Flood Risk Communication: Help from a Math Nerd

Warren Campbell, PhD, PE, CFM
Western Kentucky University
Road Map
Risk Communication

What?
How?
When?
Whom?
Public Attention Span
Hurricane Katrina – Google Trends
Thoughts

Location on the hydro-illogic cycle is important.

What is feasible?

Who is receptive?

How much can you accomplish?

The only 100% effective form of outreach is a major flood.
Elected Officials
Sometimes they get a bad rap.

Reflect will of constituents or major donors.

Priority # 1 – Reelection

Make them look good.

Best champions cannot help if not reelected.
Risk = Cost x Probability

Risk = Cost x Probability + Outrage
Hazard – Outrage Space
According to Sandman www.psandman.com
Magic Number = 0.2
Correlation between risk and outrage

Rank order the hazard

Rank order what people worry about

Correlation = 0.2

$r^2 = 0.04 = 4\%$
<table>
<thead>
<tr>
<th>No.</th>
<th>Safe</th>
<th>Risky</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Voluntary</td>
<td>Coerced</td>
</tr>
<tr>
<td>2</td>
<td>Natural</td>
<td>Industrial</td>
</tr>
<tr>
<td>3</td>
<td>Familiar</td>
<td>Exotic</td>
</tr>
<tr>
<td>4</td>
<td>Not memorable</td>
<td>Memorable</td>
</tr>
<tr>
<td>5</td>
<td>Not dreaded</td>
<td>Dreaded</td>
</tr>
<tr>
<td>6</td>
<td>Chronic</td>
<td>Catastrophic</td>
</tr>
<tr>
<td>7</td>
<td>Knowable</td>
<td>Unknowable</td>
</tr>
<tr>
<td>8</td>
<td>Individually controlled</td>
<td>Controlled by others</td>
</tr>
<tr>
<td>9</td>
<td>Fair</td>
<td>Unfair</td>
</tr>
<tr>
<td>10</td>
<td>Morally irrelevant</td>
<td>Morally relevant</td>
</tr>
<tr>
<td>11</td>
<td>Trustworthy sources</td>
<td>Untrustworthy sources</td>
</tr>
<tr>
<td>12</td>
<td>Responsive process</td>
<td>Unresponsive process</td>
</tr>
</tbody>
</table>
Outrage Benefits

What possible benefit does outrage have?

- Political will
- Media access
- Attention of elected officials
- Escape from the Chicken Little reputation
How to drive FEMA crazy in one easy lesson.

“We had a 100-yr flood last year so we don’t have to worry about another one for another 100 years.”
1. What is the average time between 100-yr floods?
2. What is the median time between 100-yr floods?
3. What is the most likely interval between 100-yr floods?
Most likely interval between 100-year floods?

Probability in 1 year = $1/100 = 0.01$
Probability in 2 years = $0.99 \times 0.01 = 0.0099$
Probability in 3 years = $0.99^2 \times 0.01 = 0.009801$

... 
Probability in n years = $0.99^{n-1} \times 0.01$
Results of rolling a die 10,000 times.
Just in case you don’t have time, I did it for you.
It was a dark and stormy night ...

For gamers, RPG doesn’t mean Rocket Propelled Grenade..

Hurricane Game
Florida Keys – One way in, one way out.
Prepare for, respond to, and recover from a hurricane.
A major hurricane hits the Keys.
Submerged except for a few acres in Key West.

Try your hand at calling for a mandatory evacuation.
How is this different from a hurricane exercise?

1. A hurricane isn’t guaranteed to strike.
2. HURDAT data allows for an effectively infinite number of hits.
3. You must prepare in years with no tropical storms.
Realistic Probabilities
A stream goes out of bank once every 2 years. 
\( \Delta Q = Q_T - Q_2 \) is related to the damage incurred. 
Damage inflicted = \( \Delta Q \).
• The most likely interval between 100-yr floods is 1 year.
• We are precaution advocates.
• Risk and perception of risk are almost uncorrelated.
• Games can help people understand risk.
Questions?
More Information?
Warren Campbell
warren.campbell@wku.edu
1906 College Heights Blvd.
Bowling Green, KY 42101