



Back to Blue

An initiative of
Economist Impact and The Nippon Foundation

THE ROLE OF FINANCE IN ADDRESSING MARINE CHEMICAL POLLUTION

- excerpts from The Invisible Wave



About The Invisible Wave

Chemical pollution—of land, air, rivers, watersheds—has been a festering issue for decades, occasionally prompting resolute action. But only recently has the scale of chemical pollution become more apparent. Chemicals in the form of nutrients, heavy metals, persistent organic pollutants, sewage and many others are being uncovered almost everywhere—in soils, aquifers, food chains, remote ecosystems such as the Antarctic, in the highest and lowest places on Earth, and in humans. As evidence accumulates of its impact on nature and human health, there is a gathering consensus that chemical pollution is a first-order global threat, alongside climate change and biodiversity loss, and often compounding the impacts of these other issues.

This awakening to the systemic nature of chemical pollution understandably focuses on where humans live, on land. This report seeks to raise awareness of marine chemical pollution, as its scale and potential impact—and thus urgency—are not widely appreciated, and to focus minds on delivering solutions that prevent, reduce and minimise chemical pollution in the marine environment. An aspiration towards zero pollution is gaining currency. The hope is not so much that the ocean can be free of pollution, which may be impossible, but rather that more will be accomplished if the goal is seen to be ambitious. Back to Blue shares this aspiration.

The Back to Blue initiative grew out of the findings of our 2021 global survey, which showed that plastic and chemical pollution are the two greatest concerns that people have about ocean health, with climate change ranked third. As this report will show, the three are profoundly connected.

The ocean is fundamentally important to all life on Earth. It covers 70% of the planet's surface and comprises 99% of its habitable space.¹ It is therefore remarkable that there has not yet been a serious scientific assessment at scale of marine chemical pollution and its impact on life in the ocean, marine biodiversity and how ocean ecosystems function, and ultimately on the ocean's overall health. The Invisible Wave seeks to set out clearly what is known about its impact and where our knowledge gaps sit, prompting the urgent need for more research.

This urgency is underscored by a further point that this report seeks to demonstrate: that despite lacking a complete picture of the dangers posed by marine chemical pollution, failing to act now is a risk too far. The report therefore suggests solutions for various groups of stakeholders that, if taken, would ameliorate chemical pollution in the marine environment. It is a starting point: mapping out the paths to those solutions is the function and aim of a research and engagement programme

that the Back to Blue initiative will undertake following the launch of the report.

Despite lacking a complete picture of the dangers posed by marine chemical pollution, failing to act now is a risk too far

The marine environment

This report concerns itself with the impact of chemicals on the marine environment. In other words, we are looking at the saltwater part of the hydrosphere: from the deep ocean to coastal seas, bays and estuaries, and including the array of ecosystems found there, including coral reefs, seagrass beds, mangroves, mudflats, sediments and water columns. The freshwater part of the hydrosphere—rivers, land run-off and groundwater—is a key transport mechanism for chemical pollution reaching the ocean and coastal areas, but otherwise is not a focus of this report.

The importance of the saltwater hydrosphere to life on Earth is greatly underestimated. Not only is the ocean a crucial food source for billions of people, but it also provides more than half the planet's atmospheric oxygen, acts as a massive carbon sink (without which global warming would be far worse), regulates the weather and climate, and provides countless formal and informal jobs in economically crucial activities that include fishing, shipping, tourism, recreation and offshore hydrocarbon exploration. The ocean provides services estimated to be worth trillions of dollars—services that are at risk from marine chemical pollution.

Despite the ocean's centrality to all life on Earth, humanity's view has been that the seas have an infinite capacity to absorb waste. That is wrong. While there is patently a need for more research on the harm that chemicals inflict on the marine environment, the existing evidence is clear: chemical pollution has damaged marine

biota, from polar bears to plankton to large-scale ecosystems such as the seas and beyond. As the production and use of chemicals rises, so inevitably will their impact escalate too.

There are many reasons why this matters. Science has already shown that climate change is in large part due to human activities, and this anthropogenic cause is true too for marine chemical pollution. Importantly, the two are linked: science is learning that synthetic chemicals in the seas can increase climate change's negative effects, while the effects of climate change (including warming water temperatures, increased acidification due to higher carbon levels, and greater salinity) can heighten the negative effects that chemicals have in the marine environment. In other words, climate change and marine chemical pollution are deeply interlinked. Consequently, it is crucial to tackle both.

Failing to do so will lead to accelerated damage to marine life and biodiversity—"the variety of life ... and the natural patterns it forms"²—and would come even as the number of species on Earth is declining at perhaps its most rapid rate due to factors like climate change, pollution and activities like overfishing. And while biodiversity loss is common to the terrestrial environment and ocean, one key difference is that we know very little about countless marine creatures. Consequently, when it comes to the ocean, we often do not even know what we are losing.³

This damage to marine biodiversity, and the complex interactions that underpin it, has important knock-on effects on the functioning and resilience of ocean ecosystems. Exactly how such ecosystems are affected by complex and multiple stresses such as warming waters, acidification, chemical pollution and the growing industrialisation of the seas, including overfishing, is still not well understood. The science is in its infancy. Yet rising levels of marine chemical pollution are an important factor in

undermining, even potentially imperilling, the capacity of marine ecosystems to provide the services on which all of humanity relies, and that are crucial to the stability of wider systems, including climate and the carbon cycle.

Why marine chemical pollution?

Marine pollution as a broad topic has deservedly gained greater attention in recent years, with plastic taking centre stage. As many of our interviewees pointed out, this is because plastic pollution is highly visible and emotive: who can forget the video of a turtle with a plastic straw in its nostril, or media coverage of whales and seabirds found dead with plastic waste in their stomachs?

Plastic is a challenge of epic proportions and complexity, and is also important to the chemicals story. Marine chemical pollution, however, is of a different order:

- For a start, it is invisible and, in a world where awareness-raising is often most effective when it is visual, as the turtle video shows, this hinders understanding its scope and significance.
- Second, synthetic chemicals production is increasing rapidly and set to grow fastest in the coming years and decades, with many new chemicals being created and circulated. The green transition is an important driver of these trends.
- Third, production is shifting to middle- and lower-income countries where regulations to manage chemicals and combat chemical pollution are typically limited and less effective. At the same time, higher-income countries that have addressed conventional chemical contaminants to some degree face new challenges with the relentless pace of chemicals' innovation and associated pollution risks.

- Fourth, scientists are open about the need for more research to better determine how marine chemical pollution will damage the ocean, which is not surprising given that there are tens of thousands of chemicals with, in most cases, completely unknown effects on human health and the environment.
- And fifth, while marine chemical pollution continues to be a threat in wealthier countries, much of the new and incremental damage taking place globally is in poorer countries where people and ecosystems are at a great remove from the markets ultimately driving the increased use of chemicals. This further decreases its visibility.

For these reasons and more, as we explore in detail in this report, marine chemical pollution is an under-appreciated and underestimated danger. It must not be.

Key chemicals and their sources

A recent study found that there are at least 350,000 synthetic chemicals and mixtures of chemicals, with thousands being added each year.⁴ Yet, worryingly, we know almost nothing about most of their health and environmental consequences. Additionally, even when chemicals are deemed so harmful that they must be replaced, their replacements are also often found to be toxic (known as regrettable substitution).

In recent years, hundreds of chemicals have been placed on lists for banning, restriction or substitution. Of particular concern are persistent organic pollutants (POPs), which, as the name indicates, linger in the environment, can travel long distances, and have serious effects on the environment and biota. Although hundreds of chemicals have been recognised as POPs, some researchers believe thousands of other unrestricted chemicals meet the requirements to be classified that way.

The sheer volume of chemicals makes drafting a list of the worst of them a significant challenge, and inevitably this report does not provide a comprehensive list of all chemicals of concern. For that reason, our expert panelists have suggested a list of classes or groups of chemicals that they feel are the most severe or that could have the greatest impact in terms of:

- Environmental health, particularly the health of the ocean.
- Human health.
- Economics (quantifying this is a long-term goal of the Back to Blue initiative).

Given their effects, POPs are an obvious category for inclusion, and feature heavily in this report. The others include heavy metals, nutrients, pesticides, plastics, pharmaceuticals, radioactive materials, oil products, household chemicals and pseudo-persistent chemicals. While some of these chemicals are banned or restricted, most are not.

By default, these are the chemicals or chemical groups that we know most about. However, future research will surely identify others that constitute a greater threat or that inflict increased harm to marine ecosystems. It is entirely possible, then, that the potential impact of marine chemical pollution will prove to be wider and more serious than currently estimated.

That raises two important questions:

- What effects do these chemicals have in the marine environment?
- How do they enter the marine environment?

Answering the first with accuracy requires more research, particularly when it comes to determining how chemicals react individually and collectively in the real world. The answer to

the second question begins by identifying the various parties involved in the chemicals value chain: the chemicals industry (which to date has externalised its costs), its clients (more than 95% of manufactured goods contain chemicals) and financiers. It also includes regulators and governments (with public sector sources of pollution including dredging and defence), end-of-life operators and civil society.

Consumers are also of note. Sources of marine chemical pollution here include pesticides, fertilisers and plastics, with pharmaceuticals and personal care products—sometimes referred to as chemicals of emerging concern—becoming increasingly important due in part to the growth in the number and size of coastal cities and towns in recent decades, and with the background rise in population numbers and incomes globally.

Our efforts to map accountability across the value chain of the chemicals' lifecycle also includes the pre-production phase: extracting and processing the fossil fuels, minerals and metals used to manufacture chemicals, with oil and gas majors like ExxonMobil, Shell and BP involved in both extraction and chemicals manufacturing. Given the projected growth of the chemicals industry and its role at the heart of marine chemical pollution, as well as often-lax industry oversight, accountability will become more important going forward.

The end-of-life phase of the chemicals value chain is another important source of marine chemical pollution, with municipal waste, e-waste and untreated sewage growing in importance. Plastics, for instance, are laced not only with chemicals from the manufacturing process, but they also break down into micro- and nano-sized particles that can adsorb chemicals in the water and transport them vast distances.

Overseeing, in theory at least, this vast value chain from extraction to disposal are regulators.

The success of any strategy to combat marine chemical pollution hinges on regulators enacting and enforcing stricter rules on pollution, and working in concert with peers elsewhere to combat regulatory arbitrage, where firms move to jurisdictions with less oversight. Encouragingly, research by the European Commission shows that regulations bring numerous benefits, cutting the costs of marine chemical pollution on the environment and human health, and lowering water pollution levels.

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Regulations, properly enforced, also require that producers adhere to common standards, and should be employed to ensure that product designers factor in end-of-life aspects, particularly impacts on the marine environment.

The dangers of inaction

Most marine chemical pollution is caused by humans, and most of that has taken place in the past 100 years. Given that the pace of chemical production and innovation is predicted to rise rapidly in the coming years and decades, and that much of the production growth will happen in countries with less regulation, it is likely that marine chemical pollution will get significantly worse unless action is taken.

Assessing the scope, extent and impact of marine chemical pollution, now and in the future, is a pressing task for scientists and environmentalists, as is evaluating the cost of such pollution. Armed with a clearer picture, action is more likely to succeed. And while inaction remains a possible response, it is no longer necessarily the likely response. The past few years have seen a broad awakening to the problem of pollution. The UN Environment Programme (UNEP) has elevated

pollution (chemicals, plastics and waste) alongside climate change and biodiversity loss as one of three interconnected anthropogenic crises. Pollution is one of the key stresses that led the UN to state that ocean sustainability is “under severe threat”, and that addressing pollution was vital to achieve the UN Sustainable Development Goals (SDGs). Meanwhile, *New Scientist* rang the alarm in mid-2021 with the headline: “Why chemical pollution is turning into a third great planetary crisis”.⁵ The Stockholm Resilience Center has, for the past decade, included pollution as one of several planetary boundaries within which humans need to operate to ensure stable Earth systems.

The language of crisis and emergency is nothing if not a call to action. While more research (and funding) is needed to close some significant knowledge gaps, it makes no sense to refrain from acting until every gap is filled. After all, it will be decades before we understand the effects that the tens of thousands of synthetic chemicals might have on health and the environment, whether individually or collectively, and the world does not have that much time. Additionally, intervening is in line with the precautionary principle, which demands that we act now on the grounds that we know enough about the effects of marine chemical pollution to be concerned about its potential effects.

A large part of this burden to act must fall on the chemicals industry and on its clients in the broader business world. In part, this will require that the business community factor in its impact on marine chemical pollution in the way that it has started to do on climate change.

If the world does not act, it is reasonable to assume that the problem of marine chemical pollution will worsen. Rising production volumes is one reason, but there are others like weak regulation and enforcement, poor product design, the lack of domestic and industrial wastewater treatment in much of the world, and insufficient waste management.

Yet perhaps the biggest problem, our experts said, is assuming that we can keep dumping waste into the ocean because it is vast enough to absorb and dilute the array of toxic substances that we produce. As this report shows, we cannot.

A global problem that lacks local research

The transboundary nature of marine chemical pollution means it affects everyone, no matter how far they are from its production. Toxins have been found in islanders in the Pacific and the Faroes, as well as in people living in the Arctic Circle—and, notably, in women and children in poorer countries who rely on seafood.

Marine chemical pollution, in other words, is a global problem. That said, much of our understanding of its economic costs is derived from a few high-income countries, which means that research is lacking that would be most relevant to billions of people for whom the seas are crucial to lives and livelihoods. This needs to be remedied. Funding should be targeted at the chemicals with the greatest potential to harm ocean biota and, in turn, human health and local economies.

It is also clear that much more research is needed on chemicals and their impact—particularly in conjunction with other chemicals in the marine environment. This needs to factor in climate change variables like temperature, acidity and salinity, as each can affect how chemicals react.

One result of the research bias favouring wealthier nations is that the studies cited often examine marine chemical pollution in the rich world. While this is an unavoidable consequence, we have kept this imbalance in our minds and endeavoured where possible to incorporate research that covers poorer nations. Clearly, a key task for the future is tipping the scales back.

A final point on research is that what is known needs to be brought to the wider community.

As UNEP notes, this includes improving the flow of communication between researchers and policymakers. This could help to motivate change by quantifying the costs of inaction and the rewards of intervention. Our bespoke case study on marine chemical pollution in the US Gulf of Mexico, for instance, found that dead zones worsening—where the sea has been starved of oxygen owing to pollution—would cost the US about US\$838m a year in fisheries revenue. Taking measures to reduce dead zones, on the other hand, would boost marine biodiversity and therefore increase revenue by more than US\$117m.

Industry

As the ultimate source of chemical pollution, the chemicals industry has the primary responsibility to act. It could hugely influence resolving the issue. However, if it fails to act, it could face an existential crisis for two reasons. First, this industry is dependent on fossil fuels to manufacture feedstocks, with the likely regulatory and financial pressures this carbon-heavy operational base will bring. Second, owing to the growing understanding of the impacts of chemical pollution on environmental and human health, there is increasing consumer and investor pressure on this issue, which could ultimately prove as critical as climate change.

Additional pressure on laggards in the sector will come as more innovative firms step up in areas like green chemistry, which could hold the key to sustainable change for the sector, even as clients come under pressure from customers to better manage the chemicals in their product portfolios, and as public awareness compels governments to enforce stricter regulations.

Surprisingly, though, industry efforts have been piecemeal at best, even though the momentum for a circular economy is growing—as with plastics. Accelerating change will require a shift at the corporate culture and systems levels.

Conclusion

Although marine chemical pollution remains a largely invisible problem, this is starting to change. There is now enough evidence to show that the problem is extensive and worsening. Moreover, given the crucial role that the ocean plays in regulating climate and weather, generating oxygen, absorbing carbon, and providing food for billions of people, we also know that inflicting further harm risks too much.

Action, then, is vital. It requires that all stakeholders play their part. Although marine chemical pollution is a huge challenge to solve, it is not impossible. In mapping the sources of marine chemical pollution, the consequences (as we know them) and a series of paths that can resolve one of the defining issues of our times, this report and the Back to Blue initiative aim to raise awareness and galvanise action from all of those involved.

The role of finance in addressing marine pollution

This excerpt of The Invisible Wave the role that finance can play in tackling marine chemical pollution and assesses the steps that financiers and their clients need to take—not least given the increasing prominence of ESG considerations, and the shift within ESG from solely green factors to blue factors. It also examines the need for better information and data to help investors in their decision-making, and the risks and rewards of a chemicals industry in transition, and assesses how that transition can be funded.

7.1 Principal findings and recommendations

- **Investors are not sufficiently aware of the problem of marine chemical pollution: better information is needed.**
A lack of awareness among the finance community about the profoundly damaging effects of marine chemical pollution is a barrier to change: the current level of awareness mirrors the sector's understanding of climate change in the mid-2000s. While demand for sustainability-linked investments is strong, data about marine chemical pollution, the role that industry plays and the possible impact of regulation are patchy. Better information about the material risks the chemical sector will face from a transition to a zero-pollution ocean will be an important first step for any finance-sector-led solution—in tandem with an appreciation of the potential rewards for early movers.
- **Pressure on sustainability issues could encompass zero pollution, but the changing nature of the chemicals sector is a complication.**
The chemicals sector is beginning to face pressure from investors to reduce its environmental impact. Increased regulatory scrutiny and the burgeoning environmental, social and governance (ESG) investment market means that this pressure will increase. Until now, the sustainability focus has been on decarbonisation and plastics—challenges that few chemicals-sector players have genuinely begun to address. New regulatory taxonomies like the international Taskforce on Nature-related Financial Disclosures (TNFD) will radically reshape how companies measure and disclose their impact on the marine environment. As yet, detailed ESG and sustainability reporting is far from uniform across the chemicals sector, though some producers and end users are starting to respond to investors' demands to provide it.

A complication is the changing ownership of the sector, with a smaller proportion of revenues generated by publicly listed companies that are the initial targets of new ESG rules and investor pressure.

- **Clarifying transition risks and potential rewards will be crucial for investors.** Many of the net-zero transition risks the chemicals sector faces also apply to the transition to a low-pollution sector (even though solving one will not automatically address the other). Though the path to a zero-pollution ocean is not yet clear, the financial risks that industry faces—including difficulty accessing finance, litigation, reputational damage and changing downstream market conditions—are similar, and increasingly apparent. On the reward side, the opportunities that may arise from the transition to a low-carbon economy through innovation and first-mover advantage are considerable, in particular to those that can attract financing on a sufficient scale.

The most important challenge in catalysing finance-sector-led solutions to marine chemical pollution is making the necessary transition a financially attractive and investable proposition

- **Eliminating marine chemical pollution needs to be an investable proposition.** The transition to a low-pollution chemicals industry will require targeted engagement of “true believers” in the finance sector. Investment guidelines that integrate strict assessment frameworks will be crucial. Additional funding through sustainability bonds, blended finance and impact investing will have a helpful role to play. Private-equity engagement and M&A will be crucial to innovation in the sector. Ultimately, however, chemicals companies will need access to very

large sums of money via traditional sources if they are to undertake the type of capital-intensive and long-term transition required, especially given the commercial pressures most industry participants face. The most important challenge in catalysing finance-sector-led solutions to marine chemical pollution is making the necessary transition a financially attractive and investable proposition.

- **A finance wish list: five steps for investor-led action on zero marine chemical pollution.**
 1. Develop **improved ESG guidance and clear regulatory standards**, particularly around emerging nature-related frameworks such as the TNFD.
 2. Publish **more and better data**, particularly around companies’ impacts on marine chemical pollution.
 3. Based on the climate-related risks and transition framework, deliver a template to investors that **sets out the risks that investors will face** during the transition to a zero-pollution ocean.
 4. Develop processes that help **industry and investors collaborate to uncover opportunities** for transition financing, aligning the supply of and demand for large-scale deals.
 5. Use **private equity and M&A activity** to drive innovation and scale in the burgeoning green chemistry start-up scene.

The enormous cost of transitioning legacy processes and products to less-polluting alternatives is perhaps the most significant barrier to the transition to a zero-pollution ocean, as the previous section explained. Stricter environmental regulations and customer demand are likely to result in significant transition costs, which will require capital.

Less innovative companies will be particularly exposed. The finance sector, then, can play a critical role in determining what the chemical value chain of the future looks like: with innovative, clean and green chemicals making up the products that we buy.

The good news is that investors are increasingly concerned about the environmental and social impact of the ventures they fund. For an increasingly large proportion of investors, new regulatory requirements and an appreciation of the long-term financial risks of climate change and other ESG factors make sustainability an important consideration in investment decisions. On current trends, around one-third of all assets under management will be ESG-focused by 2025: around US\$53 trillion worth.⁶ This tsunami of capital could present an unmatched opportunity to address the sources of marine chemical pollution.

As in any capital allocation decision, investors will need to balance risk and opportunity. Investors will first need to understand, and then to mitigate, the financial, regulatory, legal and reputational risks that companies along the chemical supply chain will face due to pollution, including marine pollution, which could undermine their viability. They will also be attracted to the opportunity to profit from the returns due to those companies that take the lead now in the capital-intensive process of transitioning to a less-polluting future. If the finance sector is to contribute to achieving a zero-pollution ocean, both aspects will be crucial.

It is important to note that the ESG finance revolution, which has so far focused on large, listed companies, is not a panacea. ESG is, so far, less of a consideration for small and mid-sized enterprises (SMEs), private companies and state-owned enterprises, all of which rely less on capital markets for funding and may face less regulatory scrutiny. Likewise, it is still unclear the extent to which private-equity investors take ESG considerations into account. Some consider it as

carefully as large institutional investors. For others, it appears not to be a consideration at all.⁷ Yet one thing is clear: if the chemicals industry is to transition to a zero-pollution model, finance will have an important role to play.

7.2 Current approaches: From net zero to zero pollution

The evolution of green finance standards

One reason for the central role of finance is regulatory: financial regulators and stock exchanges in many jurisdictions are rapidly introducing ESG disclosure requirements for companies and investors. Rules vary between jurisdictions, but the fundamentals are the same:

1. Businesses or investors must disclose any environmental, social or governance issue that could be a material financial risk to their company or investment.
2. Businesses or investors must disclose their impact on a particular ESG issue that the regulator or exchange deems essential. This could mean, for example, that chemicals companies could be required to disclose whether there have been any breaches of local environmental laws that prohibit marine pollution. Investors could be required to report whether companies in their portfolios have breached such rules.
3. Increasingly, businesses and investors are required to report on and comply with ESG rules. In the example above, this would mean not just disclosing whether there have been breaches of environmental laws but also showing a credible plan to reduce or eliminate violations in the future. Under this scenario, an investor would need to work with polluting portfolio companies to help them improve their performance or divest from that company to be compliant.

Two important pieces of European Union legislation are reshaping how companies and investors think about their environmental and social impact: the EU Taxonomy and the Sustainable Finance Disclosure Regulation (SFDR).

“Corporate sustainability is now mainstream, much thanks to the EU Taxonomy,” says Erik Giercksky, head of the Business Action Platform for Ocean at the UN Global Compact

The Taxonomy and the SFDR are globally significant for a few reasons. First, they apply to non-EU funds and businesses that market their products within the EU.⁸ Second, the EU is often seen as a de facto global rule-setter.⁹ In November 2021, the EU and China published a “Common Ground Taxonomy” on climate mitigation, which identifies areas of agreement and convergence between the two jurisdictions’ rules on climate disclosure.¹⁰ The UK looks set to use the EU rules as a template for its own legislation.¹¹

Even in areas where the rules do not converge, the experience of the General Data Protection Regulation, which regulates how companies use their customers’ data, suggests that many multinational businesses find it more practical to comply with EU rules across their operations voluntarily. They may assume that EU rules indicate the future global direction of regulatory travel.

It is difficult to understate the impact these combined pieces of legislation have had in a relatively short period. “Corporate sustainability is now mainstream, much thanks to the EU Taxonomy,” says Erik Giercksky, head of the Business Action Platform for Ocean at the UN Global Compact. Where responsibility for ESG previously sat with the sustainability department, it has now become the purview of the chief financial officer, he says. A company’s environmental performance was once a public-relations concern. Now it is critical for compliance and investor relations.

Jurisdictions that have developed taxonomies influenced by the EU Taxonomy

Countries that use the EU Taxonomy as a benchmark:

- Mexico
- United Kingdom
- Georgia
- South Africa
- Bangladesh

Countries that use the EU Taxonomy as a source of inspiration:

- Chile
- Canada
- Malaysia
- Singapore

Source: Natixis Corporate and Investment Banking¹²

Alongside mandatory ESG compliance requirements, it is now commonplace for large companies to report voluntarily on their ESG performance. Primarily, this is to meet the demands of existing investors and attract the growing avalanche of ESG-focused capital.

Detailed ESG and sustainability reporting is far from ubiquitous across the chemicals sector

Several frameworks for reporting ESG performance exist, and no single framework is dominant in the chemicals industry. However, most of the leading frameworks cover pollution in some way. Some noteworthy examples include:

- The **Task Force on Climate-related Financial Disclosures (TCFD)**, a framework for companies to report on the financial risks they face due to climate change, is currently voluntary. However, financial regulators are beginning to adopt its recommendations, and in some jurisdictions, it may become mandatory for large companies to show that they are TCFD-compliant (as it already is in the finance sector in New Zealand).¹³ The TCFD has worked with a group of chemicals companies to develop detailed advice on how the industry can implement the framework.¹⁴
- The **Global Reporting Initiative (GRI)** is a standards organisation that allows businesses to measure and report on their environmental and social impacts. The GRI is developing sector-specific standards for 40 industries, including the chemicals industry.¹⁵
- The **International Sustainability Standards Board**, launched at the COP26 climate negotiations in November 2021, will attempt to create **a single, harmonised**

reporting framework.¹⁶ One of its constituent members, formerly called the Sustainable Accounting Standards Board, has 77 industry-specific standards, including one for the chemicals sector.¹⁷

- The **UN Global Compact** is a set of 10 environmental and social principles that CEOs can pledge to adhere to, aligned with the UN SDGs.¹⁸

These are just a few examples of what has developed into a morass of competing and overlapping frameworks, leading to frustration among investors who say it is complicated to compare businesses' ESG credentials accurately. Adding to the confusion are the efforts of several for-profit ratings agencies, such as S&P Global, MSCI and Sustainalytics, whose scores for specific companies may not agree with each other.

Detailed ESG and sustainability reporting is far from ubiquitous across the chemicals sector. Standout performers are typically the large, listed companies looking to attract investment from global capital markets. SMEs, private companies and state-owned enterprises are much less likely to publish ESG-related information. These account for much of the chemicals production sector. Yet those that do demonstrate that a clear and encouraging pathway could set a standard for the industry. Some examples include:

- Thailand's Indorama Ventures, which publishes a detailed sustainability report using the GRI. Indorama has undertaken an extensive stakeholder analysis to determine 13 financially material ESG topics on which to centre its sustainability strategy. These topics include product stewardship (which covers product toxicity), supply chain management, compliance management, plastic waste and recycling.¹⁹

- Dutch conglomerate DSM, which publishes an integrated annual report combining both ESG and financial information. The headline environmental figures that DSM reports are on climate, but its most recent (2020) report also includes nature and biodiversity and product stewardship.²⁰
- Sherwin Williams, a US-based paint and coating manufacturer, publishes a comprehensive annual sustainability report. Its Global Product Stewardship organisation monitors environmental trends and regulations, and works with industry associations to proactively improve its products.²¹

DSM says nature and biodiversity are of high societal interest and have a moderate to a significant impact on its business

Materiality matrix 2020



Source: DSM, Integrated Report (2020)

ESG—from green to blue

So far, most of the E in ESG has focused on persuading companies to reduce their climate emissions—hence the global wave of corporate pledges to reach a net-zero carbon impact. Still, there is growing investor interest in the impact of the economy on nature more broadly, says Matt Jones, head of nature economy at the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC). While the focus on climate will remain, momentum is also growing for investments that are net-zero, nature-positive and socially just.

While the focus on climate will remain, momentum is also growing for nature-positive investments, which also take other environment-related risks into account

This trend will be an essential driver in the push for a zero-pollution ocean. The EU Taxonomy, for example, has until now focused on climate impacts. In 2022, it expects to publish new rules on:

- The sustainable use and protection of water and marine resources.
- The transition to a circular economy, waste prevention and recycling.
- Pollution prevention and control.
- The protection of biodiversity and ecosystems.²²

These new taxonomies could radically reshape how companies measure and disclose their impact on the marine environment and how investors assess their portfolio companies' environmental performance.

Another important example is the international Taskforce on Nature-related Financial Disclosures (TNFD) framework, which will build on its climate-related cousin and launch in 2023. The

TNFD will consider biodiversity and non-climate related ecosystem impacts, including pollution, and will likely adopt a similar framework to the TCFD considering:

- Nature-related physical risks and opportunities, including biodiversity loss, ecosystem damage and natural disasters.
- Nature-related transition risks, including policy, legal, technology and market changes.
- Nature-related systemic risks across economies (although these will be more of a concern for governments and regulators than for investors and businesses).
- Litigation or liability risks.²³

The prospect of these two initiatives means that many investors are, for the first time, beginning to think about broader environmental impacts as well as climate. “2020 was the year when investors started to ask different questions,” says Anne-Sofie Bäckar, executive director of ChemSec. “They not only asked about climate but also about water and chemicals with a much broader interest than we had seen before.”

Blue finance innovation

The finance sector is, of course, not homogeneous. Across the industry, attitudes, awareness and understanding of the risks and opportunities in sustainability-related investing vary widely. It is also essential to distinguish between different types of investors, each of which has differing incentives and motivations.

Asset owners such as sovereign wealth and pension funds look for returns over decades rather than months. They may be more likely to consider the long-term financial, regulatory, legal or reputational risks their portfolio companies may face due to marine chemical pollution. Insurance and reinsurance companies also take a typically long-term approach to risk to offset future liabilities.

Asset managers and other intermediaries, on the other hand, invest on their clients' behalf. They can advise on sustainability-related considerations, but ultimately, client demand will determine how deeply embedded these considerations become. ESG investing is now very popular due to the (hotly debated) perception that it provides superior returns.²⁴ Should ESG funds begin to underperform the market, it is not clear that client demand would remain as strong.

These subsectors of the finance industry are essential because of their scale. Yet smaller players have typically been the most innovative and proactive when it comes to sustainable investing. Impact investors, which aim to generate an environmental or social return and financial returns, and blended finance, which brings together private-sector investors with development banks and philanthropic capital, are the main drivers of a promising yet nascent blue-finance trend.

Mainstream private-sector capital will be required to finance the large-scale transition to a zero-pollution ocean

Blue bonds (like green bonds) are similar to traditional bonds: investors provide the issuer with upfront capital in return for the promise of future interest payments. Unlike conventional bonds, the money must be invested in projects that advance ocean health.²⁵ Blue bonds are modelled on the booming green-bond market, which reached US\$1.1 trillion in 2020.²⁶

Blue bonds account for only a fraction of this, yet promising case studies have emerged. In 2018 Seychelles launched the world's first sovereign blue bond, raising US\$15m to finance the transition to a sustainable fishing industry.²⁷ Then, in 2019, the Nordic Investment Bank issued a blue bond aimed at rehabilitating the Baltic Sea, raising US\$200m.²⁸

A significant recent development is the Asian Development Bank's Action Plan for Healthy Oceans and Sustainable Blue Economies, which commits US\$5bn of investment and technical assistance to the development of a sustainable blue economy between 2019 and 2024.²⁹ In September 2021, it issued US\$300m-worth of AUD- and NZD-denominated blue bonds to Japan's Dai-ichi Life Insurance Company and Meiji Yasuda Life Insurance Company. The ADB says the bonds will finance projects that "enhance ocean health through ecosystem restoration, natural resources management, sustainable fisheries and aquaculture, reduction of coastal pollution, circular economy, marine renewable energy, and green ports and shipping."³⁰

These examples are encouraging, but they are still small in scale and often driven by sovereign issuers. Mainstream private-sector investors will be required to finance the large-scale transition to a zero-pollution ocean.

Several chemicals companies have secured discounted loans attached to sustainability-linked performance criteria. In 2018, DSM concluded a €1bn line of credit to finance emissions reduction.³¹ Corporate bonds may provide another vehicle. In 2020, BASF issued what it said was the industry's first green bond, raising €1bn to finance its sustainability strategy.³² The green-bond market can provide a helpful template for ocean-linked blue bonds, according to the Blue Natural Capital Financing Facility.³³

Sustainability-linked loans are emerging as a viable source of capital in the chemicals sector

Green trailblazers

Several European and Asian chemical firms have taken out sustainability-linked loans.

Company	Amount	Metric for interest rate
DSM	€1bn (about \$1.1bn) credit line	Greenhouse gas emissions
Indorama Ventures	€100m and \$100m loans	Overall environmental performance
Kemira	€400m credit line	Overall environmental performance
Solvay	€2bn credit line	Greenhouse gas emissions
Stora Enso	SEK 6 billion (about \$635m) green bonds	Overall environmental performance

Source: Chemical and Engineering News (2019)

But for scale, blue-finance innovation requires better standards and guidelines. Several initiatives and groupings aimed at creating common standards and practices to drive sustainable investing have emerged. These could be a crucial driver of awareness and investment in addressing marine chemical pollution.

For scale, blue-finance innovation requires better standards and guidelines

One important group is the United Nations Environment Programme Finance Initiative (UNEP FI), which works with 400 private-sector financial institutions, including banks, investors and insurers.³⁴ The Sustainable Blue Economy Finance Principles were released in 2018 as “the world’s first global guiding framework for banks, insurers and investors to finance a sustainable blue economy.”³⁵ The principles include practical guidance on five key ocean-linked sectors: seafood, ports, maritime transport, coastal and marine tourism, and marine renewable energy.³⁶ UNEP FI is in the process of developing new guidance for other ocean-dependent industries.

Similarly, the UN Global Compact’s Sustainable Ocean Business Action Platform has developed a set of Sustainable Ocean Principles. Ending waste entering the ocean is a crucial focus, particularly plastic waste and nutrient runoff from farms and wastewater. Major investment funds are working with the UN Global Compact to support companies using the principles as a reporting mechanism, says Mr Giercksky of the Compact’s Business Action Platform for the Ocean. In the future, he hopes, a wide range of insurance companies, lending banks and investment funds will ask their portfolio companies to report against the principles. “In a couple of years, this might prove to be a major game-changer” for ocean health, he says.

“Companies have a responsibility towards their shareholders to align with the Sustainable Ocean Principles. This shows that they are delivering on the expectations in the market,” according to Mr Giercksky. “We need regulations to have a fair playing field, but while we wait for that to happen, the business sector can act. Governments do not make these principles. They are made by industry, and it works seamlessly.”

7.3 Barriers to progress: Low awareness and misaligned incentives

Lack of awareness, lack of data

Investors remain largely unaware of the critical drivers of and solutions to marine chemical pollution. “The broad issue of chemical pollution tends to sit lower on investors’ agendas than other areas of concern,” says Eugenie Mathieu of Aviva Investors. Eric Usher, head of UNEP FI, agrees: “For the blue economy overall, we are still very much in awareness-raising mode, trying to get the finance industry to understand the nature of the problem.”

If investors’ understanding of marine chemical pollution comes to equal their understanding today of climate-related risk and opportunity, the outlook for a zero-pollution ocean may be very different—and much more encouraging

This lack of awareness mirrors, in many ways, the sector’s understanding of climate change in the mid-2000s. When the insurance company Allianz and the environmental NGO WWF released their 2005 report, “Climate Change & the Financial Sector: An Agenda for Action,” they began with a statement of fact that few would think was necessary today: “Climate change is real.” The report then outlined the opportunities and the risks to the finance sector of climate change: knowledge that just 15 years later is mainstream and ubiquitous.³⁷

If investors’ understanding of marine chemical pollution comes to equal their understanding today of climate-related risk and opportunity, the outlook for a zero-pollution ocean may be very different—and much more encouraging.

Significantly, investors’ lack of awareness extends not just to the effects of chemical pollution on the marine environment itself but also to which sectors and companies are contributing to it. “There is currently a clear lack of data, particularly when it comes to assessing which companies are having the most detrimental impact,” says Ms Mathieu. “A ranking of the companies deemed to be causing the most pollution [in the ocean] and similarly of their efforts to minimise this impact would be particularly useful. Likewise, a ranking of which companies are in breach of environmental regulations would likely be of interest to a range of investors.”

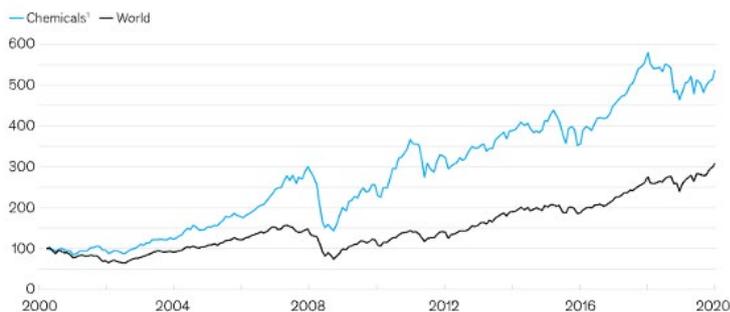
“Important data gaps remain, notably concerning the natural capital, the benefits of a sustainable ocean for the people, and the environmental and resource productivity of the ocean economy,” agrees Ivan Hašič, senior economist at the Organisation for Economic Co-operation and Development (OECD).

Pressure for profits, not progress

It is also important to recognise that—despite the booming ESG market—sustainability is not a crucial determinant of many investors’ decision-making. This appears to be particularly the case for the chemicals sector, which, after many decades of delivering spectacular returns, has been on a bumpy ride since 2018.³⁸ The industry has long been the subject of campaigns by activist investors intent on forcing managers to slash costs and focus on growth,³⁹ and M&A activity picked up in 2021. Sustainability is one factor behind this new wave of acquisitions, but the search for high-margin, pandemic-proof products appears to be the primary driver.⁴⁰ In this context, it is not difficult to imagine why CEOs of public chemicals companies seem to be more focused on cost efficiency than sustainability.

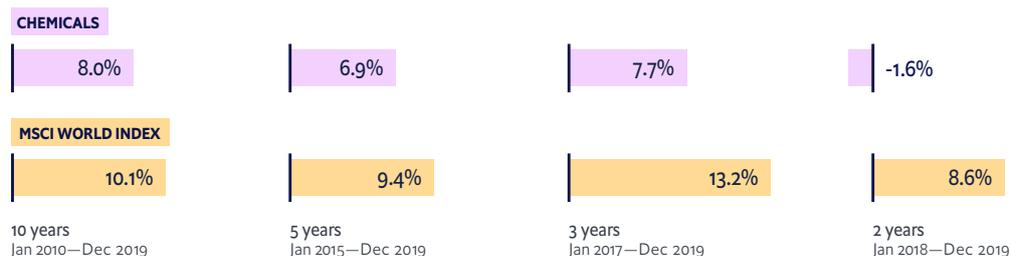
Profits in the chemicals sector have been falling since 2018

Total shareholder returns (TSR), %, index (100 = January 2001)



The chemicals industry has outperformed the world index over the long run but not in the past few years

Total shareholder returns (TSR), compound annual growth rate, %



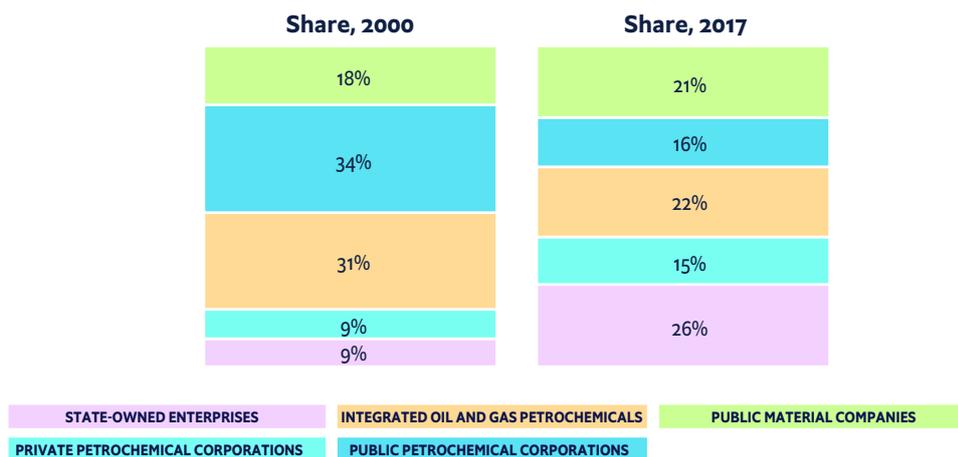
Source: The state of the chemical industry—it is getting more complex, McKinsey & Company (November 2020).
See: <https://www.mckinsey.com/industries/chemicals/our-insights/the-state-of-the-chemical-industry-it-is-getting-more-complex>

The changing ownership of the global chemicals sector is another complicating factor. In 2000, publicly traded materials and petrochemicals companies generated 52 percent of the sector’s revenue. By 2017 this had fallen to 37 percent. At the same time, the share of revenue generated by state-owned enterprises grew from 9 percent to 26 percent.⁴¹ The growing share of the sector operating outside the purview of new ESG rules, which typically target listed companies, may not be a bad thing: research published by the University of Virginia’s Darden School of Business found that state-owned enterprises perform better on environmental measures, on average, than their privately owned counterparts. But the average hides large geographical variations.⁴² It is not necessarily safe

to assume that better data about the sector’s environmental impact would suddenly sway many of its long-term owners and investors.

Even the big global banks that market themselves as leaders in sustainability do not seem to have so far been swayed by concerns about the sector’s environmental impact. In the plastic polymers sector, for example, 20 banks, including Barclays, HSBC and Bank of America, have lent the industry an estimated US\$30bn since 2011 to finance the production of single-use plastics.⁴³ According to the Minderoo Foundation’s Plastic Waste Makers’ Index, “twenty institutional asset managers hold over \$300bn worth of shares in the parent companies of polymer producers”.⁴⁴

The share of revenue generated by public companies in the chemicals sector is shrinking
 World chemical industry structure evolution, share of revenue, 2000-2017 (adapted from Cayuela and Hagan 2019)



Source: UNEP. Global Chemicals Outlook II, Part 1, p. 37.

Policymakers, business leaders and investors still have a relatively limited understanding of marine chemical pollution. This makes it difficult to describe the financial risks industry may face from pollution itself or from attempts to reduce it

Ultimately, this means that large-scale financing of the transition to a zero-pollution ocean will only materialise when it becomes profitable or the risks of not transitioning become too great. Any viable solution, then, must be predicated on this risk-reward calculus.

“No framework will, in itself, be effective unless there is sufficient disincentive to pollute and incentive to invest in the transition,” says Torsten Thiele, founder of the Global Ocean Trust. “Regulation is part of this, but the willingness to invest must come from the private sector.”

7.4 Pathways to action: Minimise transition risk, maximise innovation reward

Mitigating transition risk

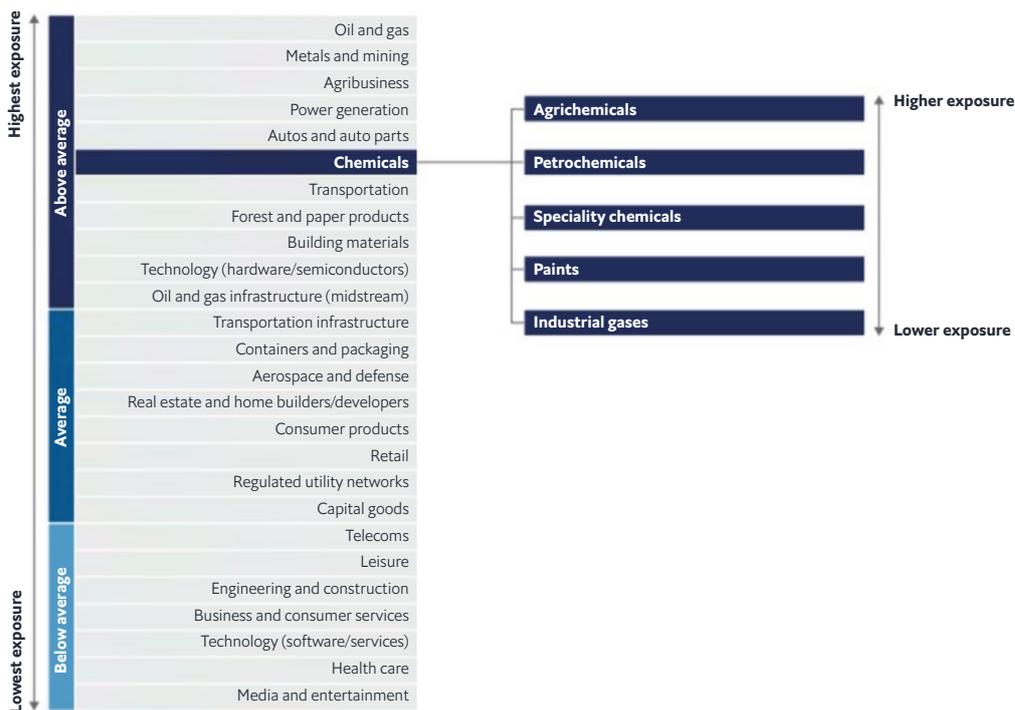
As this report has demonstrated, policymakers, business leaders and investors still have a relatively limited understanding of marine chemical pollution. This makes it difficult to describe the financial risks industry may face from pollution itself or from attempts to reduce it: we simply don’t know yet what kind of legislative or market conditions will emerge.

However, the transition required along the chemical value chain is akin to addressing climate change. An analysis of the chemicals sectors’ exposure to climate-related risks (which, as Chapter 3 notes, are inextricably linked with the impact and extent of chemical pollution in the ocean) can provide valuable clues about the type of risks the transition to a zero-pollution ocean might entail.

The chemicals sector has high exposure to environmental risk

Qualitative sector listing of relative environmental exposure: chemicals

Greenhouse gas emissions, waste, pollution, and land use



Source: S&P Global Ratings, ESG Industry Report Card: Chemicals

The transition required along the chemical value chain is akin to addressing climate change

The TCFD divides climate-related risks into two main categories:

- Transition risks arise from the transition to a low-carbon economy and include financial risks that may arise from regulatory change, litigation, reputational damage, changing market conditions (such as falling demand for specific products) and the cost of new technology.

- Physical risks arise directly from changes in the climate, including chronic changes such as higher temperatures or increased sea levels and acute changes including more frequent and severe flooding and forest fires.⁴⁵

Scope 3 emissions, which result from activity along the supply chain, present a particularly large, and probably underappreciated, financial risk to the chemicals sector. The chemicals industry is heavily reliant on fossil fuels, both as feedstock and to power its energy-hungry manufacturing processes. As fossil fuels become more expensive, the industry will face growing costs. Downstream, there are substantial risks too. Much of the sector’s Scope 3 emissions

are embedded in consumer and industrial products; chemical companies' customers, which have themselves set targets to reduce their own Scope 1 and 2 emissions, will attempt to eliminate carbon-intensive chemicals from their supply chains. End-of-life presents an additional challenge, as the embedded carbon in fossil-fuel-based chemicals is released if they are incinerated or break down.⁴⁶

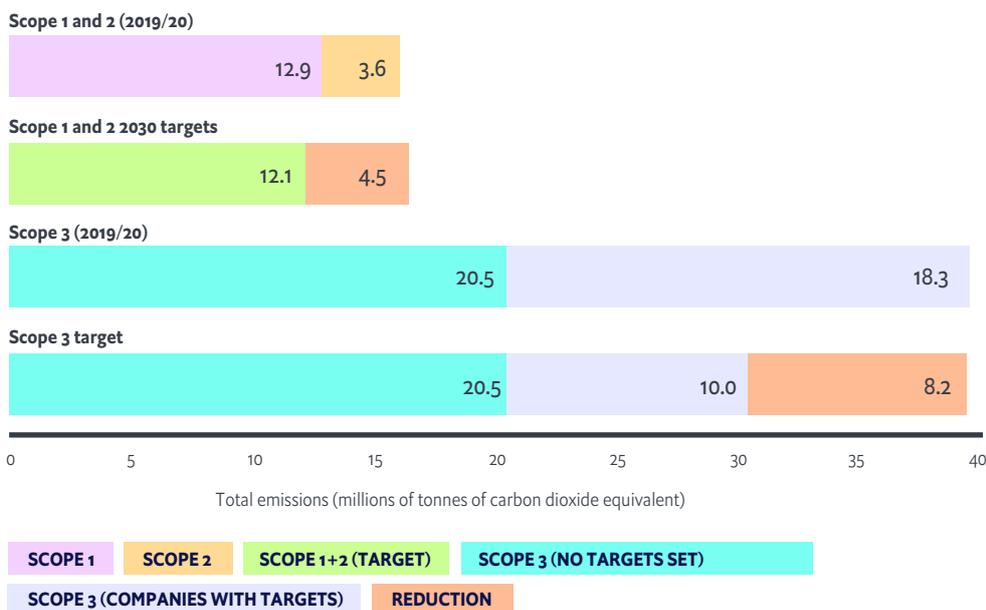
One example is the automotive industry, which is a major customer of the chemicals sector. Around half of car manufacturers' revenues are linked to Scope 3 reduction commitments. This, in turn, represents around US\$110bn in revenue for the chemicals industry.⁴⁷

Scope 3 emissions account for an outsized proportion of the chemicals industry's carbon footprint

Tracking the targets—chemicals

This chart shows the 2019-20 emissions from 10 chemicals companies that have reported their emissions and have set verified emissions targets for 2030 with Science Based Targets initiative (SBTi).

The emissions are broken down into scope 1 (direct operational), scope 2 (purchased energy) and scope 3 (indirect, supply chain) emissions. Most companies set a combined target for their scope 1 and 2 emissions, so these have been combined. Scope 3 emissions are considered separately.



Data presented for 10 companies with measured Scope 1,2 and 3 emissions, and SBTi targets for reduction of at least Scope 1+2 emissions. Of the 10 companies included, 5 have no comparable Scope 3 target for 2030

Source: Industry tightens emissions reduction targets, Angeli Mehta, Chemistry World (July 2021). See: <https://www.chemistryworld.com/news/industry-tightens-emissions-reduction-targets/4013930.article>

The transition to net zero will be immensely costly and challenging for the chemicals industry. The industry is so diverse—from large petrochemical producers to diversified conglomerates to small specialist-materials companies—and its products so interwoven

with almost every other sector that it is virtually impossible for investors to choose a single, comparable metric or scenario that will enable them to understand the sector's accurate exposure to climate-related risk.⁴⁸

Does action on climate equal action on pollution?

Shareholder activist group ShareAction launched a campaign in September 2021 targeting the chemicals industry over its carbon emissions, after its research suggested that the sector had received relatively little scrutiny over its transition plans.⁴⁹ Their report found that seven fossil-fuel-based feedstock chemicals make up 70 percent of the sector's emissions. Reducing or eliminating these feedstock chemicals would dramatically reduce the sector's emissions (along with the transition to renewable energy). The chemicals are ammonia, methanol, ethylene, propylene, benzene, toluene and xylene. Phasing out these seven feedstocks would provide the sector with a credible decarbonisation pathway, ShareAction argues.

Would this have a beneficial knock-on effect on other types of pollution? Joel Tickner, executive director of the Green Chemistry and Commerce Council and a professor at the University of Massachusetts Lowell, is not so sure: "[D]ecarbonisation is important but that won't address toxicity if the same chemicals are being made using the same platforms," he says.

A fundamental transformation which sees the chemical sector embrace innovations, new systems and new business models will be required if the industry is to meet its climate, pollution and financial challenges.

Perhaps because of this complexity and cost, very few large chemical companies have so far committed to a credible transition plan.⁵⁰ We do not yet have a clear picture of what a decarbonised chemicals sector would look like or what it would take to get there. There are clues, however. The World Business Council on Sustainable Development (WBCSDs) convened a group of five chemicals companies (AkzoNobel, BASF, DSM, Solvay and Sumitomo Chemical) to assess how the sector should respond to the TCFD. These companies consider transition risks to be the most material to their operations, in the short to medium term at least.⁵¹

It seems safe to assume that many of these transition risks would also apply to any transition to a low-pollution sector, including:

- Policy and legal: enhanced reporting obligations; mandates on, and regulation of, existing products and services, exposure to litigation.

- Technology: substitution of existing products and services with lower-pollution options, unsuccessful investment in new technologies, costs to transition to lower-pollution technology.
- Market: changing consumer behaviour, uncertainty in market signals, increased cost of raw materials.
- Reputation: shifts in consumer preferences, stigmatisation of sector, increased stakeholder concern or negative stakeholder feedback.⁵²

Climate risk has been and will continue to be an essential consideration for investors. But a new focus on nature-related risks, driven by the TNFD and new EU Taxonomies, means that concerns about the risks that may arise from pollution (or the transition to a zero-pollution ocean) could quickly become relevant to investors, says Matt Jones of the UNEP-WCMC. His team has developed a web-based tool called Encore to help investors quantify natural capital risk across their portfolios. UNEP-WCMC is also

working with ESG data providers to help them understand how to quantify nature-based exposure and risk.

“It’s not straightforward. There are massive gaps in the data,” he says. “But when we can point to places where natural capital has depleted at the greatest rate, and the risk is highest, we start to see a much wider group of people from within financial institutions pay attention. That’s been a game-changer.”

Has the transition begun?

A large-scale, system-wide transition to a zero-pollution ocean is, at this point, an ambition. But this does not necessarily mean that transition risks to the chemicals sector are hypothetical. Already, several examples demonstrate the future risks that industry players may face:

Regulatory risk:

- UK company Southern Water was fined GBP90m in 2021 after admitting to 6,971 illegal pollution incidents, including releasing untreated sewage into the sea. Southern Water is not alone. It is ranked only the *second-worst* water company in the UK after South West Water.⁵³ Yet proving that risk and opportunity are often two sides of the one coin, Australian investor Macquarie Group soon acquired a controlling share in the utility, committing more than GBP1bn to improve the company’s sustainability record.⁵⁴
- In October 2021, lawmakers in Belgium threatened to shut down a 3M facility producing PFAS over concerns that residents had been exposed to chemicals emissions.

Legal risk:

US courts have ordered several prominent chemicals companies to pay substantial damages for pollution.

- DuPont and two of its spin-off companies reached a US\$4bn settlement in 2021 for several legal proceedings relating to its historical use of PFAS.⁵⁵ Yet just months later, the company again faced fines over pollution from the same type of chemical.⁵⁶
- Texas-based petrochemical manufacturer Formosa was ordered to pay US\$50m in damages in 2019 after it was found guilty of illegally releasing plastic pellets and other pollutants into coastal waterways.⁵⁷
- DuPont and 3M face the prospect of further fines over the use of PFAS in the US state of Georgia.⁵⁸
- In 2015 the Chinese government said it encourages NGOs to sue companies that breach pollution rules, and several chemicals companies have faced lawsuits since.⁵⁹ In 2018, three chemicals companies that polluted soil near a school in Jiangsu province were ordered to apologise and pay compensation.⁶⁰

Financial risk:

- In December 2021, 23 investors managing US\$4.1 trillion in assets wrote to the 50 chemicals companies assessed by ChemScore calling for them to be more transparent about the volume of “substances of high concern” that they produce.⁶¹
- UK hedge fund Bluebell Capital Investors has targeted Belgian chemical manufacturer Solvay over its dumping of waste containing mercury, arsenic, ammonia, nitrogen and boron into Italian coastal waters adjacent to its factory at Rosignano. Solvay maintains that it is acting within Italian environmental regulations, but Bluebell claims that the practice does not align with Solvay’s ESG commitments.⁶²

Environmental impact and controversies are becoming an increasingly critical risk for Solvay

Criticality*	Stakeholders	Risk	Trend
Very High ↓ High	Employees Local Communities Customers	Security	↗
	Suppliers Employees Planet Investors	Compliance and business integrity	→
	Planet Local Communities	Environmental impact & controversies	↗
	Employees Local Communities Suppliers	Operations safety	↘
	Customers Local Communities Employees Planet Investors	Climate change	→
Emerging risks**			
	Customers Local Communities Employees Planet Investors	Regulatory framework for chemicals sustainability	Emerging

* The criticality level is determined by combining the risk's two ratings (impact and level of control) at the time of the assessment
 ** Emerging risks: newly developing or changing risk that may have, in the long term, a significant impact which will need to be assessed in the future

Source: Solvay Integrated Report 2020⁶³

The opportunities that will arise from the transition to a low-carbon economy provide a valuable template to understand those that will underpin the transition to a zero-pollution ocean

Seizing potential reward

While risk management is essential, interviewees from the finance sector invariably highlighted the other side of the coin: opportunity. The opportunities that will arise from the transition

to a low-carbon economy provide a valuable template to understand those that will underpin the transition to a zero-pollution ocean. Transition finance is a rapidly emerging segment, and while the current focus is on climate, there is a significant opportunity to finance the transition to a zero-pollution ocean.⁶⁴

Again, the WBCSD's work on the chemicals sector's readiness for TCFD is instructive. The five chemicals companies the WBCSD collaborated with (AkzoNobel, BASF, DSM, Solvay, Sumitomo Chemical) expect that the transition to a low-carbon economy will create opportunities to

profit from the more efficient use of resources, the development of new products and services, access to new markets and through diversification and substitution which will improve companies' resilience. A system-wide transition to address marine chemical pollution is likely to create similar opportunities.

The discussion about climate finance has moved beyond just risk and opportunity, says Eric Usher of UNEP FI. "It's about having the overall portfolio aligned with the transition to a net-zero economy, a perspective which captures both risk and opportunity. Banks see that most industries are going through radical disruption."

Chemicals companies have highlighted significant opportunities to profit from the transition to a low-carbon economy

Climate-related opportunities for the chemical sector based on a review of Forum members' disclosures

Climate-related opportunities		
<p>Resource efficiency</p> <ul style="list-style-type: none"> • Use of more efficient modes of transport • Use of more efficient production and distribution processes • Use of recycling • Move to more efficient buildings • Reduced water usage and consumption 	<p>Energy source</p> <ul style="list-style-type: none"> • Use of lower-emission sources of energy • Use of supportive policy incentives • Use of new technologies • Participation in carbon markets • Shift toward decentralised energy generation 	<p>Products and services</p> <ul style="list-style-type: none"> • Development and/or expansion of low-emission goods and services • Development of climate adaption and insurance risk solutions • Development of new products or services through R&D and innovation • Ability to diversify business activities • Shift in consumer preferences
<p>Markets</p> <ul style="list-style-type: none"> • Access to new markets • Use of public-sector incentives • Resource substitutes/diversification 	<p>Resilience</p> <ul style="list-style-type: none"> • Participation in renewable energy programmes and adoption of energy-efficiency measures • Access to new assets and locations needing insurance coverage 	

Source: WBCSD TCFD Chemical Sector Preparer Forum. Climate-related financial disclosure by chemical sector companies: Implementing the TCFD recommendations

For meaningful opportunities to materialise, scale will be critical. Investment into significant new capital works projects, R&D into new technologies and reshaping entire supply chains will be required. For context, the average M&A deal size in the chemicals sector in the first half of 2021 was US\$252m—a figure that has grown in the past few years despite the pandemic.⁶⁵ One thing is clear: the transition to a zero-pollution ocean will be capital-intensive.

The opportunities will arise, says Mr Thiele, from identifying polluting products or processes that will still be required in the future—desalination or antibiotics, perhaps. The commercial prize lies in designing technology that allows these to be used in a less polluting or non-polluting way and financing the transition to that new technology. "The opportunity will be in spotting future needs and then filling the finance gap," he says.

"A lot of the excitement on the investor front comes from the opportunities," says Dennis Fritsch, head of Sustainable Blue Economy Finance at UNEP FI. "It's not because of the high risks of business as usual. It's because they want to offer their clients exciting, sustainable products."

These opportunities do not yet exist at scale. "Currently there is still a significant disconnect between the opportunities, the size and volume of the demand and the supply of investable blue products," says Valeria Ramundo Orlando, co-founder of Greensquare Ventures. "There is huge variation between supply and demand. In the sustainable blue economy, there are fantastic investments in the range of US\$10m-15m, with proven returns. Unfortunately, the large institutional investors as well as family offices are looking for something that will make a greater impact in terms of volume and scale."

Innovation in more-sustainable and less-polluting chemicals will not only come from the big chemicals companies: the burgeoning green chemistry startup scene could be a significant driver of the technology needed to transition to a zero-pollution ocean

As mentioned above, some opportunities exist in sustainability-linked credit for chemicals producers. But these remain few. For the transition to be meaningful, horizontal adoption across financial institutions will be critical. It is not enough to engage with the sustainable-finance arms of asset managers, says Mr Thiele. Investment professionals across the sector must understand the scale of the opportunity.

PC, VC and blended finance

Innovation in more-sustainable and less-polluting chemicals will not only come from the big chemicals companies: the burgeoning green chemistry startup scene could be a significant driver of the technology needed to transition to a zero-pollution ocean.

Private equity (PE) and venture capital (VC) funding will be critical, then, to ensure a robust pipeline of sustainable technology. There is already intense PE interest in the chemicals sector. In the year to June 2021, PE firms invested US\$7.4bn in specialty chemicals alone.⁶⁶ These deals were not necessarily related to green chemistry, but the amount of activity indicates the potential of PE to help fund the sector's sustainability transition. PE investments in green chemicals are becoming more common: One promising example is Swedish Bank SEB's VC arm Greentech, which made its first investment in green chemicals production in 2021.⁶⁷

Large chemicals companies also commonly look to acquire green chemistry startups as a cheaper alternative to in-house R&D, says Mr Tickner. The green chemistry sector should be an attractive proposition to PE and VC firms which often invest with an exit strategy already in mind.

Large-scale, private sector-led finance will be critical to financing the transition to a zero-pollution ocean. However, marine chemical pollution is still relatively unknown, and solutions, if they exist, are in their infancy. Instruments such as impact investing and blended finance, which have both sustainability goals and financial ones, will play an essential role for some time to come.

One salient example is the Reef Credit Scheme, an innovative financing mechanism that pays Australian farmers to change their land-management practices to reduce nutrient, pesticide or sediment runoff into waters surrounding the Great Barrier Reef.⁶⁸ Sovereign, corporate and philanthropic investors—including global bank HSBC—have purchased the tradable credits.⁶⁹

If investors are to play a credible role in financing the transition to a zero-pollution ocean, the first step must be awareness-raising. Few understand the risk to, and impacts of, the chemicals industry and other sectors along the chemicals value chain from marine pollution

“Blended finance lends itself quite well to the blue economy, partly because the marine space often has legal or governance issues which are not present on the land,” says UNEP FI’s Mr Fritsch. But, he cautions, do not expect this type of instrument to deliver widespread change: “Plain vanilla instruments still finance the majority of this sector.”

A roadmap for investor-led change

If investors are to play a credible role in financing the transition to a zero-pollution ocean, the first step must be awareness-raising. Few understand the risk to, and impacts of, the chemicals industry and other sectors along the chemicals value chain from marine pollution.

ESG disclosure rules will play a crucial role in raising the issue’s profile among the finance community. An emerging focus on nature-related impacts and risks, spearheaded by instruments such as the TNFD and EU Taxonomies, provide an important opportunity to catapult a zero-pollution ocean up investors’ agenda.

A roadmap for investor-led action on marine chemical pollution

1. Develop **improved ESG guidance**, particularly around emerging nature-related frameworks such as TNFD.
2. Publish **more and better data**, particularly around companies’ impacts on marine chemical pollution and exposure to transition risks.
3. The articulation of climate-related risks to investors can provide a template for **setting out the risks that investors may face** during the transition to a zero-pollution ocean.
4. **Industry and investors must work together to uncover opportunities** for transition financing and align the supply of and demand for large-scale deals.
5. **Private equity and M&A activity** can help drive innovation in the burgeoning green chemistry startup scene.

As Chapter 6 set out, the chemicals sector urgently needs to address the environmental impact of its waste footprint and drastically reduce the greenhouse gas emissions associated with the production and consumption of its products. The scale and form of the transformation required for the sector to meet emissions reduction targets hints at what will be needed to transition to a zero-pollution ocean.

Investors, too, will face new risks—and also enjoy new opportunities. Industry and investors will need to work together to identify and profitably fill long-term funding gaps. The scale of the challenge is immense, and the capital required to meet it is just as significant. But, says Guy Bailey, head of intermediates and applications at Wood Mackenzie, “if the finance sector is persuaded that sustainable investments are the better long-term play, then capital will move in that direction”.

Notes

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