SCENARIO: CHLORINATED ORGANOPHOSPHATE FLAME RETARDANTS CAUSE BODILY INJURY AND CONSTITUTE PRODUCT POLLUTION

BEST PRACTICES IN SCENARIO DEVELOPMENT AND USAGE: PRESENT AND FUTURE
Scenario Development and Methodology Workshop
6 September 2017
Suggested best practices for casualty-clash scenario development

• Identification of scenarios should be guided by science
  • Centered around irreducible, common denominators of potential mass litigation

• Deploy ground-up models of loss that speak to specific injuries/damages and their arrival time
  • Building scenarios by scaling historical events has limited use if damages differ

• Recognize that allocative risk has no analogue in property catastrophe modeling
  • Distinct from both the frequency and severity of casualty catastrophes, can be analyzed modularly to understand industry and company exposure
What if the “next asbestos” were literally the next asbestos?

- Asbestos litigation: over $100 billion and growing
  - Mesothelioma a signature disease
  - Latency: long timeline between exposure and disease onset of the disease
  - Highly ubiquitous material, used in a wide variety of products
  - Generated concomitant property damage losses because used in structural materials, which sometimes required removal and replacement

- Chlorinated organophosphate flame retardants (ClOPFRs) are but the latest in a long line of risky chemicals that replaced asbestos
  - Following phase out of PBDEs c. 2004, ClOPFRs became dominant flame retardant chemicals in consumer products
  - Exposure is now ubiquitous and increasing
Science shows exposure to some ClOPIFRs may cause bodily injury

- Tris(1,3-dichloro-2-propyl) phosphate (TDCPP) and Tris(2-chloroethyl) phosphate (TCEP)
  - California’s Proposition 65 list
  - European Chemical Agency listed TCEP as SVHC in 2010
- Praedicat analyzed over 200 peer-reviewed, scientific articles on TDCPP and TCEP
  - Research active, but does not yet consistently link these chemicals to harms
  - Hypotheses on: developmental injury, liver injury, nervous system injury, kidney cancer, and reproductive injury

Figure 1. General Causation Risk scores and seven-year projections for TDCPP and TCEP bodily injury hypotheses.
Research attention to CIOPFRs continues to grow
Potential latent bodily injuries from CIOPFRs create a long tail of liability risk

- When diseases take decades to develop, companies may face lawsuits alleging injuries or damages arising from exposures that happened many years ago
  - Occurrence forms respond to long-tail liability claims
- Science suggests exposure to CIOPFRs could lead to latent claims like these
  - Kidney cancer may take 30 years or more to develop
  - Typical onset of mental impairment is 25 years or more from exposure
- We explicitly account for disease latency in our model and use this information to generate a time-path of bodily injury claims and losses for our scenarios
Scientific advances continue to improve medicine’s ability to determine the specific causes of disease

- Genomics brings causes of cancer into clearer view
  - Cost to sequence a human genome decreased from ~$10 million to $1000 over last decade
  - An entire human genome can now be sequenced in about 26 hours
- Neurobiological research has also improved in identifying the biomolecular causes of neurological disease
  - Parkinson’s Disease: strongly linked with dysregulation of $\alpha$-synuclein. Suggested connection between pesticide-related Parkinson’s disease and mitochondrial dysfunction
  - Alzheimer’s Disease: new treatments evolving based on better understanding of exactly how amyloid plaques cause oxidative stress
Property damage losses could substantially increase ClOFR losses

- Compensation possible under product liability theories
  - Courts have held installation of an inherently harmful product can constitute PD either at the time of installation or when harmful substances are released from the product
  - Similar to asbestos litigation related to schools, plaintiffs could contend that ClOFRs create unreasonably dangerous and inherently harmful products
- More controversial: nuisance
  - As in some lead paint litigation, plaintiffs might claim that materials containing ClOFRs constitute a public nuisance and require recompense for abatement
  - Unclear implications for coverage under commercial general liability and excess casualty policies
Litigation over ClOFRs appears unlikely, but it would have significant implications

- Public concern over exposure to ClOFRs has reached sufficient levels to warrant investigation of the potential severity of associated litigation.
- According to our frequency model, the scientific literature is not expected to reach a strong enough consensus to support mass litigation over these chemicals in the next seven years.
- Despite strong confidence in these results, scenarios such as this one address model uncertainty and other unmodeled parameters by allowing decision-makers to understand their overall exposure to potential severe events for stress-testing and capital management.
  - To facilitate this analysis, we describe our scenarios in terms of three levels, moving from the most credible to the most extreme outcomes.
  - Bodily injury and property damage losses are reported separately in case users find one type of loss more credible than another.
CIOPFRs litigation and potential bodily injury and property damage

• Level 1: In seven years, scientific evidence mounts and shows exposure to CIOPFRs causes kidney cancer and mental impairment
  • Manufacturers cease using CIOPFRs in their products
  • Exposure studies confirm CIOPFRs ubiquitously persist at high levels in household dust, and leach from existing products for many years
  • Science can specifically identify cases of kidney cancer and mental impairment caused by exposure to CIOPFRs

• Level 2: Regulatory bodies respond to bodily injury litigation by banning the use CIOPFRs and calling for abatement in some settings
  • Owners of some consumer goods contaminated with CIOPFRs file lawsuits, claiming bodily injury, property damage, or both
  • Workers with credible exposure whose claims were too weak in L1

• Level 3: All remaining potential litigants from all other settings we have profiled in our data file claims
  • Consumers or workers with very low exposure: least credible
CIOPFRs litigation and potential bodily injury and property damage: results

Level 1 Bodily Injury and Defense: $702M

- All Other Basic Organic Chemical Manufacturing: 38%
- All Other Miscellaneous Chemical Product and Preparation Manufacturing: 18%
- Urethane and Other Foam Product (except Polystyrene) Manufacturing: 7%
- Curtain and Linen Mills: 5%
- Motor Vehicle Seating and Interior Trim Manufacturing: 2%
- Upholstered Household Furniture Manufacturing: 2%
- Doll, Toy, and Game Manufacturing: 2%
- Mattress Manufacturing: 1%
- Nonwoven Fabric Mills: 1%
- Institutional Furniture Manufacturing: 2%
- Office Furniture (except Wood) Manufacturing: 1%
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Methodology
Identification of scenario event

• Praedicat mines scientific and regulatory literatures to identify the products and commercial activities that scientists believe could result in harm to health, property, or the environment
  • Focus on Litagion® agents: materials, products, substances, processes, practices, policies, events, or phenomena that could be the common denominator of an actual or potential mass litigation episode.” E.g. Asbestos.
• We then map and characterize the potential litigation by groups of lawsuits
  • “Latent mass action” (LMA): Characterized by Litagion agent, plaintiff, harm, exposure setting, and set of defendant types
• Scenarios structured by selecting sets of LMAs per their relative liability risk
  • Liability risk model accounts for both “general causation risk” and “specific causation risk”
  • For scenarios: set global parameters that affect the liability risk of all LMAs while maintaining rank ordering between them
  • Use differences in liability risk to structure the levels of our scenarios
Event severity and time path

- For bodily injury, the severity of an LMA over time is a function of:
  - N of individuals who can demonstrate that they were exposed to a Litagion agent in LMA
  - Fraction of those exposed individuals who suffer the LMA’s specified injury
  - Cost of injury
  - Disease latency
  - The strength of the plaintiff’s case
  - The cost of negotiating those settlements

- Under development: property damage estimates
  - Two types: fouling (MTBE, mold) or significant risk of bodily injury (lead, asbestos)
  - Costs for removal and replacement of building materials based on nationally representative data sets on commercial and residential buildings, unit costs ($/sq. ft.)
  - Account for vintage and natural attrition, conditional on assumptions of market removal and mandated abatement times
  - For consumer goods, costs for replacement depend on the replacement value of the goods in existence that contain the Litagion agent
  - For property damage concomitant with bodily injury, losses are a function of bodily injury loss time path
Allocation of losses

- Praedicat’s loss allocation model generates loss share distributions at the industry and company level
  - Each LMA in a scenario is connected to a number of distinct types of defendant industries
  - Analysts and algorithmic methods connect companies to these industries
- Allocation driven by defendant industry and company factors
  - Relative ease Litagion agent exposure can be attributed to a particular defendant industry
  - Estimated company market share in defendant industry
  - Certainty of connection between company, defendant industry, and Litagion agent
- Distribution of potential allocation outcomes built around calculated central estimates, drawing on external industry data and global information from our allocation model