



Nanotechnology: An insurer's perspective

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Where does insurance fit into the world of nanotechnology?

Insurance is the transfer of a risk for which the insurer charges a fee. For example, employers' liability insurance cover requires the insurer to pay for any injuries incurred by an employee in the course of their employment. The cost to the company is the premium paid each year for the insurance plus an agreed minimum amount, or deductible, paid in the event of any claim. Generally all costs greater than the deductible will be met by the insurer. This begs the question, how does the insurer manage the risk they have assumed from the company? Insurers can take on risk from many different companies and pool it. Assuming they have a good estimate of the probability of each company claiming on its insurance policy the insurer can estimate the average cost of claims each year from all of its policies. For many types of insurance, the more policies the insurer has, the more likely the predicted cost of all claims will match the actual cost of all claims; this is known to many as the "law of large numbers". Therefore in theory, an insurer with a large number of policies can predict how much they would have to pay out each year and will set the cost of the insurance premium to cover those predicted losses.

This business model hinges on the assumption that the probability of the risk occurring has been accurately calculated. This calculation can be performed in many ways and a typical method within the insurance industry is for actuaries to analyse historical data. An insurer can be more confident of the probability and impact of a risk that has been insured and studied for many years and where changes of the nature of the risk are slow or predictable. A good example of this is motor insurance. The number of cars and accidents on the road changes relatively slowly year on year and the motor insurance industry has existed for over 100 years. Nanotechnology on the other hand can give an insurer pause for thought, as historical data does not exist and the level of knowledge is changing rapidly. The use of scientific research coupled with insurance experience may help, but a common theme in nanotechnology risk assessment is that there is lack of data to understand the exposure or even the hazard itself.

How can insurers manage the risk?

There are several options available to insurers when attempting to insure a risk that is difficult to quantify. To our knowledge explicit measures are not commonly used to control nanotechnology risks. However, some of the options available to insurers are summarised below:

Monitor and research

This could be considered the first stage in assessing an emerging risk. There are many resources available to insurers to research risks, ranging from web resources like www.safenano.org to organisations like the [Lighthill Risk Network](#) (see the case study). By monitoring the risk the insurer can help to ensure their terms and conditions match the prevailing level of known risk. There is a danger, however, that a risk may be changing in ways that are not yet apparent in current thinking and research.

Price adequately and hold additional capital

The insurer can accept that nanotechnology risks are included within the overall set of risks that the insurance



policy covers and therefore may not need to mention nanotechnology specifically. The additional risk introduced is then reflected in the price of premium for the insurance. Also, the amount of money the insurer has to set aside to pay unexpectedly large loss claims, known as the capital, would also in theory increase in line with any additional risk.

Reinsurance

A common risk mitigating tool used by insurers is to transfer some of the portfolio risk using reinsurance. This is insurance for insurers, and allows risks to be spread more widely across the industry. This provides security for both the insurer and the insured.

Exclude

Insurers could, theoretically, exclude any liability related to losses caused directly by nanotechnology. As long as the exclusions are well worded and enforceable this reduces the risk to the insurer to near-zero, but does not allow the insurer to acquire historical data to price for allowing cover in the future. This is an approach that is often used for risks that are considered uninsurable. A risk may be considered uninsurable if the premium required is unaffordable by the majority of customers or when the insurer is not willing to take on that level of risk. This may apply when impact coupled with probability of occurrence, or if the uncertainty in those quantities, is unacceptably high.

Exclude and write back with limited cover

An insurer can exclude the less certain risks from full coverage and then provide separate limited cover for those risks.

Case Study: Lighthill risk network

The Lighthill Risk Network, is run as a not-for-profit organisation bringing together scientific research worldwide, the financial services and governments to exchange risk-related expertise.

On the 10 December 2007 the network hosted a conference on nanotechnology in the Old Library at Lloyd's. The conference presented academic views of issues around nanotechnology to the Lloyd's and wider insurance community. These included the law and regulation, nanotoxicology and current and future applications. In addition, the network helped identify experts for the Lloyd's Emerging Risk report on nanotechnology which was launched at the event in December, and can be found at www.lloyds.com/emergingrisks

Only accept claims within a fixed period

The insurer can also reduce their exposure by only accepting claims notified during the length of the contract, which is typically one year. This type of contract safeguards the insurer against latent claims that only manifest themselves years after the policy was written. When the policy comes up for renewal each year the insurer can then assess the claims made previously and can make an informed decision on whether to provide the same cover again next year.

Selection of risks

An insurer can choose to select risks on an individual basis, rejecting those that they may consider too risky. That decision may be based on many factors such as the quality of risk management within the company seeking insurance and how well understood the risk is.

What information do insurers need?

Various types of insurance could be impacted by nanotechnology, particularly liability insurance. These include but are not limited to:

- Professional indemnity / Medical malpractice - protects against being sued for giving incorrect advice or negligence
- Directors and officers - protects business leaders against being sued by shareholders for unsatisfactory management or negligence leading to loss of company value
- General liability - covers other liabilities the company may be exposed to



- Employers' liability - provides compensation to employees for personal injuries as a result of employment
- Product liability - covers cost of recall and claims made by consumers.

To determine the level of risk nanotechnology poses to each of these types of insurance cover an insurer would require a diverse amount of information ranging from the insured's use of nanotechnology to knowledge regarding the potential hazards of nano-materials. Some of this information is gathered by an insurance broker on behalf of the party seeking insurance; other information can be gathered from research by third parties such as universities and market research groups. For example, the similarity of carbon nanotubes to asbestos fibres has raised concern. If some nanotechnologies were to cause similar unexpected latent claims to the asbestos claims of the 1990's, then insurers would want to exclude or price the risk appropriately. This may prove difficult until the real risk is known.

For complex risks the underwriting process typically involves negotiation and we believe the following are key questions that could be asked by the insurer:

- What nanotechnologies does the company use, including those supplied and created?
- What are the known hazards of the nanotechnologies being used?
- What are the potential hazards of the nanotechnologies being used?
- Have the nanotechnologies been studied for toxic effects?
- Have the nanotechnologies been studied for their environmental effects?
- Does the company follow any guiding principles at board level for managing nanotechnology risks? For example, the Responsible NanoCode.
- Does the company follow any risk frameworks for managing the potential hazards to their employees? For example the NanoRisk Framework.
- As part of their risk management have they performed an analysis of their products entire lifecycle, if so are there any exposed hazards?
- Does the company inform its customers about the nanotechnologies it uses or sells?

The answers give the insurer an indication of the level of risk management a company may employ and help to infer the level of risk being assumed.

Definitions and Regulation

BSI, the National Standards Body of the UK, has recently published standard terminology for use within the nanotechnology industry. This is potentially good news for the UK insurance industry as it may reduce possible misunderstandings and legal ambiguity; clear definitions can help to avoid unexpected cover or gaps in cover. It also allows for regulation specific to nanotechnology to move forward for the same reasons. There are varied views on whether specific regulation for nanotechnology, and nano-enhanced products, should exist or not. From an insurer's point of view an environment with clear regulation is a desirable one to operate within. It is less volatile, enables increased contract certainty and the expectations on risk management by both the insurer and the insured are clearer. So the question is whether nanotechnology is sufficiently regulated within current mechanisms, and this is being watched carefully by the insurance industry. An example of concern is if a system of regulation views a nano-material as having the same properties as its bulk



material. The regulation in this case would not reflect the true risk, undermining the risk management of the material and possibly exposing the company and insurer to an increased hazard.

Direct benefits to insurance

Nanotechnology could also bring direct benefits to risk mitigation in the form of new materials that are stronger or more adaptive than before. Cars could be made to absorb more of the impact during a crash; building materials could be made stronger and more flexible to resist damage from earthquakes, fire, flood and corrosion. If proven to be safe, carefully managed environmental cleanup operations could be made easier and cheaper with the use of specialised nanoparticles. Medicine could also be transformed by nanotechnology allowing cheaper and more sensitive diagnostic tools for diseases giving insurance professionals better statistics to determine pricing. Some of these examples are not realised as yet, but give a sense of how wide ranging the potential benefits of nanotechnology could be.

Looking to the future

The biggest challenge facing insurers may be the diverse nature of nanotechnology and the lack of information regarding its impact to health and the environment. However, the predicted growth of the nanotechnology value chain and nano-enhanced products means that the insurance industry needs to continue to monitor this field so informed decisions regarding insurance terms and conditions can be made.



Whether nanotechnology is sufficiently regulated within current mechanisms is being watched carefully by the insurance industry.

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Disclaimer: The thoughts expressed in this note reflect those of the author and do not necessarily reflect those of Lloyd's.