Hurricanes: Human and Economic Impacts

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Hurricanes are beautiful

But they can make a mess...
Hurricane Impacts at Landfall

- High Seas
- Inland Flooding
- Beach Erosion
- Storm Surge
- Wind Damage
- Disruption of Communications, Utilities, Transportation, Schedules & Infrastructure

Disruption of Communications, Utilities, Transportation, Schedules & Infrastructure
20th Century Hurricane Experience
Risk of death in a hurricane decreased by a factor of 100 from 236 per million per decade to 2.4.
Storm Surge

Evacuation keeps People from drowning in situations like this.
Drowning in freshwater flooding

Caused by torrential hurricane rainfall has accounted for 60% of hurricane-related deaths since 1970.
What is the probability of a large (~1000 souls) loss of life in a 21st century hurricane?
The 16 deadliest hurricanes of the 20th Century

Hebert, P. J., J. J. Jarrell, and Max Mayfield, 1993:
The deadliest, costliest, and most intense hurricanes of this century.
NOAA Technical Memorandum
NWS NHC-31
Hurricane Mortality

We would lose an average of 218 people a year if we were forecasting with the same skill that we had in 1950.

Population increase 1950-2000 = 314%
Average mortality 1930-1969 = 69.7
Extrapolated mortality = 69.6 x 3.14 = 219
Value of a Human Life

Based upon premium paid to workers in hazardous occupations divided by number of deaths

Biased toward blue collar workers, male, young

$1.6-8.4M in 1986

Or $2.4-12.7M currently assuming 150% inflation

A conservative value is $5M
Value of Prevented Mortality

$5M \times (218-25) = $965M saved in impacts of mortality
Property Damage
Everybody wants a view like this.
APPEND PART 2 HERE
APPEND PART 1 HERE
Damage From the 1938 New England Hurricane Normalized to 1995

- **Wealth increase**: $16,632M (2.22X)
- **Inflation**: $7,479M (11.75X)
- **Population increase**: $636M (2.08X)
- **Damage in 1938**: $306M
The 14 most expensive hurricanes: Historical damage normalized for inflation, population and wealth to 1998.

Updated from:
U. S. Landfalls 1925-1995

Total = 244 storms

Total Damage ($ Billions)

Source: Pielke, R. A. and C. W. Landsea, 1998:
Normalized hurricane damages in the United States: 1925-95
Weather and Forecasting, 13, 621-631
Normalized Hurricane Damage 1900-1999

Normalized Damage ($B)

Year

Hurricane insurance stirring a fight

BY MICHELE CHANDLER AND JACQUELINE CHARLES
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Politicians in Tallahassee have big changes in mind for the state's hurricane coverage.

One South Florida-friendly bill would allow homeowners to challenge rate increases in court. Another would kick some of those homeowners out of the windstorm pool altogether, to save other Floridians money.

It all comes down to who wins the state hurricane legislative duel.

Lawmakers have submitted more than a dozen proposals on the subject this year, driven in part by spiraling windstorm rates scheduled to rise another 40 percent in July.

The 27-member Miami-Dade delegation has unanimously declared windstorm insurance reform its top priority this session, though its favored bill — which would give the public more ways to challenge rate increases — seems to be idling in the Legislature. Meanwhile, lawmakers outside South Florida are balking at helping to pay for coverage for...
Cost of Property Damage

$5B a year

Extremely variable

Expect $100B hit once a century

No discernable trend after correction for economic factors

Does concentration of wealth along the coast mask real progress in damage mitigation?
The Overwarning Problem

Cost is $0.5-1.0M per mile
Or $150-400M per landfall
Evacuation
Cost of Warnings

400 miles of coastline warned for each landfall

3 landfalls a year

Cost of preparations average $750K/mile

Annual cost is $800M

This figure is pure guesswork; numbers as low as $400M and as high as 1200M are plausible.
Cost of the Forecasting Enterprise

Inventory of:
• National Hurricane Center
• NOAA Research Labs
• University research
• Research and Reconnaissance Aircraft
• Local forecast offices
• Local emergency management
• Computer Forecasting Operations
• Pro-rata share of satellites
• Federal Emergency Management Administration

Total ~ $90M
The Big Picture

Hurricane Balance Sheet

- Forecasting planning & research
- Warning costs
- Mortality
- Damage to property
- Total

Controllable Parts
- Planning
- Evacuation
- Mortality

Losses ($M)
Nightmare scenarios are still possible--perhaps inevitable…

Longport, NJ

AP Photo
Thank you for your attention. Questions?
FINIS