Investment Managers

Investment Institute Sustainability

Sustainability challenges facing the chemical industry: What investors need to know

November 2023

Mariana Villanueva
ESG Analyst
AXA IM

Key points

- Chemicals help form the backbone of modern economies, providing numerous everyday benefits and enabling innovation. But how can we continue to reap their benefits and simultaneously protect the environment?
- Not all chemicals are harmful. However, there are substances which can negatively affect nature and human health. The impact of hazardous chemicals has the potential to be financially material to the companies in which we invest
- Responsible investors looking to safeguard biodiversity can proactively engage with companies in the chemical industry, advocating for greater transparency on exposure levels and the use of hazardous chemicals, as well as their reduction – with a particular regard for persistent ones
- In parallel, they can consider allocating capital towards sustainable solutions via companies developing safer alternatives and deploying technologies to address existing environmental challenges

Chemicals are widely used and a necessary component of modern economies - they provide numerous benefits and enable innovation. As a fundamental component of global manufacturing, the chemical industry forms the backbone of a wide range of downstream industries - from textiles to energy and transportation.[1]

As the industry continues to innovate to meet societal needs including the green transition, a key issue to navigate is how we can continue to reap its benefits albeit with a kinder and lighter impact on the planet. Hazardous chemicals, as well as greenhouse gas emissions, are central to this discussion.

Not all chemicals are harmful. There are, however, chemicals which can have hazardous properties that can be concerning for biodiversity and human health. These can include substances that are persistent and bio-accumulative, carcinogenic, mutagenic, toxic to reproduction, or endocrine disrupting - and they can still be in production and use today.[2]

In the European Union (EU) - the second largest chemical producing and consuming region after Asia[3] - of the 279 million tons of chemicals produced in 2021, 77% were hazardous to health and 30% were hazardous to the environment.[4]

Some 14% presented the highest level of severity of hazard for health, and 11% the highest hazard for the environment.[5]

As global chemical production has risen, so has the challenge for sustainable chemical management. Global chemical production nearly doubled between 2000 and 2017, reaching 2.3 billion tons[6], and there are currently estimated to be over 350,000 chemicals on the global market[7]. This volume means the full range of health and environmental impacts of every registered chemical is difficult to feasibly assess, posing a knowledge challenge.[8]

Coupled with expected growth, this presents a herculean task for chemical management globally. A group of scientists has recently suggested the pace of chemical production coupled with the release of chemicals into the environment is exceeding society's ability to conduct safety-related assessments and monitoring.[9]

The European Environment Agency has estimated the associated risks of hazardous chemicals in circulation are likely understated[10]. We note that it is also possible for scientific understanding of hazards and associated safety levels to evolve over time.

Nevertheless, hazard alone is not a direct proxy for the actual risks posed by chemicals. This is typically assessed as a function of both hazard (toxicity) and exposure. Beyond the nature of a substance, the actual effects are also dependent on factors like the occurrence, concentration and duration of exposure, as well as how the substance might interact with others.

Potential environmental release – and therefore chemical pollution of water, soil, or air - may occur throughout the chemical lifecycle, presenting points of vigilance, from production or use at industrial sites, downstream use in products, and from leachate (liquid contamination) during end-of-life disposal. Managing chemicals sustainably means considering toxicity but also potential environmental release.

Some external factors are challenging risk mitigation paradigms built on assumptions that risks from hazardous substances can be contained because current and future exposure patterns can be fully controlled and anticipated. This includes circular economy models and climate change.

For instance, climate change may remobilise chemicals from landfills and change pollution pathways and exposure patterns, while increased material recycling makes it difficult, costly and time consuming to trace and remove hazardous substances from closed loop systems .[11]

Considering these challenges, and likely in part due to greater public preoccupation about the impact of chemicals in everyday products[12], European policymakers have begun advocating for a more precautionary approach to chemical risk management.

A safe and sustainable by-design approach is being furthered as it is viewed as more effective to avoid the use of hazardous substances to the greatest extent possible.[13] Among others, this entails developing chemicals and materials as well as production processes that are able to fulfill specific functions while minimising or avoiding properties or volumes that may be harmful to people and nature.

As investors it is important to understand how companies are approaching hazardous substances globally, and how they are positioning themselves not only to respond to regulatory trends but the new economic models that will come with the green transition.

Chemicals industry: A key partner in environmental protection

Although the threats from chemical pollution may not be as visible or immediate, the stakes are high and their recognition as part of the United Nations Sustainable Development Goals (SDG) reflects this. Chemical pollution has been recognised as having the potential to disrupt the Earth systems' processes upon which human life depends – particularly when such chemicals exhibit persistence and mobility – leading to their recognition within one of the so-called 'planetary boundaries'.[14]

Chemical pollution forms part of the SDG agenda with several targets seeking to address hazardous chemical risks.[15]

As attention turns to nature, the chemical industry is emerging as a key and necessary partner to reversing biodiversity loss. Pollution is one of the key drivers of biodiversity loss[16] and a recent study identified the chemical industry as having one of the highest potential negative impacts on biodiversity.[17]

ESG investment considerations of hazardous chemicals

Hazardous chemical exposure and management is an environmental, social and governance (ESG) factor which has the potential to be financially material to corporates and therefore to investors. It can concern companies across the value chain from chemical manufacturers and industrials which produce these substances, to downstream companies using these substances in their manufacturing processes and products, as well as environmental services and water utilities dealing with end-of-life disposal and pollution.

ESG relevance of this topic may differ depending on a company's position in the value chain and profile. For instance, the issue of hazardous chemicals may generally be most relevant for producers as this could more negatively impact growth, margins, and valuations if risks are not fully priced in. The chemical industry is diverse, and risks may differ still for formulators who may use these substances as intermediates only, while companies exposed to end-consumers may potentially be more exposed to liabilities.

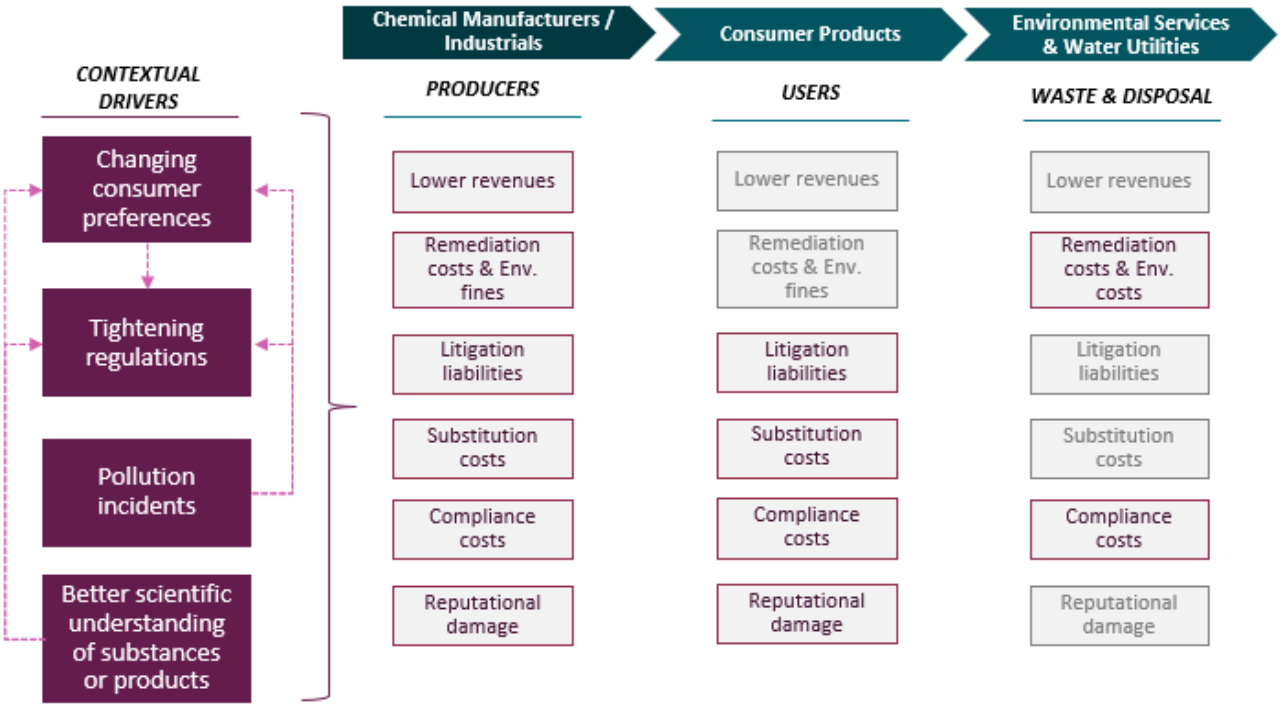
For the chemicals sector, ratings agency S&P Global generally considers pollution incidents as well as health and safety related to product performance or product characteristics as material factors to credit.[18] Individual assessments are always necessary to determine the actual degree of relevance or exposure and materiality of hazardous chemicals for each company.

The table below shows the various potential downside risks stemming from possible contextual drivers or events such as changing consumer preferences, a better scientific understanding of substances, a tightening regulatory environment - particularly the shift towards a hazard-based approach to chemical safety - and pollution incidents.

As regards to the potential downside risks above, some are likely to be more material than others. Litigation risks, particularly in jurisdictions like the US - where class actions lawsuits are accessible and effective - as well as remediation costs are likely to have the strongest possible downsides for companies, particularly when compounded by reputational damage. For 'forever chemicals' – highly persistent, synthetic chemicals - risks can be ongoing even once production has ceased. The possible effect of 'stranded product portfolios', relating to exposure to hazardous substances requiring phase-out, may be softened by overall revenue diversification at the company level depending on the company profile. Ultimately, companies proactively phasing out hazardous substances may be better insulated from possible tail risks involving potential litigation and boycott.

While we have focused on downsides, there could be upsides for producers that position themselves at the forefront of best practice by offering alternatives. This could help them recover lost market share or create new value by responding to increased demand for safer alternatives as consumer awareness grows and new opportunities are unlocked by the transition to circular business models.

Figure 1. Potential downside risks from hazardous chemical exposure across the value chain



Sources: AXA IM; ESG Materiality Map Chemicals, S&P Global, May 2022; How will tightening 'forever chemicals' (PFAS) regulation impact the manufacturing sector? UBS, July 2023. The arrows above denote possible relationships between the contextual drivers.

Forever chemicals: A persistent problem

One group of chemicals is particularly worth highlighting: persistent chemicals. These are highly concerning because their molecular stability means they do not easily degrade in the environment or in living organisms, or even during technical processing.[19] This makes them very difficult to get rid of once released and in turn this can potentially lead to high concentrations in humans and animals and in the environment.

In the US and EU, persistent chemicals are most commonly produced and imported by the chemicals, biotech and pharmaceutical, electrical equipment, and materials sub-sectors.[20]

Within the persistent chemical family, perfluoroalkyl and polyfluoroalkyl substances (PFAS) are especially in the crosshairs of regulators and consumers worldwide.

What are PFAS and why are they a concern?

Perfluoroalkyl and polyfluoroalkyl substances (PFAS), also known as forever chemicals, are a group of around 10,000 manufactured chemicals. Due to their unique properties such as oil and water repellence and temperature and pressure resistance, they are used in a vast array of industrial applications and everyday consumer products like firefighting foams, non-stick frying pans, food packaging, textiles and coatings. Their ubiquity and persistence have led to traces of PFAS being detected in humans and animals and the environment – including remote areas – across the globe.[21]

Much is still unclear about the health and environmental risks of all PFAS due to their number, extensive use and existing monitoring gaps. Yet those that have been relatively well-studied are considered moderately-to-highly toxic and linked to adverse health impacts like cancer, fertility issues, and developmental effects.[22] The health burden of PFAS in Europe has been estimated at between €52bn and €84bn annually.[23]

While the environmental costs of PFAS pollution have yet to be well estimated, in Europe an initial investigation suggests there is large-scale contamination of over 17,000 sites[24], while in the US, 43 states have locations with PFAS contamination.[25]

How is tolerance for PFAS changing?

US and EU regulators are moving towards tighter PFAS restrictions through regulations on water quality and on the use and sale of certain types of PFAS, while other markets are considering regulations.[26]

The Stockholm Convention, a global treaty to protect health and the environment from certain persistent chemicals, already covers three types of PFAS, though the US and EU regulations under consideration would cover a wider scope.[27] The EU proposal, which is still under a protracted process subject to uncertainties, is the most stringent and comprehensive as it seeks a blanket ban on the manufacture, use, and sale of all PFAS with some potential exemptions.[28]

In the US, where existing legislation is fragmented with different states limiting specific uses, the Environmental Protection Agency is proposing federal limits on drinking water.

Other pressures could come from growing consumer awareness, aided by media scrutiny. Several downstream companies in the food and fashion industry are also adding to upstream pressure by voluntarily excluding PFAS from their products.

How might companies be impacted?

Regulatory and consumer pressures are mounting for PFAS producers and users. Restriction on PFAS' use and sale will likely primarily exert pressure on upstream producers. Meanwhile the lowering of limits and extending the scope of PFAS in water quality regulation could make litigation and the need for removal more likely and costly.[29]

Due to the nature of regulatory developments, PFAS represent an ongoing ESG risk, notably for producers. As production appears concentrated, this is likely to concern some more than others[30]. Yet the limited available disclosure may impede visibility on exposure particularly for production outside the EU and US. For companies that have been affected by PFAS controversies thus far, the impacts have been material, particularly those relating to litigation liabilities and remediation costs based on the size of settlements reached. Some companies have been more heavily affected than others. For certain emblematic cases, the threat of litigation has weighed on credit profiles.

Yet the dust is far from being settled as settlements reached mostly refer to legacy emissions of PFAS already restricted, and tightening regulation may leave scope for more litigation and fines to come[31]. Much of this so far has occurred in the US where lawsuits can be elevated by class action, with potentially more waves to come including in the EU and elsewhere as the landscape of PFAS claims unfolds.

Steps responsible investors could take: Engaging to promote transparancy and reduction

Investors can proactively engage with companies within the chemical industry. We believe reliance on external ESG and controversy scores alone may prove inadequate in fully capturing risks or in informing issuer selection over long investment horizons. While ESG scores do factor these in, due to limited and standardised transparency, methodologies can depend on indirect proxies to estimate exposure. Controversies can have a backward-looking bias and may not necessarily move in tandem with credit rating actions.

Investors' engagement priorities should support the need to ensure that risks and valuation are being adequately appraised and hazardous substances are being adequately managed.

The need for increased transparency

While the potential risks posed by the production and use of hazardous chemicals are clear, investors are faced with limited standardised public disclosure. It is generally not a common practice for chemical companies to systematically report on the list of all the hazardous chemicals they use and produce globally, their volumes or the sales connected to them – hampering visibility on the size and nature of risk exposure.

Of the 54 chemical companies covered by the 2022 ChemScore ranking, according to ChemSec only two have provided information on global hazardous chemicals[32]. Hazardous chemicals may come to public attention selectively, in relation to specific environmental liabilities disclosed in annual reports.

However, this may not necessarily resolve investor visibility of overall risks. It can lead to investor dialogues on risk management occurring belatedly with a focus on the containment of the risks at hand. Additionally, as the recent PFAS settlements have only illustrated, liability overhangs remain difficult to estimate even for companies which may tend to underestimate provisions.

Engagement efforts should encourage companies to publicly disclose the full extent of their material exposure and bring clarity to the ways in which substances are used. Having a full view on global production and use also ensures that companies do not merely displace pollution and safety risks to jurisdictions with looser regulation. While competitiveness considerations may help to explain current transparency practices, investors will need to work with companies to determine the appropriate balance to strike.

Advocating for the reduction of hazardous chemicals

Given the potential headwinds associated with hazardous substances, companies are encouraged to take a proactive stance by reducing these substances where possible - voluntarily phasing out the most harmful ones starting with persistent chemicals and seeking more sustainable alternatives.

MSCI chemical industry reports indicate that while companies generally have moderate-to-high exposure to chemical-related risks, actual risk management is generally weak-to-moderate[33]. Companies focused on regulatory compliance only may be weakly positioned to weather long-term challenges, particularly in the case of persistent chemicals which linger in the environment long after production and use has ceased – potentially posing latent credit risks.

Many companies are already marketing products presented as more sustainable, indicating that companies do see value here, and environment and safety considerations are generally integrated into product stewardship programmes.

However, no company in the 2022 ChemScore ranking has been able to commit to only producing products that are safe and sustainable by design thus far. A handful, however, are adopting public strategies committing to phase out existing hazardous products and replace them with safer alternatives, and by announcing full or partial exits from PFAS often in response to controversies or regulatory trends.

Engagement efforts should focus on companies' strategies to manage hazardous substances in both outstanding and new products. This includes probing into whether all products have been comprehensively screened for containing substances of concern and how toxicity and risk is factored into decision-making in product stewardship programmes screening for sustainability.

In addition, it should include the use of cut-off criteria in new products to avoid regrettable substitution – where a chemical is replaced with another that is just as harmful or worse - and the active exploration of safer alternatives. Vital to the dialogue is understanding how new products and processes might factor into company competitiveness.

Solutions-driven investing

One way investors can help facilitate the shift is by allocating capital towards projects supporting the removal of hazardous substances from the economy through green bonds that fund the development of safer alternatives.

Green bonds may be currently underused as funding instruments by the chemical industry.[34] Those that have been issued have mostly been used to finance projects focusing on decarbonisation, given the industry's profile as the largest industrial energy consumer and third-largest industry sub-sector in terms of direct carbon dioxide emissions.[35]

Consequently, the few eligible projects that might have a product stewardship angle have often dealt with the move away from fossil-based feedstock towards 'bio-based' or circular alternatives.

As companies advance in proactively phasing out hazardous chemicals, investors should encourage them to pursue carbon management and benign product design together within their funding programmes. Green bonds from the sector can be made even more credible when accompanied by the exclusion of products meeting criteria for substances of very high concern (SVHCs)– a key consideration in addition to being fossil-free – as well as a robust chemicals management strategy.

Another way would be to invest in companies positioning themselves to address the existing burdens of chemical pollution. Legacy chemicals that have already made their way into the environment can continue to pose burdens even after hazardous chemicals are phased out. Legacy PFAS are a good embodiment of the significant remediation challenges particularly with respect to water pollution.

Investing in companies developing solutions and technologies that can be deployed towards clean-up or companies providing services helping utilities to address contaminated water supply are just two examples of how investors can potentially enable a healthier environment.

However, special attention should be paid to potential conflicts of interest. For example, that companies developing solutions should not also be implicated in related pollution incidents, or that solutions should not be used to preserve the status quo by seeking use-case exemptions in parallel without actively seeking alternatives.

Overall, we believe there is significant scope for investors to address the issue of hazardous chemicals as part of their investment engagement and decisions, thus helping to reduce the impact on biodiversity loss, human health and the wider environment.

---

[1] Global Chemicals Outlook II, United Nations Environment Programme (UNEP), 2019.

[2] Chemicals in our life – chemicals of concern -SVHC, European Chemicals Agency, retrieved July 2023. Global Chemicals Outlook II, UNEP, 2019.

[3] Global Chemicals Outlook II, UNEP, 2019.

[4] Production and consumption of chemicals by hazard class, Eurostat, accessed 31 July 2023. Chemicals can be both hazardous to health and the environment. Due to this overlap, shares cannot be combined.

[5] Share of "Carcinogenic, mutagenic and reprotoxic (CMR) health hazard", and share of "Severe chronic environmental hazard" of total chemical production in Eurostat's database. Actual hazardous chemicals in circulation may differ as this does not account for net imports.

[6] Global Chemicals Outlook II, UNEP, 2019.

[7] This refers to chemicals and chemical mixtures, about a third of which are publicly unknown. The identity of several chemicals can remain publicly unknown as they have been claimed as confidential (50,000) or are ambiguously described (up to 70,000).
Towards a Global Understanding of Chemical Pollution: A First Comprehensive Analysis of National and Regional Chemical Inventories, Environmental Science & Technology, January 2020.

[8] Chemicals for a Sustainable Future, European Environment Agency (EEA), March 2018. EU Chemicals Strategy For Sustainability.

[9] Outside the Safe Operating Space of the Planetary Boundary for Novel Entities, American Chemical Society, January 2022.

[10] The European Environment – State and Outlook 2020, April 2019. In reference to the figures reported by Eurostat.

[11] Chemicals for a Sustainable Future, EEA, March 2018

[12] More than eight in 10 Europeans are worried about the impact of chemicals in everyday products. Attitudes of Europeans towards the Environment, European Union (EU), March 2020.

[13] This perspective is put forward in key policy documents such as the European Green Deal and the EU Chemicals Strategy For Sustainability.

[14] Refers to the planetary boundary on "novel entities" which includes synthetic chemicals. Planetary Boundaries: Guiding Human Development on a Changing Planet, Science, January 2015.

[15] United Nations Sustainable Development Goals 3, 6, and 12 addressing risks within health outcomes, water sanitation, and environmental management across the chemical lifecycle.

[16] Global Assessment Report on Biodiversity and Ecosystem Services, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019.

[17] Top 10 Biodiversity-impact Ranking of Company Industries, Finance for Biodiversity Foundation, April 2023. Note that the study refers to modelled and not actual impacts and was conducted on a selection of companies in the MSCI World Index.

[18] ESG Materiality Map Chemicals, S&P Global, May 2022.

[19] The European Environment – State and Outlook 2020, April 2019.

[20] Based on the Total Number of Persistent Chemicals indicated by sub-sector on the SIN Producers List, accessed 1 August 2023. This database indicates the number of individual substances registered by companies before authorities in the US and EU with no indication of volume. The sub-sectors named above can contain high concentration in a small set of companies.

[21] PFAS, EPA, accessed 1 August 2023; Emerging Chemical Risks in Europe – 'PFAS', EEA, May 2023.

[22] Emerging Chemical Risks in Europe – 'PFAS', EEA, May 2023.

[23] The Cost of Inaction, Nordic Council of Ministers, 2019. Despite the high level of uncertainty, findings suggest that health-related costs of PFAS exposure are substantial.

[24] Forever Pollution: Explore the map of Europe's PFAS contamination, Le Monde, accessed 1 August 2023.

[25] PFAS Sparks a Wave of Litigation in the US Chemical Industry, Sustainalytics, accessed 1 August 2023.

[26] How will tightening 'forever chemicals' (PFAS) regulation impact the manufacturing sector? UBS, July 2023. Countries include Japan, UK, and Canada.

[27] Three PFAS are on the Stockholm Convention on Persistent Organic Pollutants (POPs) list: PFOS, PFOA, and PFHxS.

[28] Restriction Proposal, ECHA, accessed 1 August 2023.

[29] How will tightening 'forever chemicals' (PFAS) regulation impact the manufacturing sector? UBS, July 2023.

[30] Eight manufacturers of fluoropolymers are estimated to make up 60% of global market according to Annex A of the Restriction Proposal, ECHA, accessed 1 August 2023. Top 12 PFAS producers in the world and the staggering societal cost of PFAS pollution, ChemSec, May 2023. Also based on PFAS registered on the SIN Producers List, accessed 1 August 2023.

[31] How will tightening 'forever chemicals' (PFAS) regulation impact the manufacturing sector? UBS, July 2023.

[32] ChemScore Report, ChemSec, accessed 12 October 2023.

[33] This refers to the factors 'Chemical Safety' and 'Toxic Emissions and Waste' in the following: Industry Report – Commodity Chemicals, MSCI, May 2023; Industry Report – Diversified Chemicals, MSCI, June 2023; Industry Report – Specialty Chemicals, MSCI, April 2023.

[34] Less than 5% of total debt outstanding has been issued in ESG-labelled format whether Use of Proceeds such as green, social or sustainable, or in Sustainability-Linked (Chemicals Sector: Synthesising impact with SLBs, Anthropocene Fixed Income Institute, 13 July 2023). Meanwhile of the 54 companies rated by ChemScore in 2022, as of end-August 2023, only 12 have issued green bonds or sustainability bonds that include green projects

[35] Chemicals, IEA, accessed 28 July 2023.