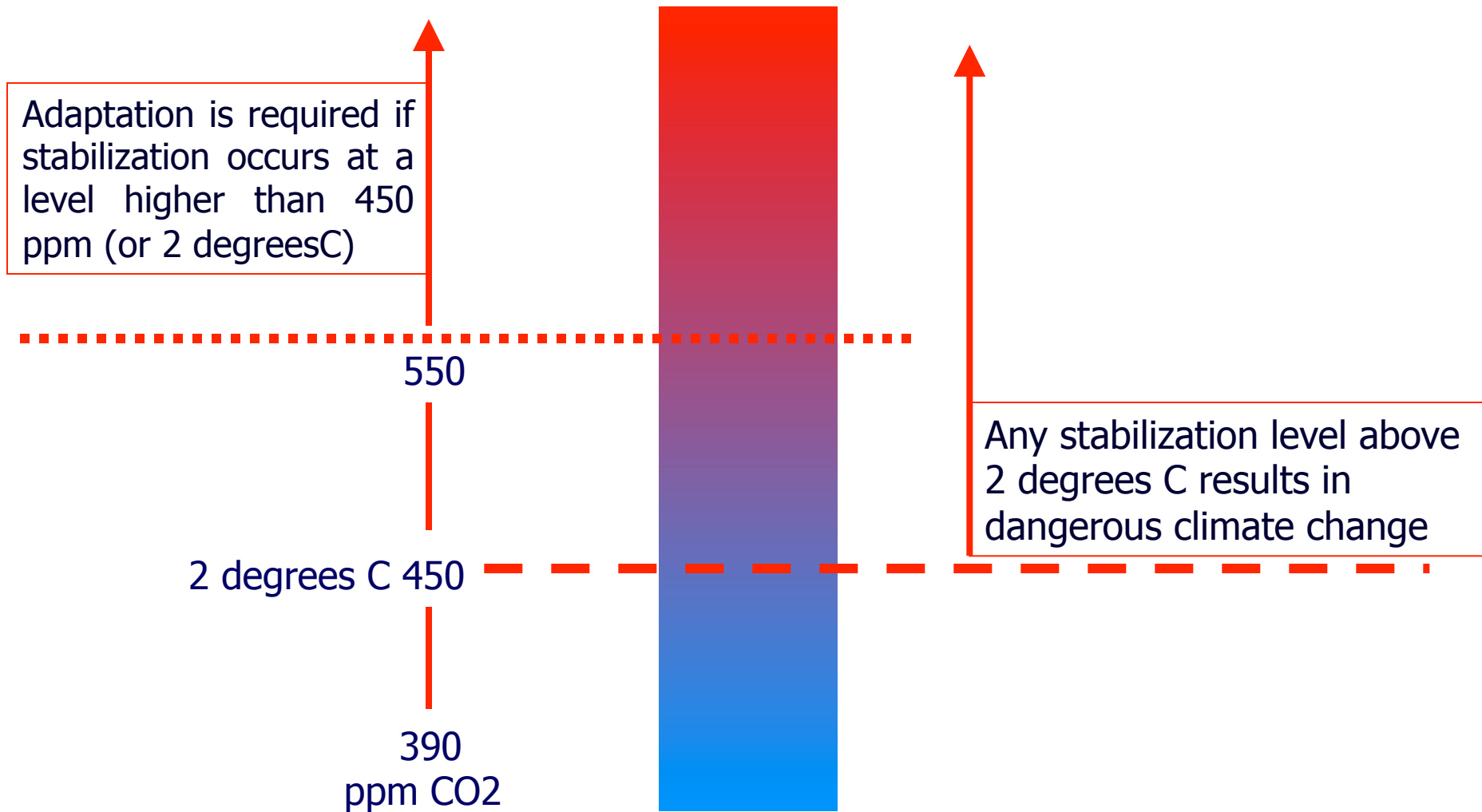
# Stabilizing Greenhouse Gases

## Framework Convention on Climate Change

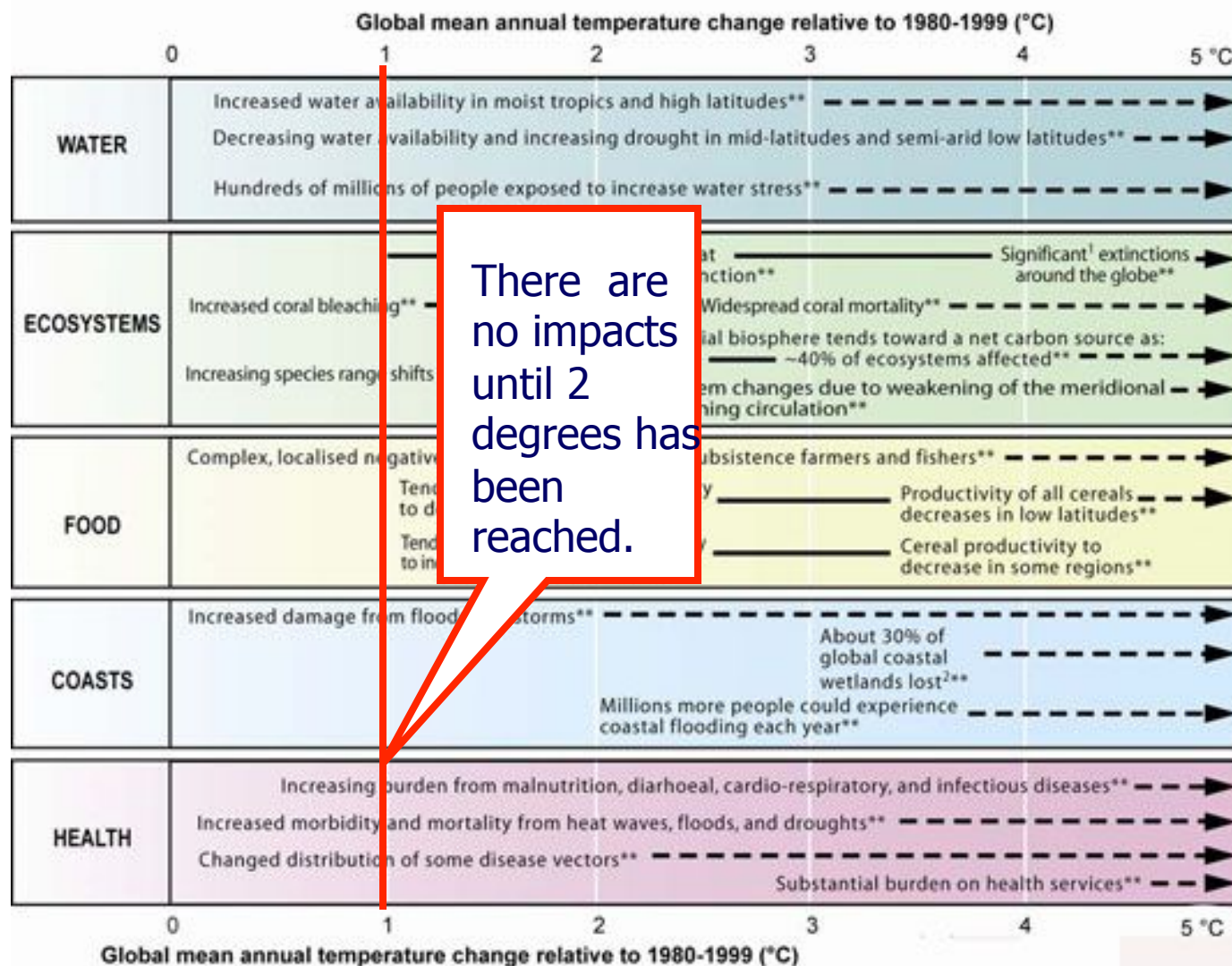
### GOAL

... to achieve ... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

# Adaptation Under the Logic of the FCCC



# IPCC AR4 WGII on Climate Impacts



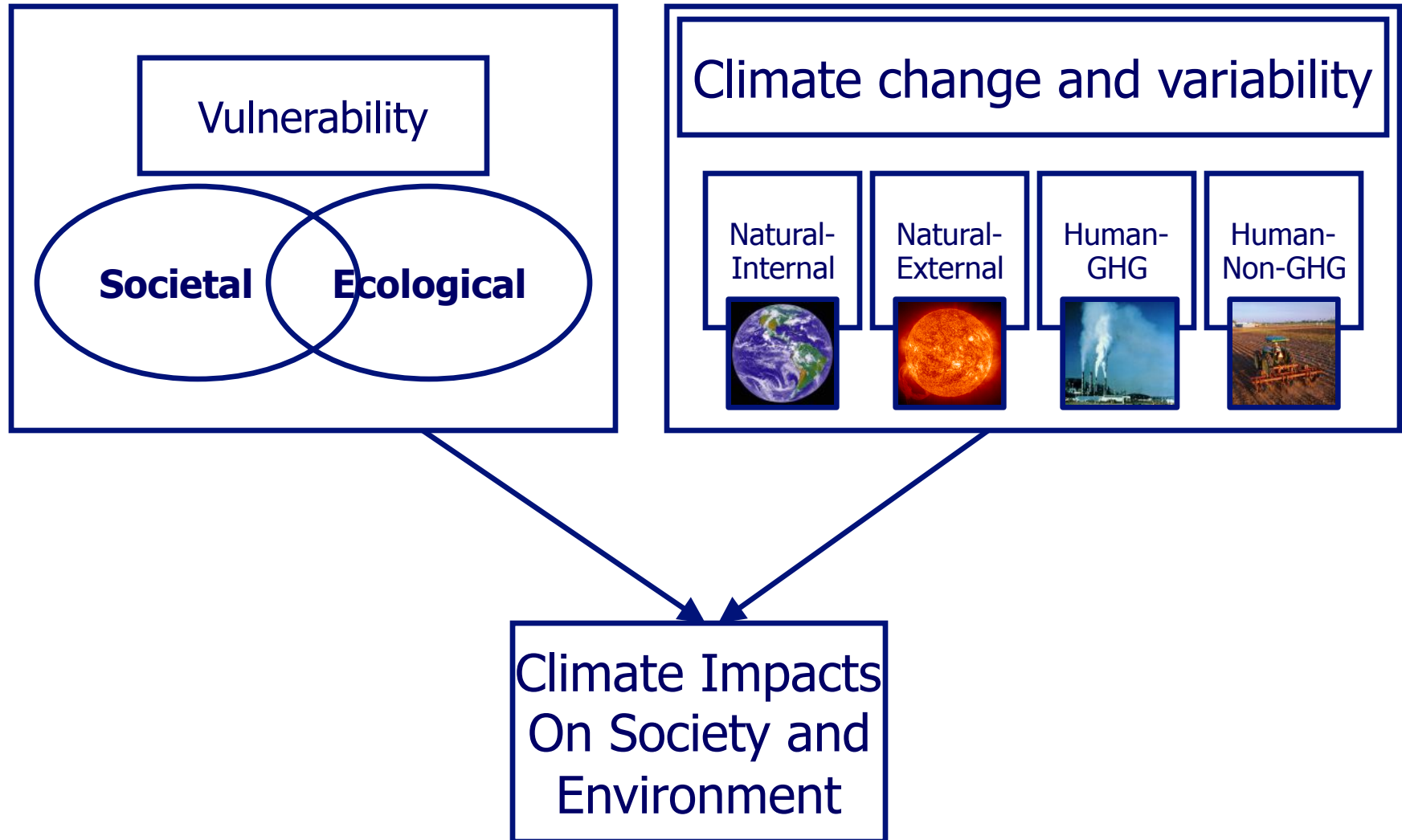
There are no impacts until 2 degrees has been reached.

<sup>1</sup> Significant is defined here as more than 40%.

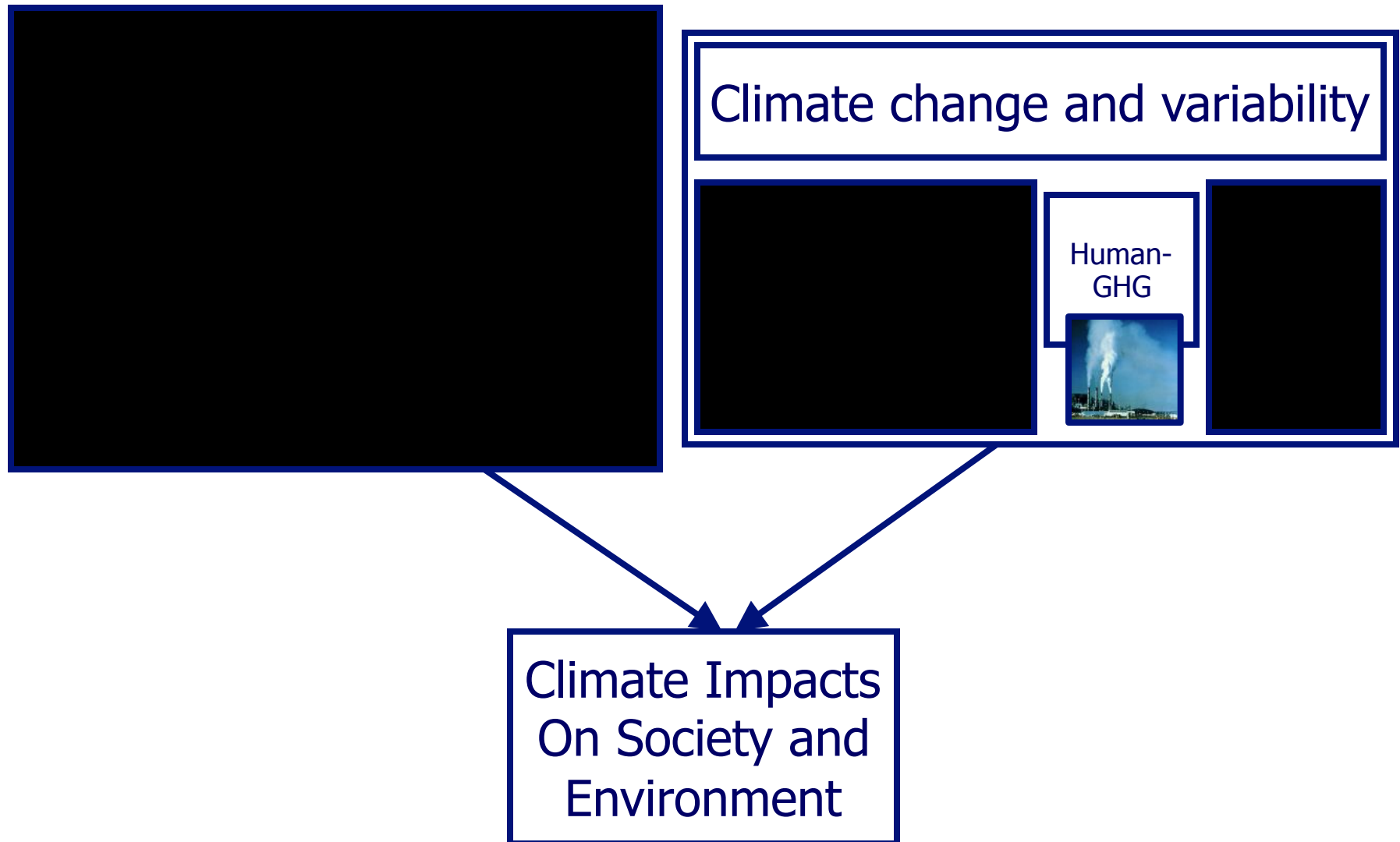
<sup>2</sup> Based on average rate of sea level rise of 4.2 mm/year from 2000 to 2080.



# Reducing climate impacts: **IPCC** Perspective



# Reducing climate impacts: FCCC Perspective



Conventional wisdom: If dangerous climate change can be avoided, then adaptation would be unnecessary

- Adaptation is thus a cost of climate change
- A need for adaptation represents failed mitigation
- IPCC cost-benefit analysis have classified adaptation as having costs but no benefits
- Adaptation is a “laziness” –  
Al Gore, **Earth in the Balance**
- Adaptation is “genocide” –  
Tim Flannery, author of **The Weather Makers**

# What is “innovation”?



“Innovation is change that creates a new dimension of performance.”

Peter Drucker



# Adaptation as innovation

## Production Functions





# Schumpeter on Innovation – Five Types

- Product (weather radar)
- Process (evacuation system)
- Market (insurance)
- Resource (World Bank financing)
- Organization (disaster relief)

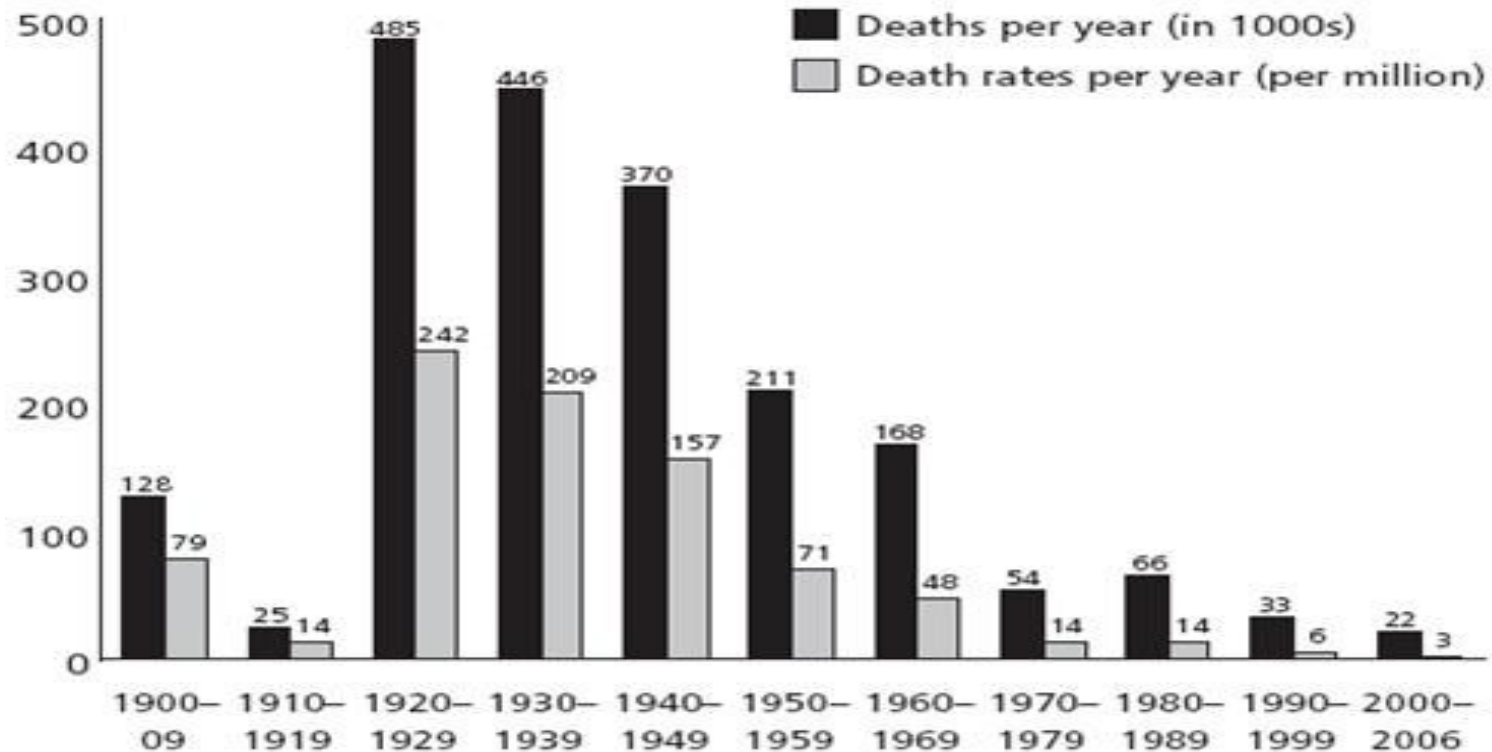


“. . . any “doing things differently” in the realm of economic life - all these are instances of what we shall refer to by the term Innovation. It should be noticed at once that the concept is not synonymous with “invention”. . . It is entirely immaterial whether an innovation implies scientific novelty or not.”

Schumpeter 1947

# Decreasing deaths and death rates

Figure 1 Global death and death rates due to extreme events, 1900–2006

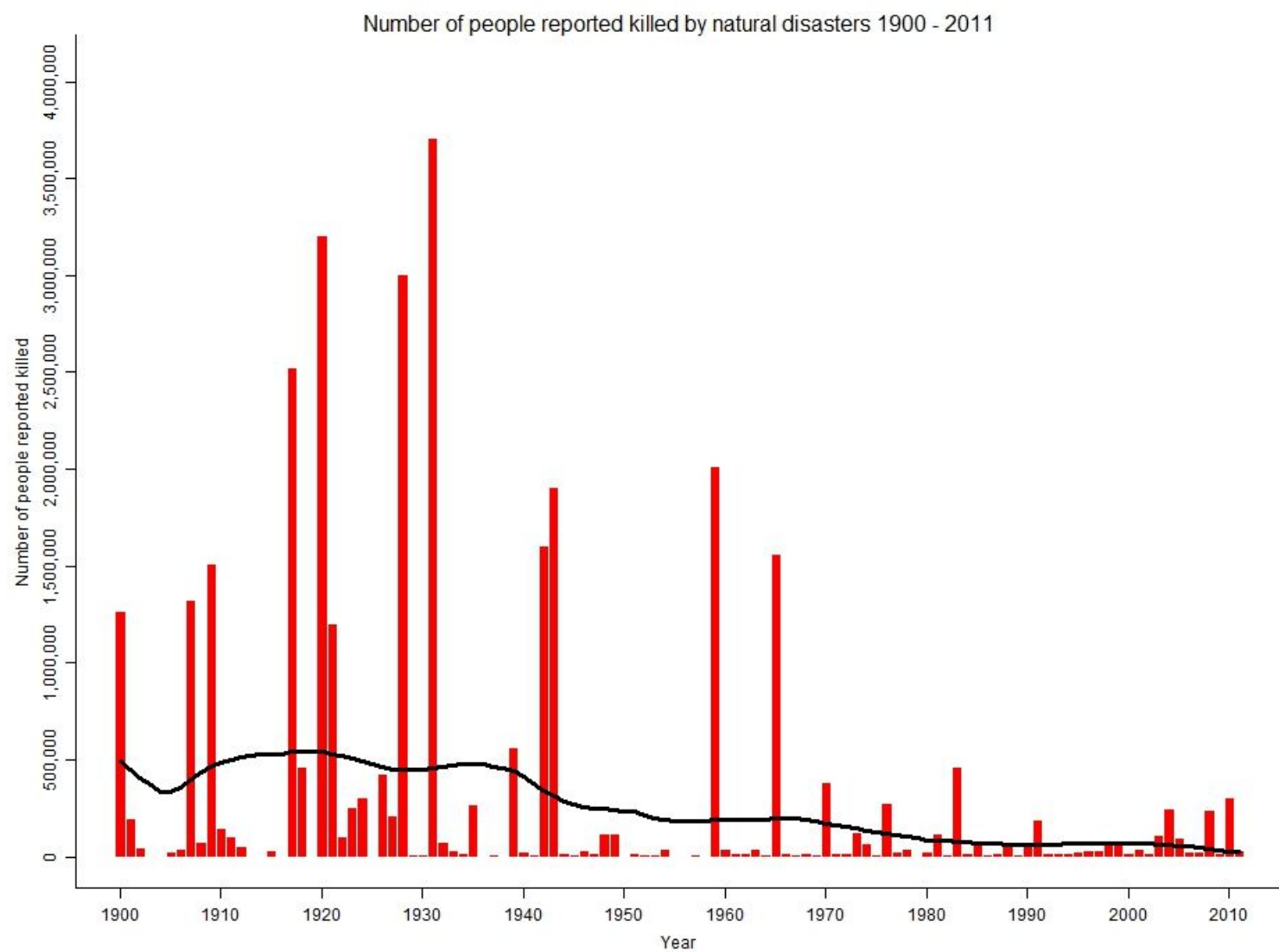


Note that in figures 1 through 4, data for the last period are averaged over seven years worth of data.

Sources; EM-DAT (2007); McEvedy and Jones (1978); WRI (2005, 2007)

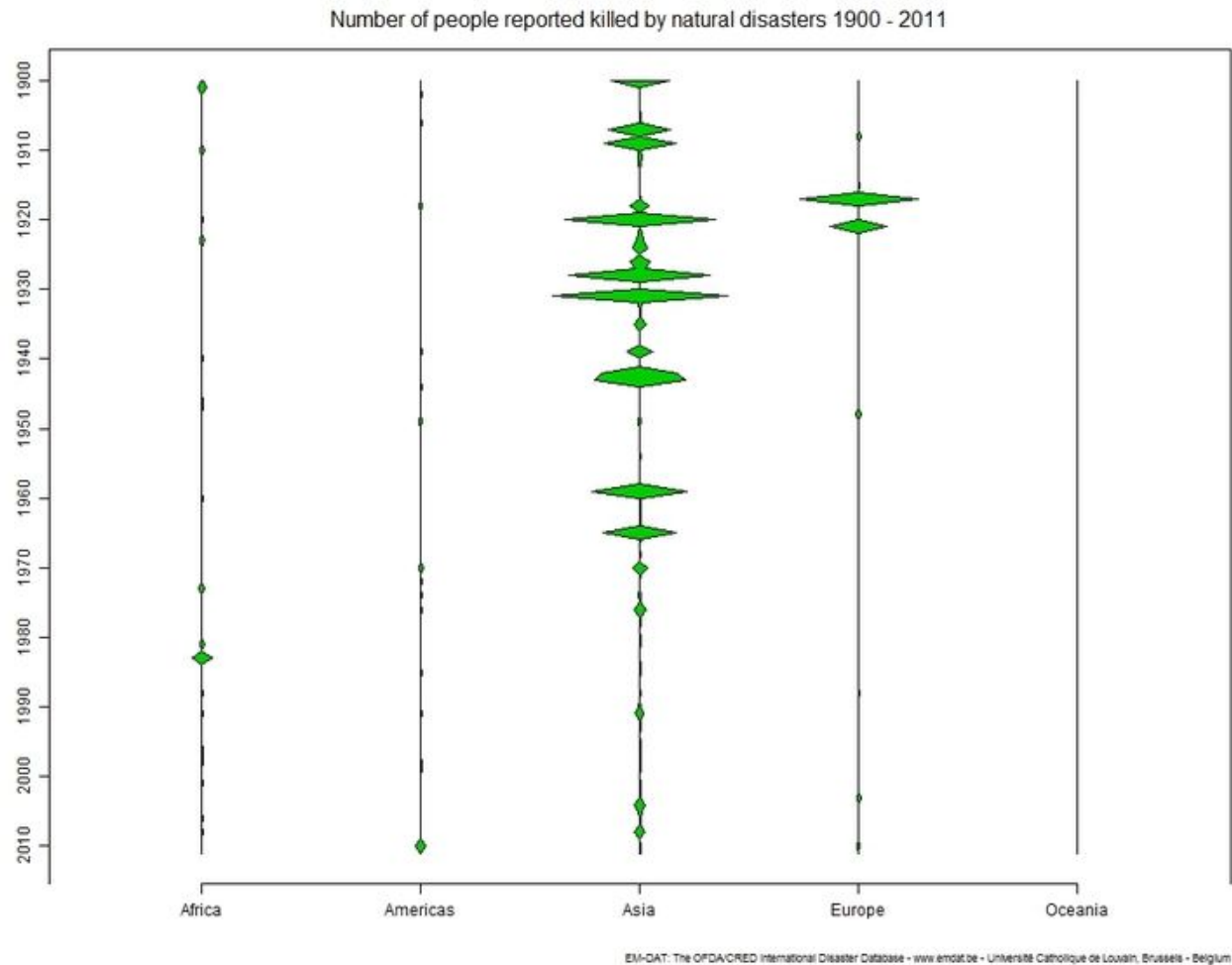
Source: Goklany 2008

# Data from CRED in Belgium

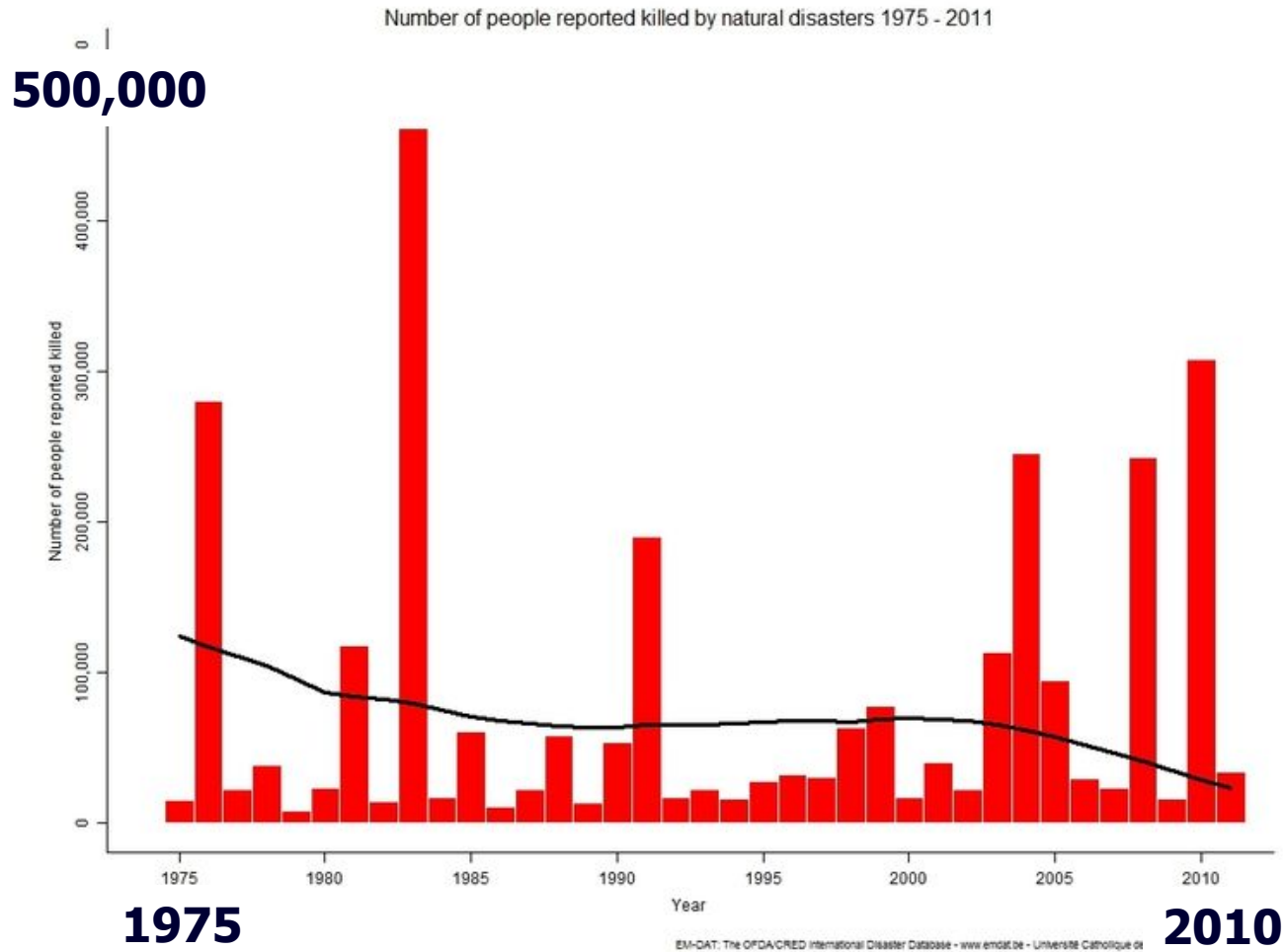


EM-DAT: The OFDA/CRED International Disaster Database - [www.emdat.be](http://www.emdat.be) - Université Catholique de Louvain, Brussels - Belgium

# End of era of mega-disasters?

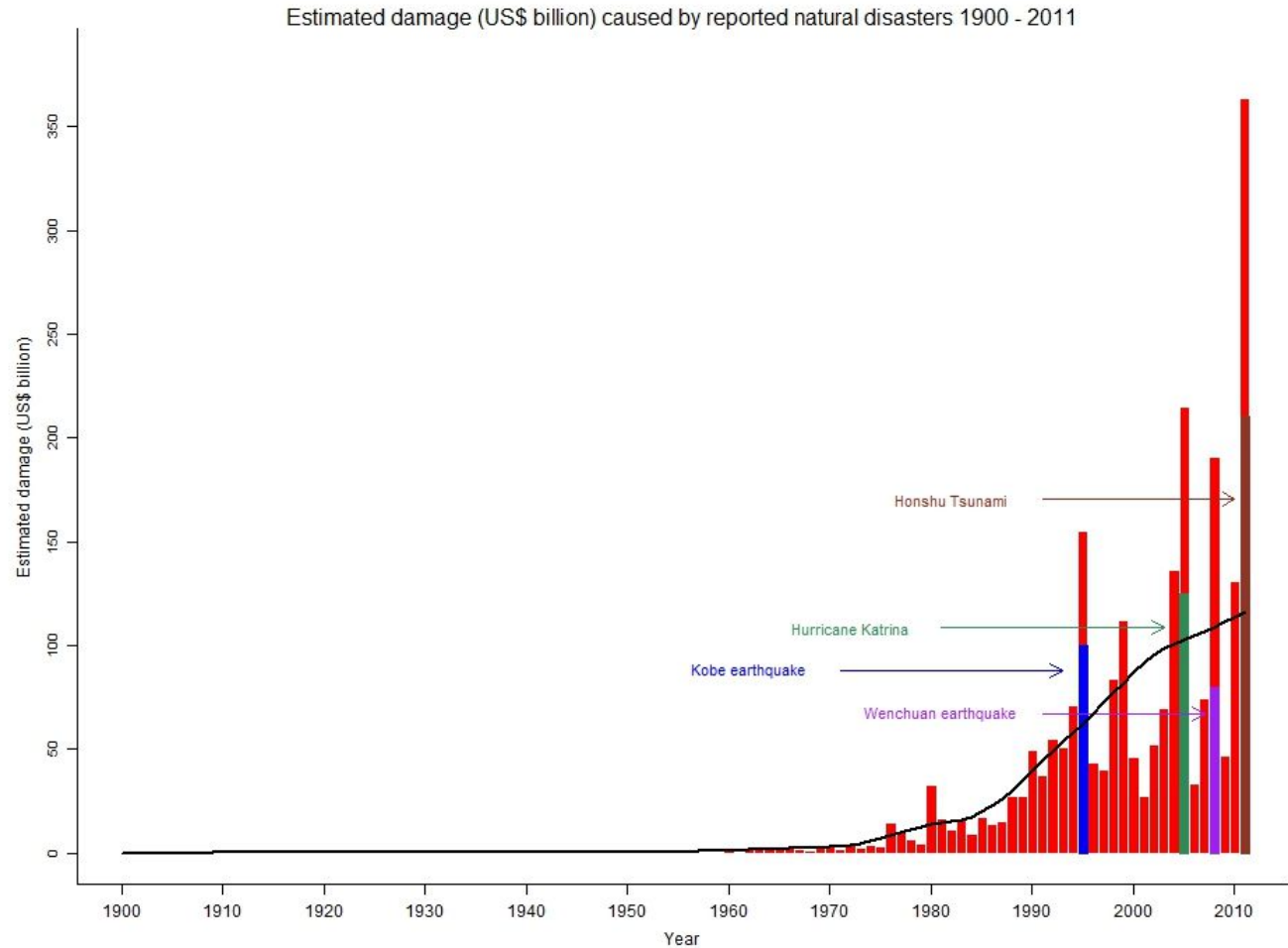


# A big problem/opportunity remains



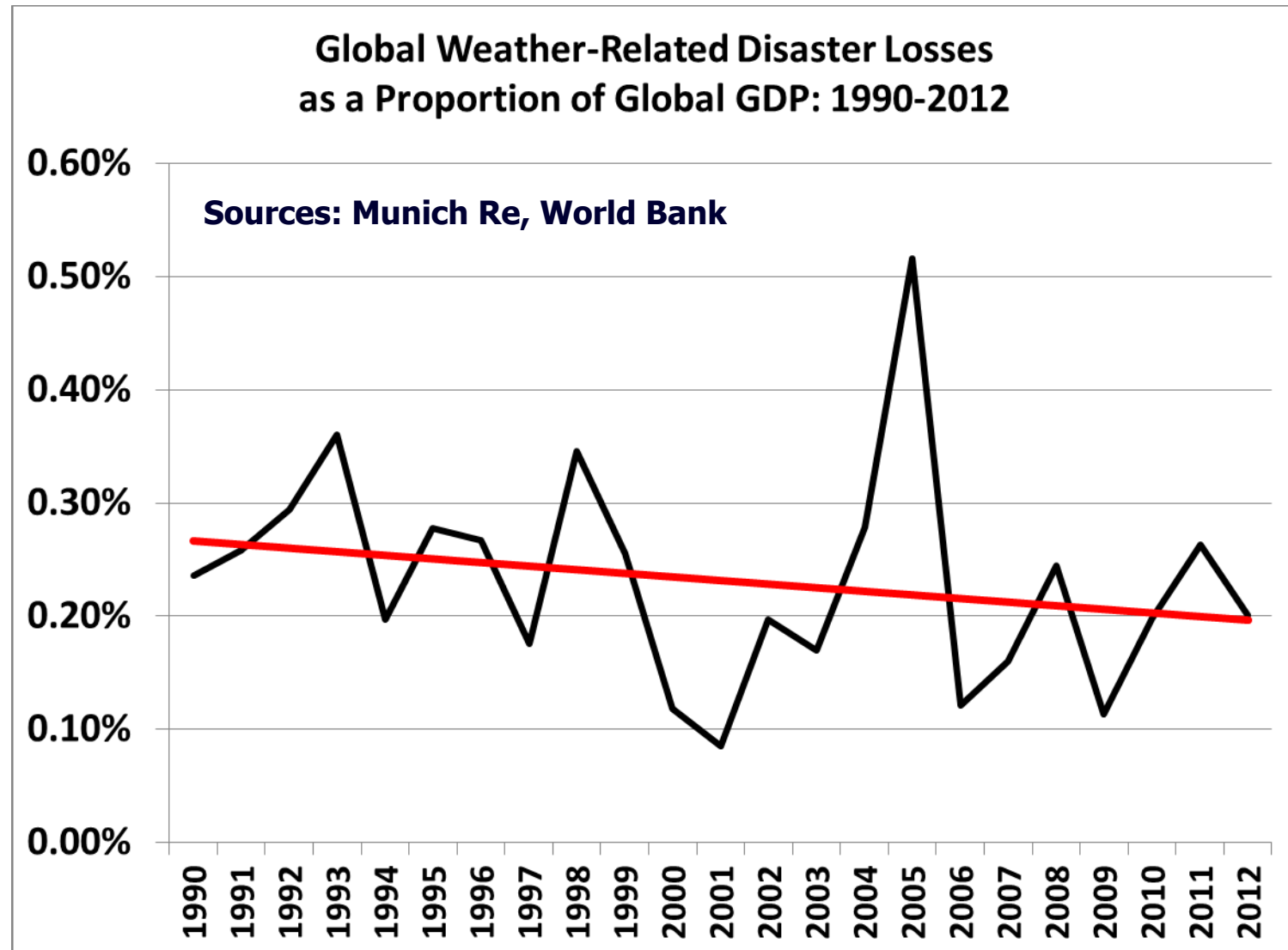


# Increasing disaster losses \$\$\$



EM-DAT: The OFDA/CRED International Disaster Database - [www.emdat.be](http://www.emdat.be) - Université Catholique de Louvain, Brussels - Belgium

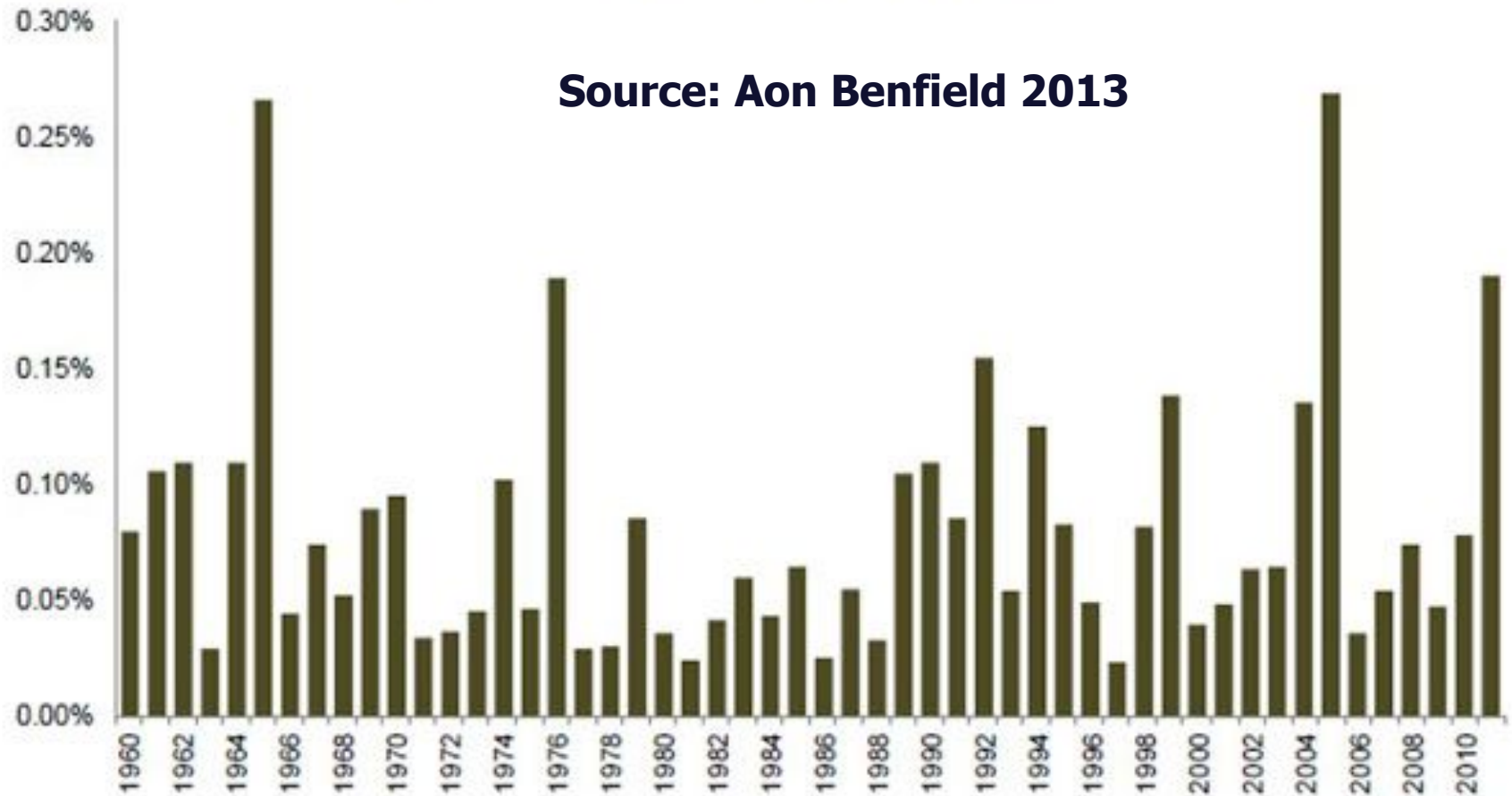
# Total Losses as % of global GDP



# Insured losses as % of Global GDP

Exhibit 15: Global Insured Catastrophe Loss as a Percentage of GDP

Source: Aon Benfield 2013



# US tornado deaths

## US Tornado Deaths/Million People

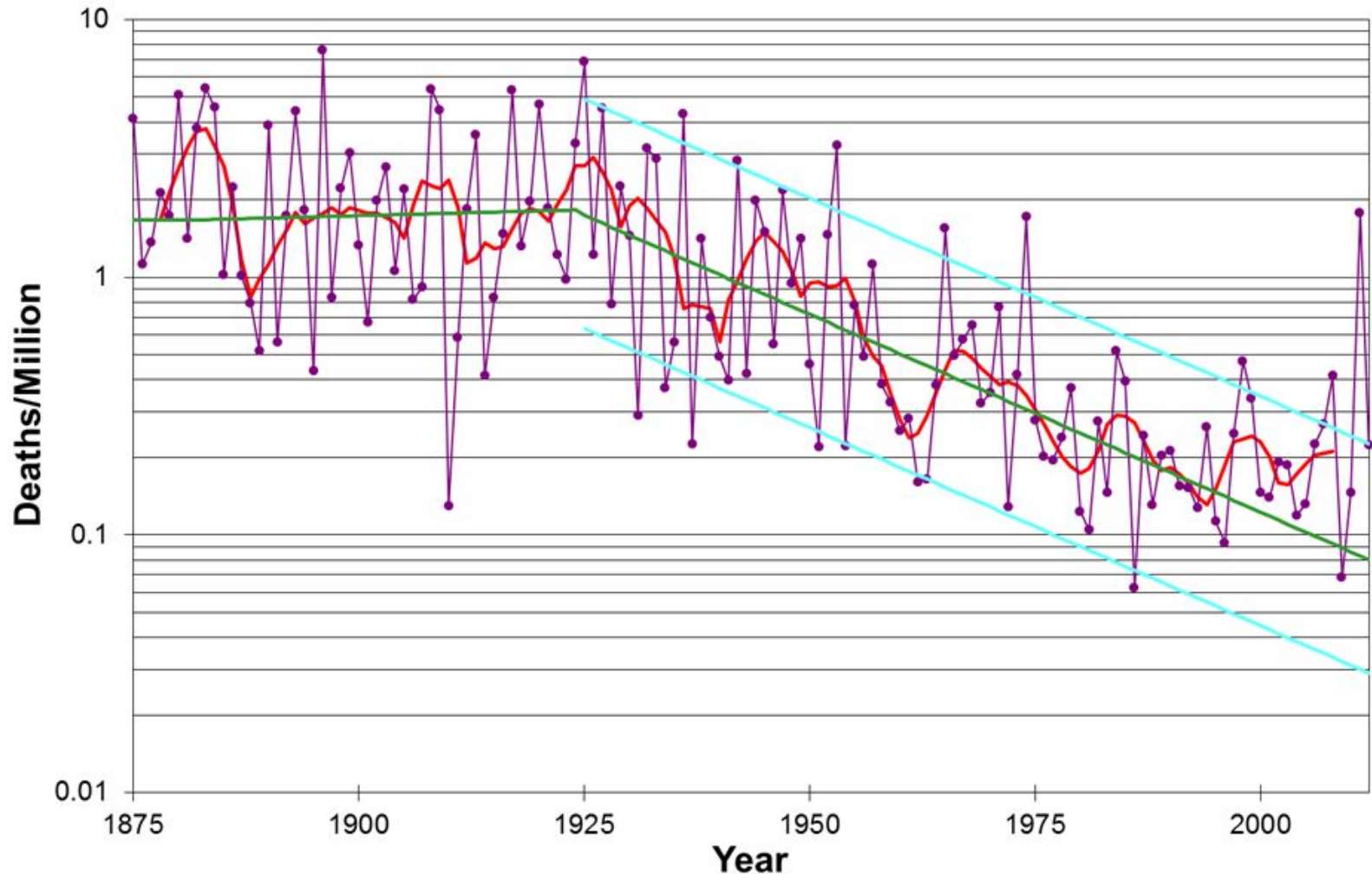


Figure courtesy Harold Brooks, NOAA

# Super typhoon Haiyan – Storm Surge

“City [Tacloban] and national officials had days of warning and rushed to prepare. By week's end, the officials believed they had the situation in hand.

But many of their efforts, it turned out, were woefully inadequate. Some officials miscalculated the biggest threat that Typhoon Haiyan posed to the city and its surroundings. They used a term for the storm that wasn't widely understood. They grossly underestimated the havoc the storm would wreak, stocking far too few supplies for a city to survive on in an emergency. And they failed, despite vigorous efforts, to move many of the most vulnerable people out of harm's way.”

Wall Street Journal, Nov 26, 2013



# Thailand floods 2011

## Effect of Thai floods on Japanese companies

		Status	Effects	
Automobiles	Honda	Factory submerged	No prospect of recovery	
	Toyota	Parts not supplied by flood-damaged manufacturer	Production suspended	Until Saturday. Considering air shipment of parts and other measures
	Nissan			Until Wednesday
	Isuzu			Until Friday
Electronics	Nikon	Digital camera factory submerged	No prospect of recovery	
	Sony			
	Canon	Printer-related factory submerged	Considering production at a different factory in Thailand and other areas	
	Nidec	Two electronic parts factories submerged and employees at four factories evacuated	Considering production in China and other countries	
	TDK	Electronic parts factory submerged	Considering production at a different factory in Thailand	
Food	Ajinomoto/Calpis	Jointly established beverage plant submerged		

## Thailand Flood Losses Reported by Insurers and Reinsurers

As of Feb. 3, 2012

\$Millions

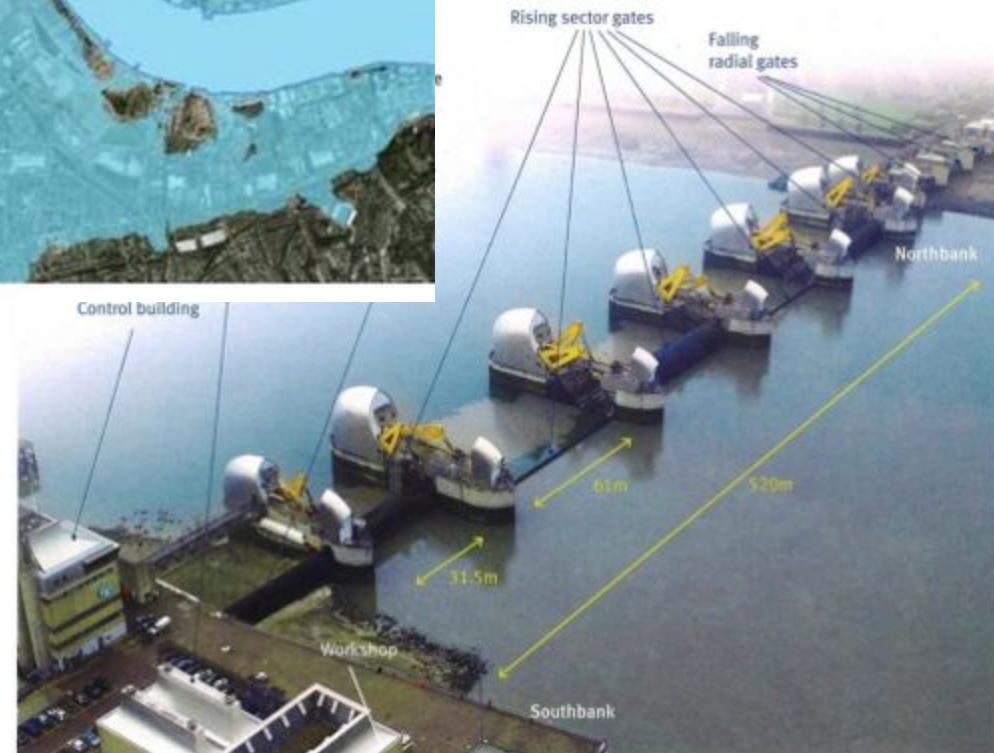
Insurer/Reinsurer	Low Estimate	High Estimate
NKSJ Holdings	\$1,300	
Munich Re	\$640 <sup>(1)</sup>	
Swiss Re	\$600	
Zurich Financial	\$250	\$300
XL Group	\$135	\$185
SCOR	\$180 <sup>(2)</sup>	
Everest Re	\$145	
PartnerRe	\$120	
Endurance	\$76.5	
Transatlantic	\$72	
Arch	\$35	\$65
Validus	\$54.1	
Aspen	\$54	
Allied World	\$40	\$50
Axis Capital	\$48	
RenaissanceRe	\$45	
Argo Group	\$25	\$35
Sirius International Group	\$34	
Alterra	\$30	
Platinum Underwriters	\$27.9	

Source: Moody's/Company announcements

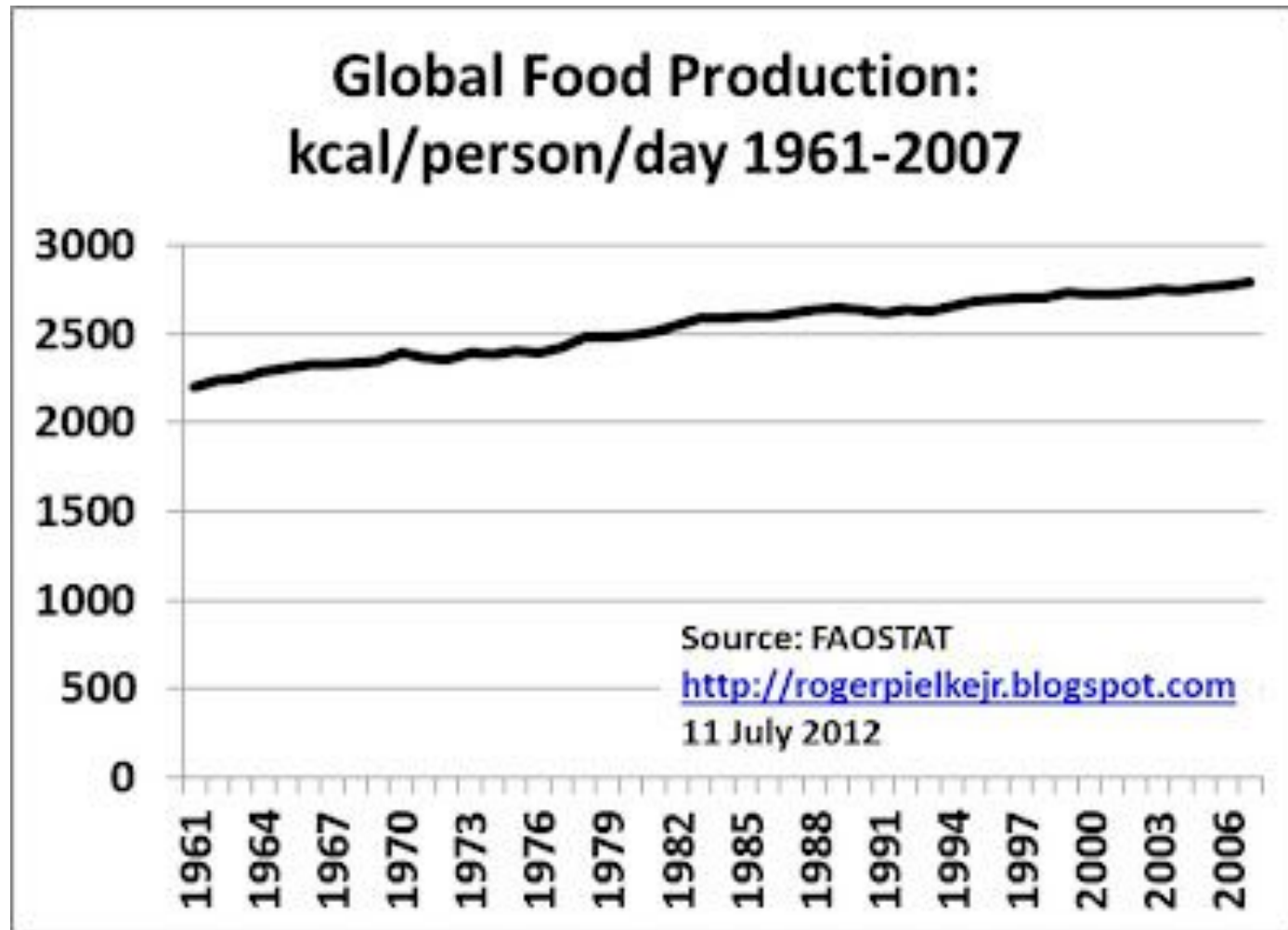
(1) Munich Re: €500 million

(2) SCOR: €140 million

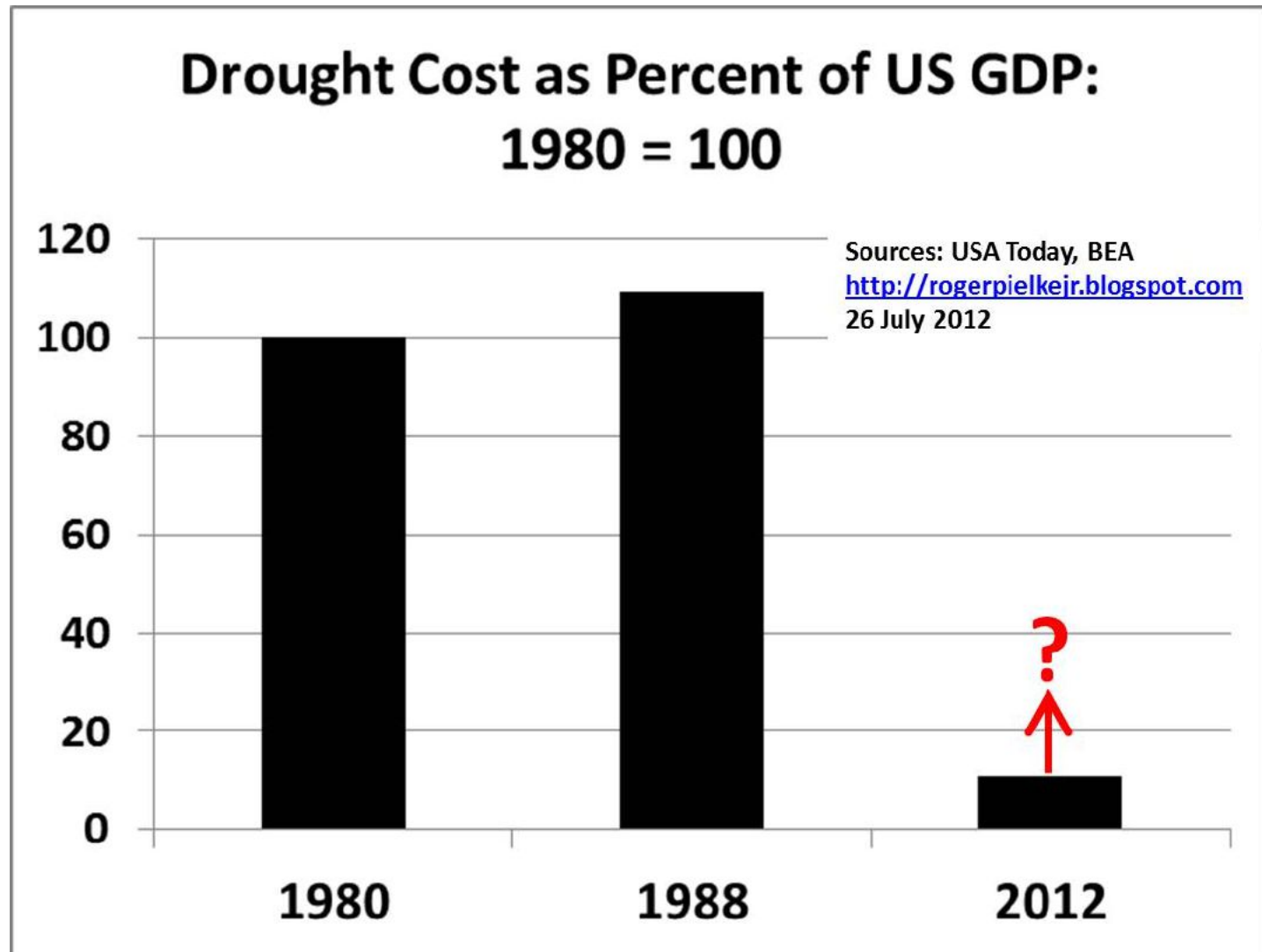
# Thames Barrier – a major non-flood



# Global food production

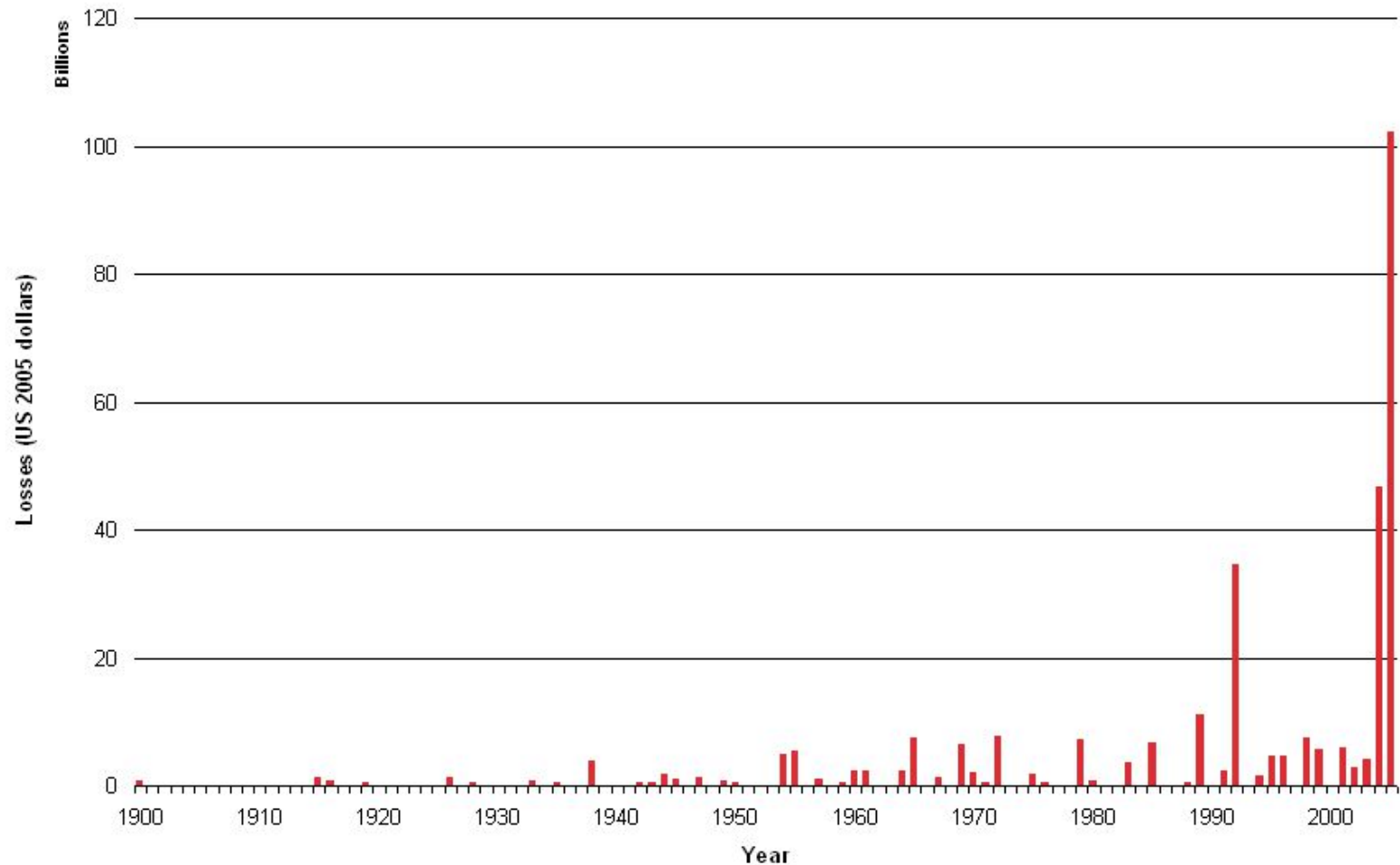


# Drought Impacts



# A baseline for evaluating success

Total Losses per Year from Atlantic Tropical Cyclones in 2005 Dollars





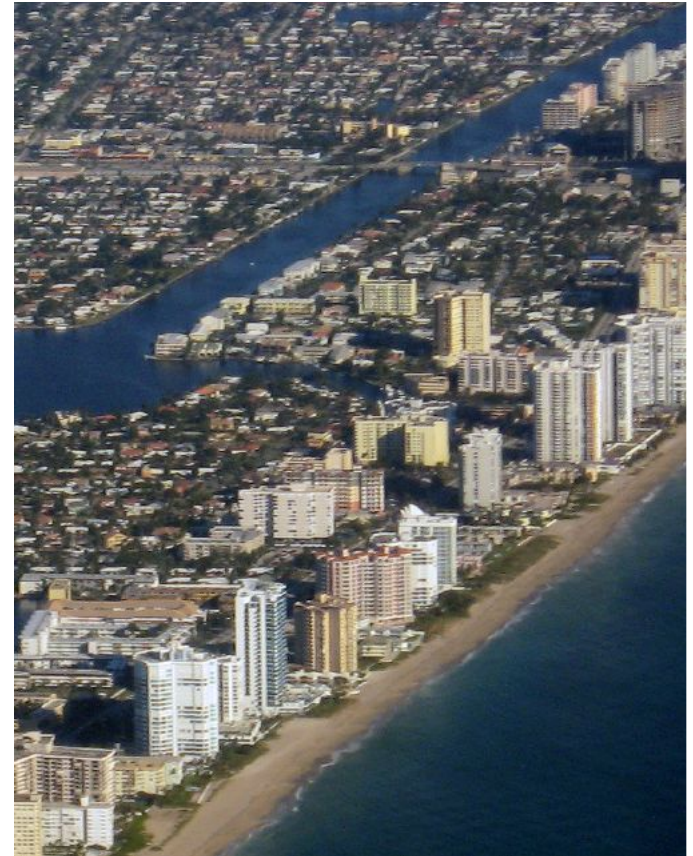
# Society changes in dramatic fashion

**Miami Beach 1926**



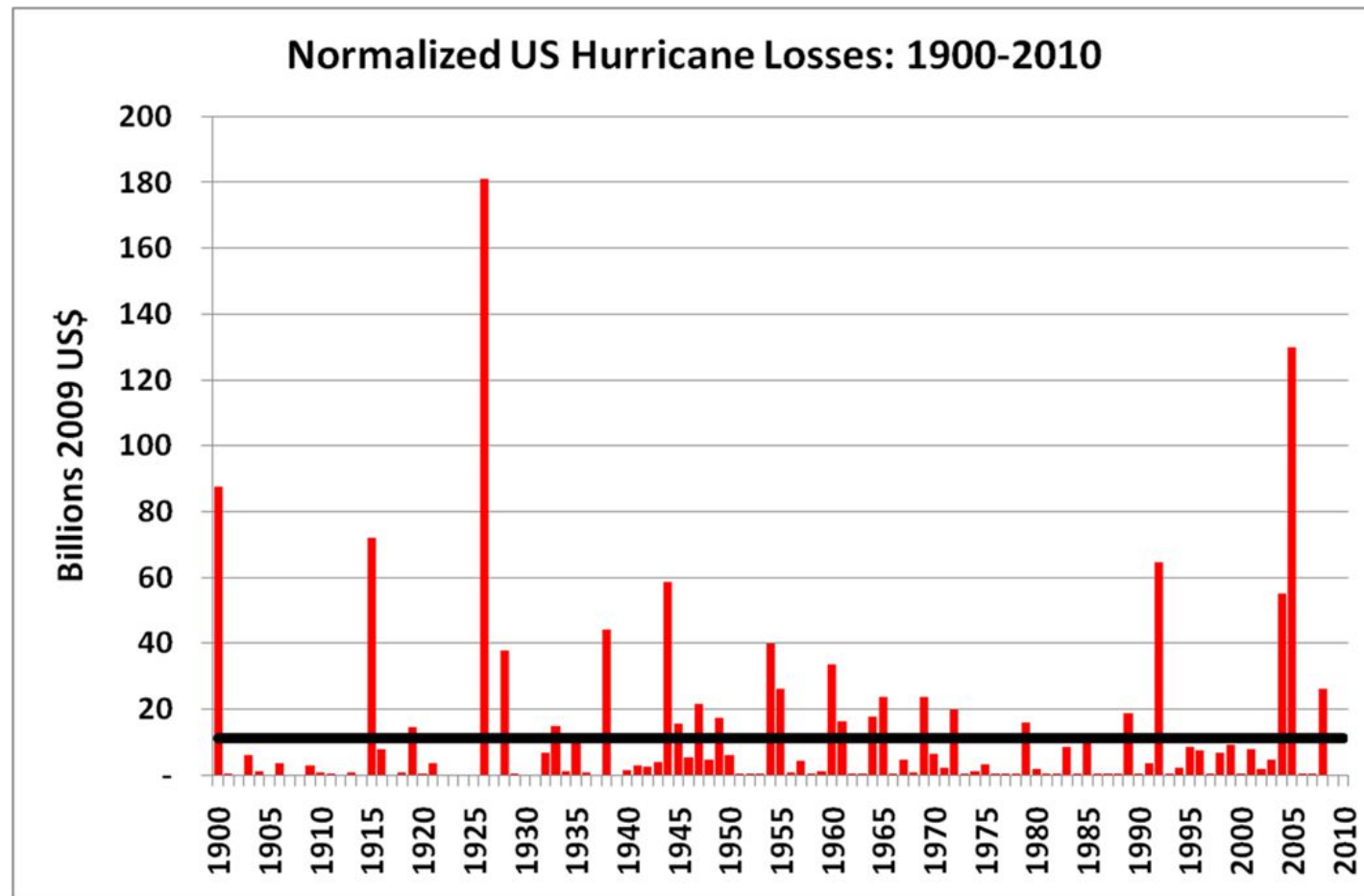
Wendler Collection

**Miami Beach 2006**

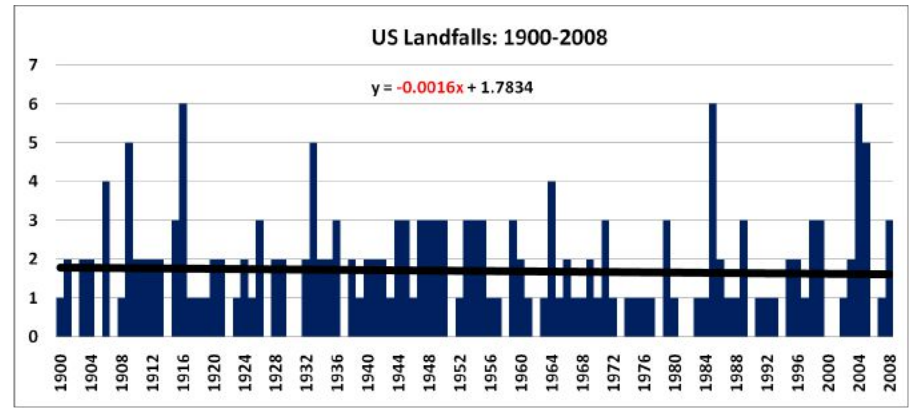
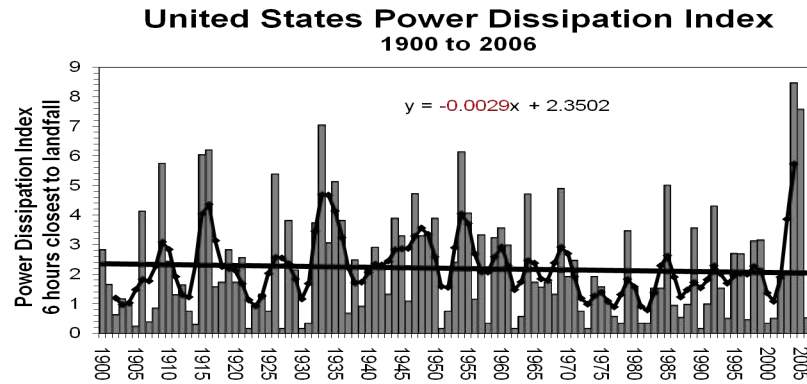


Joel Gratz © 2006

# US normalized hurricane losses



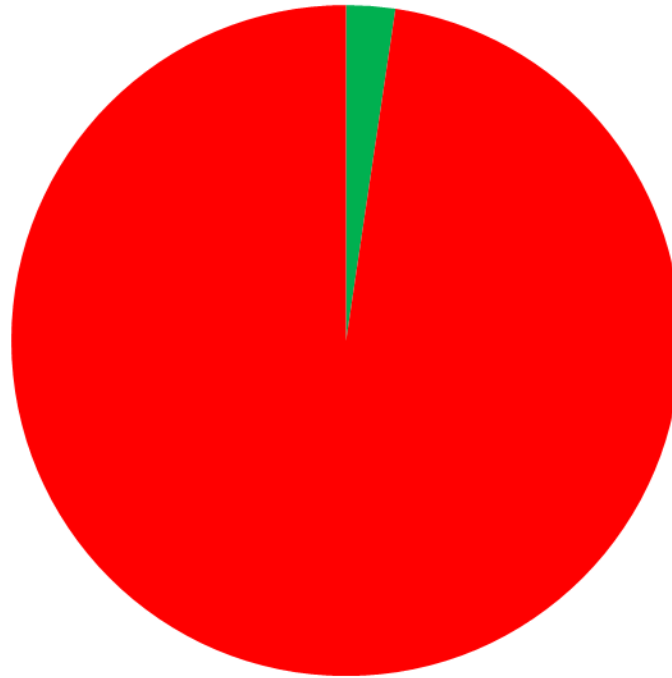
# Data on hurricane landfalls can be used to evaluate a normalization of losses



With no upwards trends in hurricane landfall frequency or intensity, there is simply no reason to expect to see an upwards trend in normalized losses

# Why is it difficult to see a climate signal in a loss record?

## Idealized Comparison of the Effects on Damages of Climate and Societal Changes Over 50 Years



- climate change (10% increase in intensity, raised to the 6th power)
- societal change (doubling of losses every 10 years)

# Peer reviewed studies – normalized losses

Hazard	Region	Period	Normalization	Normalized loss	Reference
Bushfire	Australia	1900-2009	Wealth, population	No trend	Crompton et al. 2011
Flood	Europe	1970-2006	Wealth, population	No trend	Barredo 2009
Windstorm	Europe	1970-2008	Wealth, Population	No trend	Barredo 2009
Flood	USA	1926-2000	Wealth, population	No trend	Downton et al. 2005
Hurricane	Latin America	1944-1999	Wealth, population	No trend	Pielke et al. 2003
Hurricane	USA	1900-2005	Wealth, population	No trend	Pielke et al. 2008
Hurricane	USA	1950-2005	GDP, population	No trend	Schmidt et al. 2009
Tornado	USA	1890-1999	Wealth	No trend	Brooks and Doswell 2001
Typhoon	China	1983-2006	GDP	No trend	Zhang et al. 2009
Typhoon	India	1977-1998	Income, population	No trend	Raghavan and Rajesh 2003
Weather	Australia	1967-2006	Wealth, population	No trend	Crompton and McAneney 2008
Weather	USA	1951-1997	Wealth, population	No trend	Choi and Fisher 2003
Weather	World	1950-2005	GDP, population	No trend	Miller et al. 2008

**Source: adapted from Bouwer, (2011)**

# Concluding thoughts

- Adaptation as “innovation” is contrary to conventional wisdom of climate policy
- Innovations take many forms, adaptation to climate can be a central focus but often is a secondary consideration to other actions
- A richer, more interconnected world sees changes in **vulnerabilities**, adaptation focuses on a moving target (changes in climate are part of that, but may not be most significant)
- Less loss of life is accompanied by greater financial losses
- Technological innovations can be important, but innovations in political and social systems can be more important
- Ability to innovate comparable to “**adaptive capacity**”
- We should not underestimate how much we know, and how successful we have been with respect to **outcomes**



# Outline

---

- **An opening case study**
- **Adaptation as conventional wisdom**
- **Adaptation as innovation**
- **Various examples**
- **Concluding thoughts**



# Thank you!

- [pielke@colorado.edu](mailto:pielke@colorado.edu)
- Papers etc. can be downloaded from:  
<http://sciencepolicy.colorado.edu>
- Weblog: <http://rogerpielkejr.blogspot.com/>

