

FOREVER CHEMICALS, LONG-TAIL LIABILITIES:

WHY EMERGING CONTAMINANTS ARE BECOMING AN ACTUARIAL CHALLENGE

BY **YOHAN BOTBOL**

Some of the most significant insurance liabilities begin long before they are recognised as such. Over the last century the growth of the chemical industry has led to the development of a vast number of new materials used across almost every sector of the economy including construction, transport, defence and energy.

One infamous example is asbestos, once regarded as a miracle material in the construction industry. After years of use, litigation emerged in many jurisdictions against manufacturers and suppliers over fatal disease caused by asbestos exposure. Several large corporations have subsequently entered into major settlements.

A more recent and now widely known family of substances is PFAS which stands for per- and polyfluoroalkyl substances. These substances are often called ‘forever chemicals’ because of their persistence in the environment and in the human body. The PFAS family comprises thousands of chemical substances. They have

been used for decades in firefighting foams, industrial processes, water-resistant materials, food packaging, cosmetics, and many other products.

In recent years several major companies involved in PFAS-related litigation or pollution claims, mostly in the US, have reached settlements before trial. The ultimate magnitude of the issue remains uncertain, but it is already clear that PFAS has the potential to become one of the most significant long-tail liability challenges of our time. The European Commission has estimated that, if current pollution levels persist, the societal cost of PFAS pollution in Europe could reach approximately €440 billion by 2050.¹

¹ European Commission, The Cost of PFAS Pollution for Our Society, 2026.

PFAS in Europe: Potential Societal Cost

Important: societal cost is not the same as insured loss.



Illustrative cost components



For actuaries, the key question is how much of this economic burden may ultimately reach insurance and reinsurance balance sheets.

Sources: European Commission PFAS societal cost estimates; EEA context; author synthesis.



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This figure does not represent insured losses, but it illustrates the potential scale of the underlying economic exposure.

LESSONS FROM LONG-TAIL LIABILITIES

Asbestos, once regarded as an innovative material, became a major problem for society and for insurance companies generating endless procedures, complex medical and legal investigations, and a new challenge for actuaries.

The main actuarial concern was how to reserve for a risk that was still developing and for which negotiated settlements played a significant role in the ultimate claims outcome.

Although asbestos, PFAS and other emerging pollutants are fundamentally different, they share several characteristics that deserve actuarial attention. Insurers can benefit from revisiting the lessons learned from this period. The common characteristics, which made the risk difficult to approach are: long latency, scientific uncertainty, evolving regulation, multi-year exposure, litigation context, political dimensions and multi-industry issue. Parallels can also be drawn with more recent episodes related to Covid-19, where uncertainty, coverage interpretation and scenario analysis played a major role. >

From Asbestos to PFAS: Two Generations of Long-Tail Liabilities

Similar patterns. Different era. Shared actuarial features.

	Asbestos	PFAS and Emerging Pollutants
 Widespread use	Widespread throughout much of the 20th century; peak use varied by country	1940s–present
 Claims emergence	Often several decades	Potentially long; still highly uncertain
 Scientific understanding	Evolved over decades	Still developing
 Regulatory response	Gradual, then accelerating	Accelerating globally, especially in Europe and the US
 Litigation	Mass torts, class actions, multi-jurisdiction	Increasing, still evolving, potentially multi-jurisdiction
 Actuarial challenge	Estimating unobserved ultimate losses	Reserving under deep uncertainty and limited data



Shared actuarial features: long latency, evolving science and regulation, and material uncertainty.

Sources: Swiss Re Institute; EEA; WHO; EPA; author synthesis.



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Persistent pollution exposures can arise across almost every sector of the economy, including chemicals, construction, textiles, technology, energy and transport. These sectors are typically insured by international non-life insurers operating in specialty and commercial lines. During my years as Chief Actuary within a specialty insurer, emerging-risk discussions focused primarily on climate-related exposures, heavy rainfall, flooding, drought and other natural-catastrophe developments. More recently, PFAS has moved rapidly to the forefront.

When a new risk with potentially significant implications emerges, the first response is often to revise policy wordings. Such measures can limit PFAS exposure on newly written business

but do not eliminate historical exposure for claims arising under earlier policy wordings. A large proportion of specialty and commercial insurers is potentially exposed to PFAS-related liabilities through current and historical portfolios. Some specialty insurers continue to write clients with PFAS exposure supported by tailored terms and reduced sub-limits as they represent a material part of their revenue. Other insurers may purchase facultative reinsurance to transfer part of the exposure, although capacity may be limited and expensive. It is a way to stay within the company's risk appetite and keep the client. Where traditional market capacity is unavailable or insufficient, some corporate groups may consider captive reinsurance solutions to cover part of the exposure.² >

² See Yohan Botbol, 'Reinsurance Captives: Why Luxembourg?', *The European Actuary*, October 2018.

RESERVING UNDER DEEP UNCERTAINTY

Traditional reserving techniques rely heavily on historical experience. Emerging pollution risks challenge this assumption. Historical triangles are less relevant when reporting patterns are still immature, scientific knowledge evolves, legal frameworks change and regulatory intervention accelerates.

Actuaries can approach the problem in two stages. It starts with a qualitative assessment and a simple question: How much of this liability can reach our portfolio?

Answering that question requires close collaboration with other functions. Underwriters understand the product, the sublimits, the coverage, the exposure, and the original intent behind the coverage. Claims specialists can explain how claims emerge and provide insight from surveyors and legal advisers. Risk engineers can help identify potential sources of contamination and propose risk mitigation measures. Risk management, Legal and the reinsurance team should also contribute to this

exercise. Together, these functions provide the range of expertise required to refine the initial qualitative view.

The qualitative assessment should be followed by quantitative scenario analysis. Actuaries need to convert the initial exercise into numbers that can inform reserving, pricing, capital management and the wider finance function. This analysis should also influence the company's strategy as it is no longer solely an underwriting risk anymore. Embedding new metrics and quantitative scenarios can provide a concrete perspective on how the risk may evolve. A natural framework in which one can formalise this approach is through the annual ORSA (Own Risk and Solvency Assessment) work.

In practice, the scenario-based methodology would be similar to that used for other emerging or systemic risks. Specialty insurers have already applied such approaches for asbestos, Covid-19 and climate-related claims. <

*In Part II (next quarter), this analysis will be taken one step further by translating the qualitative and scenario-based assessment into a structured actuarial analysis. Particular attention will be given to two critical issues for long-tail pollution liabilities: the trigger of coverage under **occurrence-based** and **claims-made** policies, and the **allocation of losses** across multiple policy years. The analysis will then consider how these technical questions can inform reserving, reinsurance and strategic decision-making.*

- Written by a human, reviewed & corrected by AI
- Illustrations generated by AI



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