The Age of Extreme Weather

Casualty Actuarial Society Spring Meeting
May 21, 2019
New Orleans, Louisiana

James Lynch, FCAS MAAA, Chief Actuary
Insurance Information Institute • 110 William Street • New York, NY 10038
Tel: 212.346.5533 • jamesl@iii.org • www.iii.org
I.I.I. Mission Statement

Improving public understanding of insurance...

...what it does and how it works.
Catastrophes

Extreme Weather Threatens Union
A Small Town in Missouri
1982 Union, Missouri, Flood
A Storm for the Ages

Bourbeuse River
Record Crest
33.8 feet
12/5/1982

Source: Fox2News.com, @BoxxRadio.
2015 Union, Missouri, Flood
A Storm for the Ages

Sources: CBSnews.com; fox2news.com
2017 Union, Missouri, Flood

“Unfortunately, it’s a river and Mother Nature. And we can’t control her.”

Bourbeuse River Crest
29.4 feet
May 2-3, 2017

<table>
<thead>
<tr>
<th>Year</th>
<th>Crest (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.40</td>
</tr>
<tr>
<td>2</td>
<td>0.40</td>
</tr>
<tr>
<td>3</td>
<td>0.40</td>
</tr>
<tr>
<td>4</td>
<td>0.50</td>
</tr>
<tr>
<td>5</td>
<td>0.55</td>
</tr>
<tr>
<td>6</td>
<td>0.64</td>
</tr>
<tr>
<td>7</td>
<td>0.68</td>
</tr>
<tr>
<td>8</td>
<td>0.78</td>
</tr>
<tr>
<td>9</td>
<td>0.80</td>
</tr>
<tr>
<td>10</td>
<td>1.14</td>
</tr>
</tbody>
</table>

## Extreme Events: A Troubling Trend

<table>
<thead>
<tr>
<th>Rank</th>
<th>Date</th>
<th>Event</th>
<th>Cause</th>
<th>Insured Loss (1) ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug. 2005</td>
<td>Hurricane Katrina</td>
<td>Hurricane</td>
<td>$41,100</td>
</tr>
<tr>
<td>2</td>
<td>Sep. 2017</td>
<td><strong>Hurricane Maria (2)</strong></td>
<td>Hurricane</td>
<td><strong>25,000-30,000</strong></td>
</tr>
<tr>
<td>3</td>
<td>Sep. 2017</td>
<td><strong>Hurricane Irma (2)</strong></td>
<td>Hurricane</td>
<td><strong>20,000-25,000</strong></td>
</tr>
<tr>
<td>4</td>
<td>Sep. 2001</td>
<td>September 11 Events</td>
<td>Terrorism</td>
<td>18,779</td>
</tr>
<tr>
<td>5</td>
<td>Oct. 2012</td>
<td>Hurricane Sandy</td>
<td>Hurricane</td>
<td>18,750</td>
</tr>
<tr>
<td>6</td>
<td><strong>Aug. 2017</strong></td>
<td><strong>Hurricane Harvey (2)</strong></td>
<td>Hurricane</td>
<td><strong>16,000-19,000</strong></td>
</tr>
<tr>
<td>7</td>
<td>Aug. 1992</td>
<td>Hurricane Andrew</td>
<td>Hurricane</td>
<td>15,500</td>
</tr>
<tr>
<td>8</td>
<td>Jan. 1994</td>
<td>Northridge, CA earthquake</td>
<td>Earthquake</td>
<td>12,500</td>
</tr>
<tr>
<td>9</td>
<td>Sep. 2008</td>
<td>Hurricane Ike</td>
<td>Hurricane</td>
<td>12,500</td>
</tr>
<tr>
<td>10</td>
<td>Oct. 2005</td>
<td>Hurricane Wilma</td>
<td>Hurricane</td>
<td>10,300</td>
</tr>
</tbody>
</table>

(1) Dollars when occurred.
(2) Insurance Information Institute estimate based on data from catastrophe risk modelers, the Property Claims Services unit of Verisk Analytics, et al.

Source: Insurance Information Institute, catastrophe risk modelers, The Property Claim Services® (PCS®) unit of ISO®, a Verisk Analytics® company, et al.
U.S. Inflation-Adjusted Insured Cat Losses

2018 – Third worst year for U.S. Insured Catastrophe Losses. Average Insured Loss per Year for 1980-2018 is $19.3 B.

*2018: Inflation-adjusted estimate, subject to change. 2010s is average of 2010 to 2018. All losses are Direct. Sources: Property Claims Service, a Verisk Analytics business; Insurance Information Institute.
How Insurance Drives Economic Growth

**Safety/Security**
1. Insurers are financial first responders
2. Insurers are risk mitigators

**Economic/Financial Stability**
3. Insurers are capital protectors
4. Insurance is a partner in social policy
5. Insurance sustains the supply chain
6. Insurers are capital infusers

**Development**
7. Insurers are community builders
8. Insurance enables infrastructure improvements
9. Insurers are innovation catalysts
10. Insurers are credit facilitators
Insurance Leading Throughout History

1648

1784

1870

1969

???

Cyber-Physical Systems
Underwriting Solutions
## (Re)insurance Products

<table>
<thead>
<tr>
<th>Private Industry</th>
<th>Case Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEMA Reinsurance</strong></td>
<td>Through a $150 million purchase of private reinsurance products, FEMA was able to recover approximately $1 billion, or an eighth of its total 2017 loses.</td>
</tr>
<tr>
<td><strong>NFIP NatCat Bonds</strong></td>
<td>By issuing new natural catastrophe bonds geared towards institutional investors, the NFIP can bring an estimated $500 million of additional reinsurance coverage.</td>
</tr>
<tr>
<td><strong>Private Market Flood Products</strong></td>
<td>During 2017, the private flood insurance market added 50 new carriers. Direct private flood insurance premiums written reached $630 million, an increase of $217 million over 2016.</td>
</tr>
</tbody>
</table>

Case Study: Offshore Wind Power
Growth of Wind Power Capacity in the U.S.

By 2050 total wind power capacity across 48 states will be 404.25 gigawatts, an increase of 180.15 gigawatts from 2030.

Source: Energy.gov
Cost of Alternative Energies is Falling

LOCO: Levelized cost of energy – cost of producing MWh of electricity, accounting for cost of development, construction and equipment, financing, feedstock, operation and maintenance

Source: BloombergNEF.
Offshore wind farms pros and cons

**Pros**
- Offshore wind speeds are faster and steadier than on land
- Meet energy needs of high-density coastal areas
- Renewable energy with no pollution
- Domestic energy source
- Jobs

**Cons**
- Expensive and difficult to build and maintain
- Effects on marine animals and birds are not fully understood
- May be unpopular with residents

Source: American Geosciences Institute
### Key risks faced by wind farms

<table>
<thead>
<tr>
<th>Risk</th>
<th>Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo in transit</td>
<td>Marine</td>
</tr>
<tr>
<td>Construction problems</td>
<td>Construction delay cover</td>
</tr>
<tr>
<td>Mechanical, cable issues</td>
<td>Property damage cover</td>
</tr>
<tr>
<td>Lightning strike</td>
<td>Business interruption</td>
</tr>
<tr>
<td>Terrorism</td>
<td>Political risk</td>
</tr>
<tr>
<td>‘Wind drought’</td>
<td>Weather hedge</td>
</tr>
</tbody>
</table>

Education Solutions
I.I.I. Resilience Project

Data transformed to show the power of resilience.
Education & Analysis

Actuaries Climate Index – Measuring Weather Extremes

**Seasonal Five-Year** Moving Average, United States

- **1961-1990:** Index Average is 0.00

Index Measures Frequency of Extreme Events (Heat, Cold, Drought, Wind, Rain, Sea Level) Vs. 1961-1990 Average

Source: Actuaries Climate Index, http://actuariesclimateindex.org/home/
Summary

- Extreme Weather is a Growing Problem Worldwide
- Insurance Traditionally Manages Emerging Risks
- Insurers Are Taking an Educational Role
Thank you for your time and your attention!