

The investor's guide to hazardous chemicals

**An introduction to
harmful substances,
ChemScore and the
Investor Initiative
on Hazardous
Chemicals (IIHC)**



This guide provides a brief overview of the chemical crisis, ChemSec’s online ranking tool ChemScore and the Investor Initiative on Hazardous Chemicals.

It also highlights some common industry arguments and how to respond to them. The purpose of this guide is to equip investors with information and arguments to enable a constructive engagement with companies in the chemical sector in their efforts to reduce their chemical footprint.

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Hazardous chemicals are a threat to our planet

Humanity faces a triple planetary crisis: climate change, biodiversity loss and chemical pollution. Whereas investors have become increasingly aware of the risks related to climate change and biodiversity loss, far less attention has been paid to hazardous chemicals and how they are interlinked with the other crises.

It has been estimated that 95 percent of all manufactured goods rely on some form of industrial chemical process.¹ A large share of the chemicals used in these processes have been linked to adverse impacts on human health and the environment.² In the European Union, 75 percent of the almost 300 million tons of chemicals used annually are considered hazardous to human health or the environment.³

Everyday we are exposed to a wide variety of harmful substances. The fact that men's sperm count has more than halved over the last 40 years has been linked to the "chemical cocktail" that we are constantly exposed to.⁴ Exposure to toxic substances has also been linked to birth defects, cancer, obesity, attention deficit disorders and a range of other ills.⁵

In addition, chemical pollution is a key driver of the biodiversity crisis since it negatively impacts, for example, insects, pollinators and bird populations. It also leads to “ocean dead zones”.⁶ Moreover, the chemical sector is a big contributor to climate change. It is the most energy-consuming production sector in the world and the third largest source of global carbon emissions.⁷

Chemical production has increased 50-fold since 1950 and is expected to triple by 2050 compared to 2010 levels.⁸ But the chemical crisis has now gone so far that scientists have concluded that our production of chemicals has already exceeded the environmental limits within which humanity can safely operate.⁹

Total revenue of the global chemical industry 2005-2021 in US billions

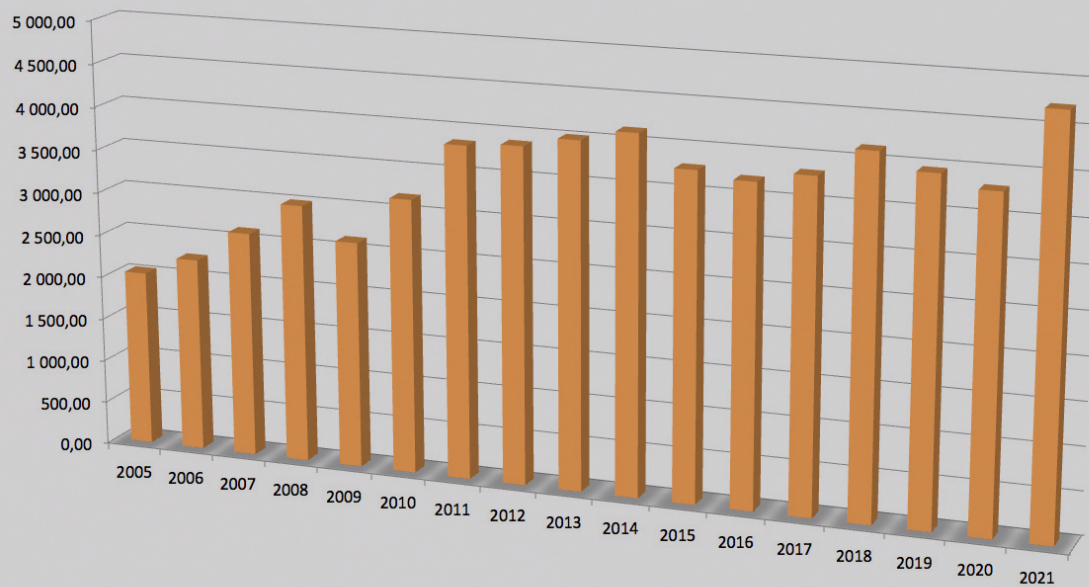


Figure 1. Source: <https://www.statista.com/statistics/302081/revenue-of-global-chemical-industry/>

A particularly pressing concern is the widespread production and use of per- and polyfluoroalkyl substances (PFAS). PFAS is a family of around 4,700 man-made chemicals, many of which are hazardous to humans and the environment.¹⁰ Their chemical structure makes them so persistent that they have been termed “forever chemicals”.

The transition from hazardous chemicals to safer alternatives could be one of the next big disruptors of the global economy as it affects every single industry and supply chain in the world. The transition will put significant regulatory, legal and reputational pressures on chemical companies unable or unwilling to reduce their toxic footprint.

PFAS ARE CALLED “FOREVER CHEMICALS” because they do not break down in nature. Their chemical properties are well-suited for many industrial and consumer products – such as fire-fighting foam, cosmetics and non-stick pans – but problematic for human health and the environment since they build up over time. One study found that soil and rainwater all over the world contain PFAS levels that exceed the safety levels set by authorities.¹¹ Another study found that 98 percent of all Americans have PFAS in their bloodstreams.¹²



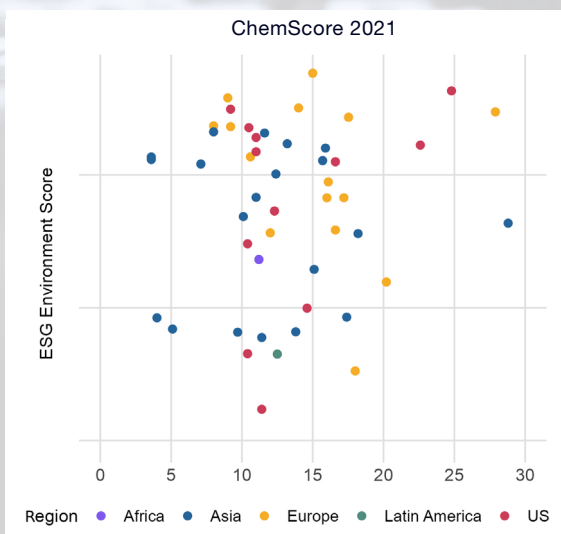
Figure 2. PFAS are used in countless products. These are just a few examples where PFAS have been known to occur.

ChemScore fills an important ESG data gap

ESG rankings tend to underestimate the risks associated with the production of hazardous chemicals. For example, companies that develop decarbonization-enabling products often receive high scores even though they produce and use highly toxic substances. The consequence is that material risks associated with hazardous chemicals do not appear on the radar of investors.

To fill this ESG data gap, ChemSec – with the advice of chemical companies, investors, authorities and other non-governmental organizations – developed ChemScore, an online ranking of the largest publicly traded chemical companies in the world.

Figure 3. This graph shows how the chemical companies score according to ChemScore (X-axis) compared to the “Environment” category in Refinitiv’s ESG ranking (Y-axis). As can be seen from the graph, there is little correlation, indicating that ChemScore offers a different lens for investors.



The ranking is based on the companies' chemicals management and efforts to reduce their chemical footprint.¹³ ChemScore scores the companies in four different categories, which are then summed up to an overall score. This score is then presented as a grade running from A+ to D-.

Category 1: Product Portfolio (18 points):

How many toxic chemicals are in each company's product portfolio?

Top scorer: Air Liquide, 12 points.

Category 2: Development of Safer Chemicals (12 points):

How much effort goes into research & development?

Top scorer: Lanxess, 10 points.

Category 3: Management & Transparency (12 points):

How progressive is the chemicals management and how much information is made public?

Top scorer: Indorama, SABIC and Solvay, 7 points.

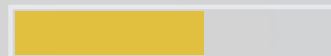
Category 4: Lack of Controversies (6 points):

How many controversies and scandals has the company been involved in during the last ten years?

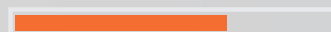
Top scorer: 14 companies, 6 points.



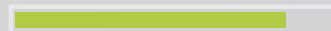
Total score 35 / 48



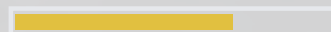
Product Portfolio 12 / 18



Development of Safer Chemicals 10 / 12



Management & Transparency 7 / 12



Lack of Controversies 6 / 6



CHEMSEC IS AN INDEPENDENT NON-PROFIT ORGANISATION that advocates for substituting hazardous chemicals for safer alternatives.

It was founded in 2002 by WWF, the Swedish Society for Nature Conservation, Friends of the Earth Sweden and Nature & Youth Sweden. It receives funding from the Swedish government, charity foundations and private donations. It does not accept money from corporations.

Three financial risks investors need to be aware of

There are substantial material risks associated with the production and use of hazardous chemicals. These risks are amplified by a lack of transparency in the chemical sector, where only modest insights into the portfolios of the companies are permitted. In this section, three key financial risks that investors ought to be aware of are described.

1

STRICTER REGULATION MAY PUT A HALT TO REVENUE

Historically, chemical production has been a comparatively unregulated business. Up until 2016, only five chemicals – out of hundreds of thousands – were for example restricted in the United States.¹⁴ In the European Union, the chemical regulation called REACH was passed in 2006.

Since REACH was implemented, less than 100 substances have been restricted.¹⁵

But as the understanding of the chemical pollution crisis grows, the regulatory environment is rapidly changing. The EU's Chemical Strategy for Sustainability is seen as the flagship of this budding effort to achieve more efficient regulations of chemicals, potentially banning all of the most harmful substances.¹⁶

Chemical Strategy for Sustainability

In 2020, the EU Commission launched – as part of its “Green Deal” – the Chemical Strategy for Sustainability (CSS). The main purpose of it is to assess and regulate chemicals more effectively and ensure a higher protection of human health and the environment. The strategy, for example, aims to rid consumer products – such as food contact materials, toys and cosmetics – of the most harmful chemicals. The strategy also seeks to restrict groups of chemicals instead of the traditional substance-by-substance approach. A group restriction for PFAS is one example of this.

Regulations are changing in other regions as well. The State of California recently announced that the manufacture and sales of textiles containing PFAS will be prohibited from January 2025.¹⁷ And in China, an action plan has been published to regulate a number of key pollutants, such as PFAS and endocrine-disrupting chemicals.¹⁸

For companies unwilling or unable to develop safer alternatives, the transition to a harsher regulatory environment will put future revenues at risk. Reformulating products and modifying processes are expensive and time-consuming, especially if forced rather than planned. Assets can become stranded if they cannot perform in compliance with regulations.

2

HAZARDOUS CHEMICALS ARE LIABILITY DISASTERS WAITING TO HAPPEN

Over the last decade, chemical companies have been the subject of a large number of lawsuits and litigations. Companies that produce PFAS have been particularly targeted. While some analysts estimate that PFAS producers might be facing legal costs up to \$40 billion, the risk modelling firm Praedicat says costs could exceed \$400 billion.¹⁹

PFAS is therefore now being described by insurance and liability experts as “the mother of all toxic torts”, “the next asbestos” and a “looming liability disaster”.²⁰ The PFAS crisis may very well trigger sector-wide interruptions – including bankruptcies – in the coming years.

It is worth pointing out that PFAS is just one group of chemicals. Many others are known to be highly hazardous for human health and the environment as well. Companies that produce hazardous substances will therefore always be at risk of being dragged into resource-intensive litigations that often end up significantly increasing costs and reducing profits.

3

HARMFUL SUBSTANCES COULD LEAD TO DEVASTATING REPUTATIONAL DAMAGE

Nine out of ten Europeans are worried about the environmental impact of chemicals in everyday products, and 84 percent are worried about the impact on their health.²¹ This means that chemical companies manufacture products which are considered highly problematic by many people.

In addition, the production and use of hazardous chemicals often lead to accidents, such as fires, spills and explosions. Some notorious examples include Seveso, Italy (1976), Bhopal, India (1984) and Kolontar, Hungary (2010).

A damaged company reputation due to use or production of harmful chemicals might reduce both suppliers' and customers' inclination to do business. It could also reduce the ability of companies to attract and retain qualified employees. Furthermore, it can have a negative effect on creativity and morale, a particular concern for the R&D-intensive chemical sector.

Taken together, companies that produce hazardous substances will always be susceptible to reputational damages, which can hurt profits and lead to tumbling stock prices.

The Investor Initiative on Hazardous Chemicals

The Investor Initiative on Hazardous Chemicals (IIHC) aims to reduce the impacts on human health and the environment from the manufacture of hazardous chemicals, thereby reducing financial risks to investors from, for example, litigation and regulation.

In 2021, Aviva Investors and Storebrand Asset Management assembled a group of 23 investors with a combined \$4.4 trillion of assets under management and sent a letter to the companies ranked in ChemScore, requesting better chemicals management. In 2022, this group was expanded to 47 investors with \$8 trillion under management or advice. In September, the group sent a new letter asking for increased transparency, phaseout plans for persistent chemicals and improved ChemScore grades.

This has been developed into the Investor Initiative on Hazardous Chemicals (IIHC), an investor-led collaborative engagement initiative, modeled on similar approaches to address various sustainability issues (for example, FAIRR and ATNI). In the IIHC, investors are organized into groups with leads and matched to target companies in ChemScore. The lead investor of each group is responsible for contacts with the company and chairing the calls. ChemSec is the supporting secretariat and coordinator of the initiative.

Four industry arguments and how to reply to them

When investors engage with chemical companies around transparency and hazardous chemicals, there are a number of industry arguments that are commonly brought forth to justify a continuation of business-as-usual. These can be difficult for investors to reply to. In this section, the four most common industry arguments are presented as well as how to respond to them.

“The lion is in a cage”

Chemical companies often defend their production of hazardous chemicals from a risk-based approach, arguing that toxic chemicals only become harmful when people are exposed to them. And with good risk management practices – for example, clear safety instructions to employees and customers – the risk of exposure can be minimised.²² In other words, as long as the lion stays in its cage, it is not dangerous.

Reply:

While the risk-based approach is sometimes useful, it also has clear limits. It is impossible to guarantee that exposure to a chemical is avoided throughout its life cycle. From all the workers in the chemical production plant, down the complex and global value chain, and from first-hand consumers to waste and recycling, there are too many unknowns to guarantee such a thing. The human factor must be taken into account. An outdoor cable – containing toxic flame retardants – will, for example, many times be used indoors. And a make-up set – with hormone-disrupting chemicals – may end up in the hands of a child and be used as a toy.

While most people know what a lion looks like and that it is dangerous, very few of us know anything about harmful chemicals and when we are exposed to them.

In contrast to the risk-based approach, the hazard-based approach – which assesses chemicals on their inherent properties – is much more protective. The hazard-based approach is crucial for the most harmful chemicals (for example, carcinogenic, mutagenic and reprotoxic) in particular since exposure to these chemicals should be avoided fully.²³



“What we do is top secret”

In the European Union and the United States, companies must register production of chemicals that exceeds certain thresholds. The rest is often considered confidential business information. In other parts of the world, such as Asia, there is no requirement on transparency. Chemical companies tend to argue that they should not disclose more information about their chemical portfolios than what is required by law.

Reply:

Not knowing the production volume or what chemicals the company produces in other parts of the world, substantially undermines investors' ability to accurately assess the risks of the company. Lately, the need for more transparency on chemical content has also been publicly voiced by large downstream users such as H&M and Shaw.²⁴

It is worth highlighting that there are no technical obstacles to disclosing, for example, the production volume of each individual chemical (according to CAS-number) since the companies are obliged to disclose that to EU and US authorities. An example of best practices comes from the company Braskem, which publishes the precise production volume of a large part of its chemical portfolio in a public fact book.²⁵ Lanxess and Eastman are also positive examples, as they are fully transparent about all the hazardous chemicals they produce worldwide.



“Salt can kill you too”

Some chemical companies have attempted to justify production of hazardous chemicals by arguing that almost everything can be hazardous if a person is overly exposed to it. For example, you can die from drinking too much water or eating too much salt. And since it would be absurd to restrict water or salt because they could potentially be hazardous to your health, it is equally absurd to restrict hazardous chemicals.

Reply:

While it is true that too much of almost anything can kill you, there is a big difference between salt and synthetic chemicals that cause cancer and brain damage at very low doses. In addition, most of us are generally not even aware of the thousands of chemicals that we are exposed to everyday. Also, the negative effects are often delayed for years.



“You need to crack some eggs to make an omelette”

Another common industry argument is that certain hazardous chemicals are critical for the decarbonisation of the global economy, for example in high-performance insulation materials and batteries for electrical vehicles. In this sense, if we are to make a green transition we must allow for the use of some toxic substances.

Reply:

It is reasonable to make an environmental cost-benefit analysis, weighing the costs (chemical pollution) against the benefits (decarbonisation). But most hazardous chemicals are not critical for the decarbonisation of the economy. Instead, they tend to be used due to old habit and low cost.

Some hazardous chemicals will, unfortunately, continue to be produced until there are alternatives (in part to produce tools and technology necessary for the green transition). But companies should still acknowledge that they are hazardous, minimise the risk of exposure throughout their life cycle, and commit to developing safer alternatives. This argument should not be used as a loophole for the continued mass production of hazardous substances.²⁶ The decarbonisation of the global economy must be implemented with a simultaneous detoxification.

“But most hazardous chemicals are not critical for the decarbonisation of the economy. Instead, they tend to be used because of old habit and low cost.”

Some questions to ask chemical companies

Here are some examples of questions that investors can ask companies when they engage with them. Some questions only apply to certain companies.

General Questions	At what level in your company has your ChemScore rating been discussed?	Has your company set any targets or aspirations for improving your ChemScore rating?		
Product Portfolio	What is your general strategy for reducing and eliminating your use of hazardous chemicals?	3M has published a time-bound phase-out plan of all its PFAS substances (criteria 1.4 and 3.2). Do you have a strategy for reducing or eliminating the use of PFAS and other persistent chemicals?		
Development of Safer Chemicals	Lanxess and Ecolab have a cut-off criterion (criterion 2.3) for Substances of Very High Concern (SVHCs) in their new products. Do you have plans to implement a similar policy for new products?	Eleven of your peers offer safer alternatives (criterion 2.4) and market those on independent third-party platforms like ChemSec's Marketplace (criterion 2.5). Do you have plans to do the same in the coming year?	Circularity is becoming more prioritised by policy makers and regulators globally. Do you have strategies in place to increase your circular products portfolio (criterion 2.6)?	Do you have plans to increase the use of biobased, renewable or mechanically recycled feedstocks in your production (criteria 2.7 and 2.8)?
Development of Safer Chemicals	Various chemical companies define "safer" or "sustainable" products in very different ways. What are your definitions?	How much of your R&D spending is allocated to developing safer and sustainable alternatives?		
Management & Transparency	Solvay has a public time-bound phase-out plan for its hazardous portfolio (criterion 3.2). In addition, Indorama, SABIC and Yara have phase-out plans, but not time-bound. Are you developing similar plans?	Eighteen companies have taken first steps to report in accordance with the EU taxonomy regulation (criterion 3.3). Do you have plans to do the same?	36 out of 54 ChemScore companies actively engaged with ChemSec in 2022 (criterion 3.5). Will you engage with them in the coming year to improve your score?	Lanxess and Eastman disclose their global portfolios of hazardous chemicals (criterion 3.6). Will you be doing the same in the near term?
Management & Transparency	Five companies have clear key performance indicators to assess their progress on circularity (criterion 3.8). Do you have plans to do develop similar indicators to track your progress?	Braskem publishes the volumes and sales of a large part of its product portfolio. Do you have similar plans to disclose the volumes and sales of your hazardous product portfolio?		
Lack of Controversies	How do you use your experiences from previous incidents to develop your health and safety policies?	Are you actively engaged in remediating pollution and minimise human exposure to hazardous chemicals, beyond legal requirements?		

When a question relates to a specific criterion in ChemScore, the criterion is stated in parentheses.

ChemScore 2022 ranking

Company	Position	Country	ISIN Number	2022 Score	Change from 2021
Indorama	1	Thailand	TH1027010004	30.0	+1.2
Air Products	2	USA	US0091581068	25.6	+0.8
Johnson Matthey	3	UK	GB00BZ4BQC70	24.4	+4.2
Air Liquide	4	France	FR0000120073	24.2	+6.2
Yara	5	Norway	NO0010208051	23.1	+7.0
Linde	6	Germany	IE00BZ12WP82	21.8	+4.3
DSM	7	Netherlands	NL0000009827	21.7	-6.2
Avery Dennison	8	USA	US0536111091	20.0	-2.6
Lanxess	9	Germany	DE0005470405	19.0	+7.0
Covestro	10	Germany	DE0006062144	18.4	+2.4
AkzoNobel	11	Netherlands	NL0013267909	18.0	+1.4
SABIC	12	Saudi Arabia	SA0007879121	17.7	+4.5
Nutrien	13	Canada	CA67077M1086	16.6	+2.0
Sika	14	Switzerland	CH0418792922	16.4	
Solvay	15	Belgium	BE0003470755	16.0	+8.0
Umicore	16	Belgium	BE0974320526	15.4	+6.2
Teijin	17	Japan	JP3544000007	14.8	
LG Chem	18	Korea	KR7051910008	14.7	+2.3
BASF	19	Germany	DE000BASF111	14.4	-0.6
Westlake	20	USA	US9604131022	14.2	+1.5
Ecolab	21	USA	US2788651006	14.2	+1.9
Toray	22	Japan	JP3621000003	14.2	-4.0
Arkema	23	France	FR0010313833	14.0	+5.0
Evonik	24	Germany	DE000EVNK013	14.0	0
Nan Ya Plastics	25	Taiwan	TW0001303006	13.7	-1.4

Company	Position	Country	ISIN Number	2022 Score	Change from 2021
Sasol	26	South Africa	ZAE000006896	13.3	+2.1
Mitsui Chemicals	27	Japan	JP3888300005	12.8	-3.1
Asahi Kasei	28	Japan	JP3111200006	12.5	+0.9
LyondellBasell	29	Netherlands	NL0009434992	12.1	-5.1
Mitsubishi Chemical	30	Japan	JP3897700005	11.9	-5.5
Braskem	31	Brazil	BRBRKMACNOR1	11.8	-0.7
Nitto Denko	32	Japan	JP3684000007	11.6	-2.2
DOW	33	USA	US2605571031	11.6	+1.1
Eastman Chemical	34	USA	US2774321002	11.0	0
PPG	35	USA	US6935061076	11.0	0
Sherwin-Williams	36	USA	US8243481061	10.7	-5.9
Showa Denko	37	Japan	JP3368000000	10.1	0
3M	38	USA	US88579Y1010	10.1	+0.9
Bayer	39	Germany	DE000BAY0017	9.9	-0.7
Mosaic	40	USA	US61945C1036	9.9	-1.5
Hanwha Solutions	41	Korea	KR7009830001	9.8	+4.7
Corteva	42	USA	US22052L1044	8.6	-1.8
Lotte Chemical	43	Korea	KR7011170008	8.6	-2.8
Shin-Etsu	44	Japan	JP3371200001	8.4	-2.6
Nippon Paint	45	Japan	JP3749400002	7.9	
Tosoh	46	Japan	JP3595200001	7.6	-2.1
DIC Corporation	47	Japan	JP3493400000	7.0	-1.0
Sumitomo Chemical	48	Japan	JP3401400001	6.9	-8.8
Air Water	49	Japan	JP3160670000	6.8	
Wanhua	50	China	CNE0000016J9	6.7	+2.2
PTT GC	51	Thailand	TH1074010006	6.1	-1.0
Formosa Chemicals & Fibre	52	Taiwan	TW0001326007	3.9	+0.3
Sinopec Shanghai Petrochemical	53	China	CNE000000BB2	2.4	-1.2
DuPont	54	USA	US26078J1007	0.0	-10.4

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8. <https://pubs.acs.org/doi/10.1021/acs.est.1c04158>
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10. <https://www.oecd.org/chemicalsafety/risk-management/global-database-of-per-and-polyfluoroalkyl-substances.xlsx>
Furthermore, there are other persistent chemical than PFAS that investors should know about. Some of these are benzotriazole UV filters (for example found in electronics and plastics), D5 and D6 (personal care and washing products), chloroform and carbon tetrachloride (cleaning and manufacturing) and melamine (wood panels and washing powder).
11. <https://pubs.acs.org/doi/10.1021/acs.est.2c02765>
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13. *The size of the company is determined by revenue. The Global Industry Classification Standard (GICS) is used to classify companies in the chemical sector.*
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22. *The risk is the combination of hazard and exposure (risk = hazard x exposure).*
23. https://environment.ec.europa.eu/strategy/chemicals-strategy_en
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26. *It is also worth noting that the chemical industry is highly dependent on fossil fuels and that hazardous substances seriously damage the circular economy.*