

# Why actuaries should care about climate change, even if they don't reduce, reuse, or recycle

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## Outline

1. Actuarial Science and Traditional Science
2. Current climate change and insurance case study  
“To understand now it helps to look back”
3. Climate Change and Actuarial Implications
4. Modeling under uncertainty – Mortgage collapse
5. Look to the ASOP’s
6. Current products
7. Summary

## 1. Actuarial Science and Traditional Science

### ASOP’s

- 12 Risk Classification
- 13 Trending
- 23 Data
- 43 UCE Models
- 41 Communications
- identify methods, procedures, assumptions, data
- another actuary qualified in same practice area could make objective appraisal of reasonableness of work product

### Scientific Method

- objective, minimize bias
- hypotheses to explain phenomena
- experiments test predictions
- steps must be repeatable
  - guard against individual mistakes
- Full Disclosure
  - document and archive
  - share all data and methods
  - careful scrutiny by other scientists
  - reproducibility
  - statistical measures of data reliability

## 2. Case Study: Environmental Liability

- **April 25, 2012:** Virginia Supreme Court upholds circuit court's ruling insurance company does not owe defense or liability coverage under CGL pollution policy Kivalina vs ExxonMobil Corp et al
  - Steadfast Ins Co (indirect subsidiary of Zurich Financial Services)
  - Coverage under 5 policies issued 2003-2008
  - AES Corp (an energy company)
- Civil complaint vs AES Corp does not allege an "occurrence" as defined in insurance contracts between AES and Steadfast

How did this happen?

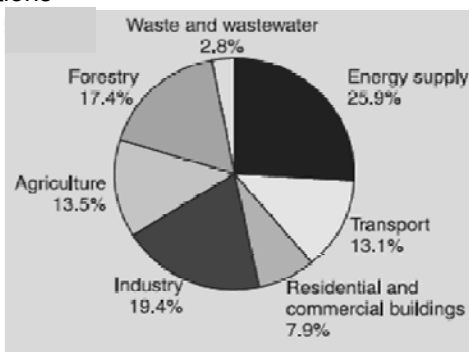
[www.legalnewsline.com](http://www.legalnewsline.com)

## 2. Case Study: Underlying Case Summary

- Kivalina v ExxonMobil et al. : Common law nuisance claim filed Feb 2008
- Alaskan village depends on protection from sea ice
  - Ice forming later and melting sooner due to higher temperatures
  - Fall and winter waves have pummeled village
  - Damage estimates placed between \$95 million to \$400 million
  - Courts dismiss in 2009 ruling GHG regulation political not legal issue
  - Status: In appeal to reinstate case

## 2. Case Study: Kivalina Issues

- For plaintiff victory
  - prove specific activities caused event
  - link event to specific bodily injury or economic loss
- Negligence and Nuisance considerations
  - Defendant standard of behavior
  - Unreasonable and tortious?
  - Disproportionate CO2 emitters? \*



### How does this matter to us?

- Compensable under CGL pollution insurance policy/exclusions?
- Early asbestos litigation: precedent to trump exclusive remedy WC coverage  
→ open to civil lawsuits → Supreme Court upholds 1981

\* Source: IPCC

## 2. Case Study: Environmental Liability: Precursors

- “Silent Spring” published 1962, ignites environmental movement
- EPA formed (1970) – Environmental Protection Agency
- CAA – Clean Air Act (1970)
  - U.S. Supreme Court ruled GHG’s air pollutants under CAA April 2007
- CWA – Clean Water Act (1972)
- ESA – Endangered Species Act (1973)



Richard M. Nixon, served 1969-1974, at swearing in of first EPA Administrator, Bill Ruckelshaus  
Source: EPA

## 2. Case Study: Environmental Liability

### The Acts that create an Insurance Market

- RCRA [Resource Conservation and Recovery Act (1976)]
  - “Cradle to Grave” liability
- Section 3004. (a) IN GENERAL
- (6) the maintenance of operation of such facilities and requiring such additional qualifications as to ownership, continuity of operation, training for personnel, and financial responsibility (including financial responsibility for corrective action) as may be necessary or desirable; No private entity shall be precluded by reason of criteria established under paragraph (6) from the ownership or operation of facilities providing hazardous waste treatment, storage, or disposal services where such entity can provide assurances of financial responsibility and continuity of operation consistent with the degree and duration of risks associated with the treatment, storage, or disposal of specified hazardous waste.
- (f) FINANCIAL RESPONSIBILITY PROVISIONS.—(1) Financial responsibility required by subsection (a) of this section may be established in accordance with regulations promulgated by the Administrator by any one, or any combination, of the following: insurance, guarantee, surety bond, letter of credit, or qualification as a self-insurer.

Source: EPA

## 2. Case Study: Environmental Liability

### The Acts that create an Insurance Market

- CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act (“Superfund”) (1980)] - cleanup super toxic sites
- 70% of Superfund activities paid for by (PRPs)

**Love Canal:** Failed canal development  
Niagara, NY

Sold -> chemical waste disposal landfill  
-> U.S. Army buried chemical warfare  
waste -> Hooker Chemical and Plastics  
Corp buried 21,000 tons toxic waste  
1947-1952

After site filled, city purchased for \$1  
and developed as a residential  
community. Community sues Hooker’s  
parent company.



Source: EPA

## 2. Case Study: Environmental Liability: Lessons

- **Today**
- CGL pollution coverages avail for statutory risks due to RCRA and CERCLA
- Ongoing court cases on CGL pollution liability coverage
  - **RE: climate change damages**
- **Parallels:** growing scientific awareness, changing social attitudes, legal and legislative uncertainty
- **But**
  - Connectivity of society to political process is different now
  - Climate change is much larger scale than point source pollutants
  - Affects our entire environment and society's resource bases
- Companies are retaining climate change risk exposure, **even if** it has not yet been recognized, quantified, or mandated (court or legislative)

## 3. Climate Change and Actuarial Implications

1. Changes in frequency & severity of extreme weather events
    - Storm damage (wind, hail, water), wildfire damage, crop damage
    - Transportation and food supply disruptions
  2. Sea level change
    - Change coastal exposures and eliminate property
  3. Forest/other ecosystem services disrupted/diminished
    - => Changes in supplies and building materials
      - Completion guarantee [cost/supply/alternate materials]
      - Company investment performance in these commodities?
- $\Sigma$  = changing frequency & severity of insured events  
 $\Rightarrow$  Shifting dist'n parameters;  $\uparrow$  variability

Source: IPCC Fourth Assessment Report, 2007

### 3. Climate Change and Actuarial Implications

- **Challenges**

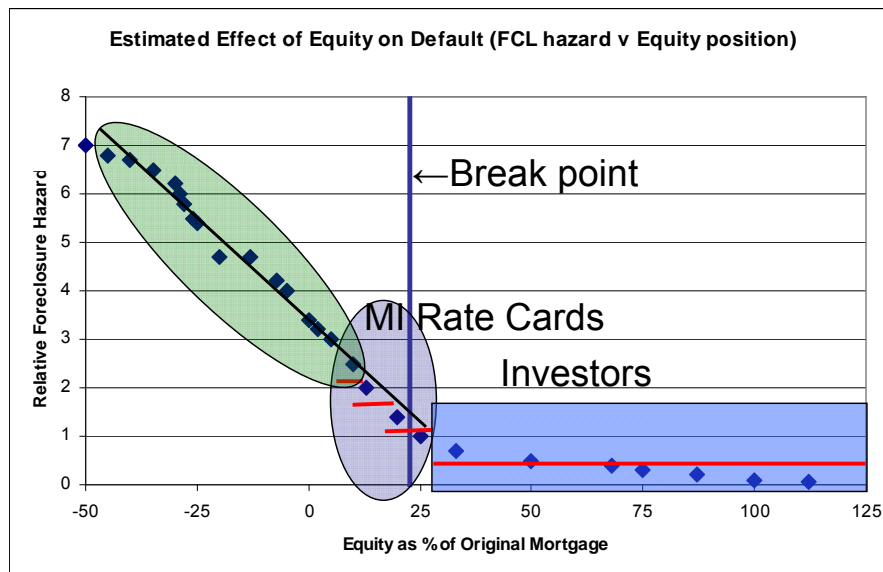
- Insured event prediction with changing hazards, abrupt or irreversible impacts
  - Traditional actuarial model assumptions fail
  - Assuming constant relative growth from past to future wrong
  - Chasing pricing, reserves, or worse, insolvency

- **Solutions**

- Modify assumptions in traditional models
- Develop new classes of models adequate to address changing (as opposed to constant) data trends and surprises
  - Interdisciplinary approaches/models from other disciplines
  - ACCI : raise awareness, provide guidance, some direct uses

Source: IPCC Fourth Assessment Report, 2007

### 4. Lessons on Models from Mortgage Crisis



Modified from Foote et al. 2008. "Negative Equity and Foreclosure: Theory and Evidence"

## 5. ASOP 13: P&C Trending Procedures

### 3.2 Historical Insurance and Non-Insurance Data

- the credibility assigned to the data by the actuary

### 3.3 Economic and Social Influences

- data selection, trending calculations and procedures

### 3.4 Selection of Trending Procedures

- precedent or common usage in profession
- insurance, econometric, and other non-insurance data

### 3.5 Criteria for Determining Trending Period

- changes in mix of data past/future

## 5. ASOP 43: P&C UCE

### 3.6.2 Assumptions - implicit or explicit

- Method/model appropriateness
- Parameters – constant in spatio-temporal window?

2.7 Model Risk: Methods inappropriate or models unrepresentative  
(entire model wrong!)

2.8 Parameter Risk: Parameters unrepresentative of future outcomes

2.10 Process Risk: Projections inherently variable, even when parameters known with certainty  
(process risk always a nuisance)





## 6. Current products/impacts for P&C

- New Regulation
  - NAIC – Insurer Climate Risk Disclosure Survey
  - Approved March 2009, first filing May 2010
  - Mandatory for insurers w premiums > \$500M
  - Q's evaluate risk exposure and responses
- New Product Emergence
  - Green-Buildings Insurance
    - unique exposures with renewable energy equipment
  - Renewable Energy Project Insurance
    - manage performance risk for renewable energy systems
  - Pay-as-you-drive insurance
    - encourage reduced driving to achieve safety/environmental benefits
  - Carbon trading
    - Insurance products part of carbon risk-management strategies for participants in emissions trading markets in EU

## 7. Summary

- Scientific certainty, peer review, and ASOP's
- Lessons in environmental liability emergence
- Environment is constantly your context, but it is not constant, and its nonconstancy is changing (2<sup>nd</sup> derivative);  $\mu$  ,  $\sigma^2$
- Changing hazards in some lines will demand new classes of models that recognize changing trends and surprise
- The costs of using models that do not adequately address model and parameter risk are enormous, process risk always nuisance
- ASOP's outline where we as actuaries need to look to face challenges
- New products and regulations already emerging

## References

- Actuarial Standards Board
- Foote et al. 2008. Negative equity and foreclosure: Theory and evidence. *Journal of Urban Economics*. 64(2):234-245.
- Intergovernmental Panel on Climate Change (IPCC). 2007. Fourth Assessment Report.
- [www.epa.gov](http://www.epa.gov)
- [www.legalnewsline.com](http://www.legalnewsline.com)