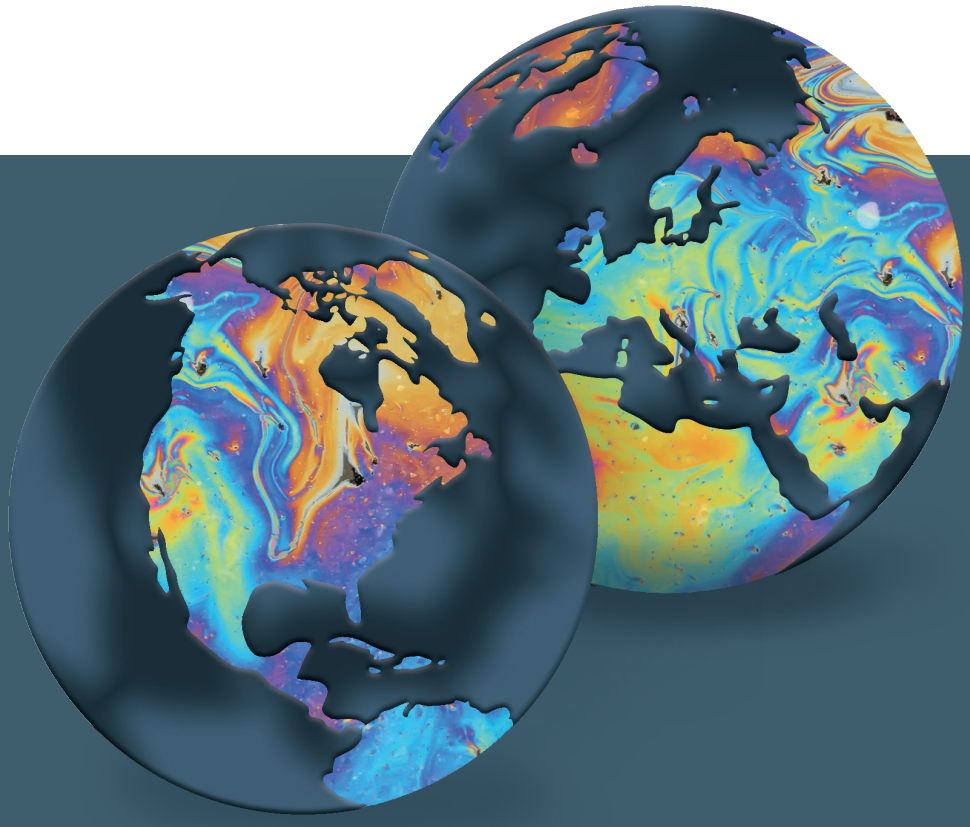
Planet Tracker

A Tale of Two Systems

Comparing toxic chemical reporting requirements in the U.S. and EU

Why investors should support standardised regulation and transparency for toxic chemicals



December 2024

Contents

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Executive summary

In this report **we compare the toxic release reporting requirements between the U.S. and Europe**. We examine areas of difference and question why a chemical would be considered worthy of reporting in one region, but not another.

Planet Tracker previously analysed U.S. Environmental Protection Agency (EPA) data from the Toxic Release Inventory (TRI) and the Risk Screening Environmental Indicator (RSEI) databases. We looked at releases by the petrochemical industry to reveal the largest toxic chemical polluters in the U.S. Gulf states of Louisiana and Texas (see our reports - *Toxic Footprints* and *Toxic Fog* and the accompanying data dashboard *Toxic Footprints USA Dashboard*).

We then examined the European Trilateral Chemical Region and toxin release data reported via the EU Pollutant Release and Transfer Register (E-PRTR). We mapped key toxic hotspots and producers, as well as the financial markets actors responsible for funding them (see our report - *Toxic Footprints Europe* and the accompanying data dashboard *Toxic Footprints Europe Dashboard*).

The relevance of the analysis presented in this report to the financial markets is examining the risk exposure associated with these regulatory regimes, whether they will change, and the way this affects corporates within their scope.

Planet Tracker has previously written about the potential risks to investors from the release of toxic chemicals into the environment – see our report *Novel Entities: A Financial Time Bomb*.

Given this risk, we believe **investors should welcome a robust regulatory regime as they provide some level of protection against future litigation risk if followed**.

The EU and U.S. take a different approach to regulating toxic chemicals. The **U.S. has adopted a risk-based procedure**. Generally, the **EU's hazard based approach** is often viewed to be more burdensome for business, given it operates on a more precautionary basis and thus is more restrictive. However, it could reduce future litigation risk because of that more precautionary principle.

For investors, we believe greater transparency is a critical request to make of both regulators and corporates irrespective of the geography of operation and reporting. Only with transparency about the products produced, their volumes and locations can they make a judgement about potential or actual risks from toxic releases. **Given the growing threat of litigation, this transparency should be an increasingly urgent ask of chemical corporates**.

Introduction

We live in a world dependent on chemicals. Petrochemical products are a significant part of our daily lives and can be found in many items, including but not limited to, plastics, packaging, clothing, medical equipment, tyres, modern energy systems, including solar panels and wind turbine blades, thermal insulation and electric vehicle parts.

However, the **pollutants related to the manufacture of petrochemicals threaten both human health and the environment. Toxic releases often hide in plain sight**.

In our reports *Toxic Footprints* and *Toxic Fog* and the accompanying data dashboard (*Toxic Footprints USA Dashboard*). Planet Tracker analysed U.S. Environmental Protection Agency (EPA) data from the Toxic Release Inventory (TRI) and the Risk Screening Environmental Indicator (RSEI) databases. We examined releases by the petrochemical industry to reveal the largest toxic chemical polluters in the U.S. Gulf states of Louisiana and Texas

Our report *Toxic Footprints Europe* and the accompanying data dashboard (*Toxic Footprints Europe Dashboard*) examined the European Trilateral Chemical Region and toxin release data reported via the EU Pollutant Release and Transfer Register (E-PRTR). We mapped key toxic hotspots and producers, as well as the financial markets actors responsible for funding them.

In this report we compare the reporting requirements between the two regions. **We examine areas of difference and question why a chemical would be considered worthy of reporting upon in one region, but not another**.

We note that as of 22 May 2024, the Industrial Emissions Portal Regulation (IEPR) replaced the E-PRTR (see - *Industrial Emissions Portal Regulation (IEPR) - European Commission (europa.eu)*). **The European Commission will spend the next two years refining the new rules** and how they will be implemented by new sectors included under the new regulations. **The first data reported under the new law will be published in 2028** and report releases and resource use in 2027. We will continue to refer to the E-PRTR throughout this report as our previous work was based on this database.

Hazard vs. Risk

A key difference between the EU and the U.S. is how they approach regulation of chemicals based on hazard or risk. These are related concepts but have very different ways of being ascertained and interpreted.

The hazard of a chemical considers all potential sources of danger or harm it could cause. It is based on a toxicological analysis of potential harmful effects and under what circumstances these can occur (e.g. inhalation, ingestion, skin exposure).

For instance, a chemical could cause lung damage. That would be a hazard. This would not imply that any level of exposure, no matter how small, and received by any means will cause lung damage. A hazard profile for the chemical would consider how a person would need to be exposed and at what level of exposure for lung damage to occur.

The Risk of a chemical considers the likelihood that a specific hazard occurs.

Risk = Hazard x Exposure

Using our example of a chemical that causes lung damage, a risk assessment would quantify the risk of lung damage based on the level of exposure needed. The risk might be considered insignificant if you would have to ingest kilos of the chemical to cause the hazard.

We can be exposed to highly hazardous chemicals safely if the exposure is below the level that causes harm. **The hazard of a chemical cannot be changed, it is a fundamental part of its chemistry, but the risk of exposure at harmful levels can be managed via regulation and proper handling**.

The EU's Regulation, Evaluation, Authorisation and Restriction of Chemicals (REACH) assesses chemicals based on eliminating hazards. Chemicals are identified as being "substances of Very High Concern" based on assessment of their hazards. This approach suggests that potentially hazardous chemicals should be avoided where possible. The regulation allows authorisation for the use of hazardous chemicals under controlled circumstances where there are no possible replacements, or the benefit of use is adjudged to outweigh the risk.

The hazard based approach has received criticism from businesses as overly burdensome and leading to the banning of chemicals which could be used safely under controlled conditions.

The U.S. EPA takes a risk based approach to the regulation of chemicals. It first prioritises chemicals for review based on an initial screening. Those deemed necessary for review are then evaluated for their risk. Those found to have an unreasonable risk are subject to restrictions to eliminate the unreasonable risk (see - *How EPA Evaluates the Safety of Existing Chemicals | US EPA*). Restrictions can include labelling, reporting requirements, restrictions on use or outright bans.

The U.S. risk based approach can generally be considered less burdensome for business but relies on accurate modelling of all the possible ways chemical exposure can occur throughout the entire lifecycle of a product. By their very nature, many toxic chemical releases are inadvertent and thus it can legitimately be asked whether they are accurately captured by a risk assessment which may assume a chemical is used only under controlled conditions in a factory sealed off from the wider environment or civilians.

Reporting of toxic releases in the U.S. vs EU

U.S. TRI

The U.S. Toxic Release Inventory (TRI) dataset comprises facility-level disclosures of toxic releases. Facilities must report to the TRI when they meet certain disclosure requirements, for example whether they use, process, or dispose of TRI listed toxic chemicals.

Chemicals covered by the TRI are those considered to cause[1]:

- Cancer or other chronic human health effects
- Significant adverse acute human health effects
- Significant adverse environmental effects.

In 2023, the TRI required reporting on 721 non-PFAS chemicals or chemical groups (see *link* for a full list from reporting year 2023). An additional 189 PFAS chemicals reported to the TRI in reporting year 2023 are also *listed*.

The risk screening environmental indicators (RSEI) dataset builds upon the TRI data by providing two main metrics to users - RSEI Hazard and RSEI Score. The former provides an indication of the toxicity of the chemical release, which is specific to the method of release (air, land, or water). The latter goes one step further and estimates the impact on human health by modelling how these chemicals travel through the environment and enter the human body. For more details, please see the methodology annex from our Toxic Footprints work (*link*).

E-PRTR

In January 2006, the EU established the European Pollutant Release and Transfer Register (E-PRTR) which required all facilities to report information about releases and waste quantities to their national authorities for inclusion in the European Register. Note that facilities may report more information to their national agencies than is shown in the E-PRTR. The E-PRTR carries information only according to the minimum recording requirements agreed by the EU member states.

The EU currently requires corporates to report releases of 91 chemicals or groups of chemicals via the E-PRTR (see *link* for a full listing). **The EU appears to have taken the approach of generally targeting high-level groups for reporting**. For instance, it requires reporting on halogenated organic compounds (as AOX)[a] as a group, rather than trying to list all the possible specific chemicals which would fit within that group. **This approach has the benefit of meaning corporates generally cannot avoid reporting requirements by making small changes to the chemical structure of their products such that they would be missed by specific chemical reporting requirements**. The downside is that within these groups there could be significant variation in the toxicity of products.

a Halogenated organic compounds are substances that contain carbon and hydrogen, but where one or more hydrogen atoms have been replaced by a halogen – chlorine, bromine, fluorine or iodine

EU National level reporting requirements

As noted above, **national level reporting requirements can differ from those of the E-PRTR and can be significantly more stringent**.

As an example, in the Netherlands, reporting requirements cover more than 2,900 chemicals or groups of chemicals. Companies operating in the Netherlands must report on releases of these Substance of Very High Concern (SVHC) every five years. It is notable that the reporting requirement under Dutch law is not limited to the published list of SVHC (see *https://rvszoeksysteem.rivm.nl/ZZSlijst/TotaleLijst*), facilities are also obliged to report releases of chemicals that are not on this list, but do meet the hazardous criteria of REACH article 57 (such as being carcinogenic or persistent, bioaccumulative and toxic).

In contrast to the more stringent Netherlands national reporting regime, Germany mirrors the E-PRTR requirements at national level, with 91 chemicals or chemical groups required to be reported upon. Despite this, the German Government failed to submit data to the E-PRTR for over three years, until its submission in the middle of 2023.

Table 1: Summary comparison of the E-PRTR and U.S. TRI. Source: Planet Tracker.

	E-PRTR	U.S. TRI
Regulatory Approach	Hazard-based	Risk-based
Number of reporting lines	91	721

Comparing the E-PRTR and the U.S. TRI

Comparing reporting requirements between geographies could be **complicated by the fact that a single chemical can have multiple different names or designations - including its molecular formula and generic, common, and any trade names**. To avoid this confusion, science and industry often use the **CAS registry number system**[2]. Chemical Abstracts Service (CAS) registry numbers are a unique number assigned to different chemicals by the Chemical Abstracts Service, a division of the American Chemical Society (*American Chemical Society*). The number itself is not related to the chemical being categorized, but it is unique to that particular substance.

Using CAS numbers and comparing the E-PRTR and the U.S. TRI we find that of the 91 reporting requirements in the E-PRTR, 39 have a direct correlate in the U.S. TRI (Table 2).

Table 2: Common chemicals between the E-PRTR and U.S. TRI. Source: Planet Tracker.

1,1,1-trichloroethane	Benzo(g,h,i)perylene	Hexachlorobutadiene (HCBD)	Tetrachloroethylene (PER)
1,1,2,2-tetrachloroethane	Chlordane	Hydrogen cyanide (HCN)	Tetrachloromethane (TCM)
1,2-dichloroethane (EDC)	Di-(2-ethyl hexyl) phthalate (DEHP)	Isodrin	Toluene
Alachlor	Dichloromethane (DCM)	Lindane	Toxaphene
Aldrin	Diuron	Naphthalene	Trichloroethylene
Ammonia (NH3)	Ethyl benzene	Pentachlorobenzene	Trichloromethane
Anthracene	Ethylene oxide	Pentachlorophenol (PCP)	Trifluralin
Asbestos	Fluoranthene	Phenols (as total C) (13)	Vinyl chloride
Atrazine	Heptachlor	Polychlorinated biphenyls (PCBs)	Xylenes (17)
Benzene	Hexachlorobenzene (HCB)	Simazine	

Where there is not a direct CAS number match, it looks like there is sometimes a very similar reporting line. For instance, the E-PRTR requires reporting on "Arsenic and compounds (as As)" while the U.S. TRI requires reporting on "Arsenic compounds". We list what we believe to be these common lines below (Table 3). These are all focused on reporting on metals and metal compounds.

Table 3: Groups which seem to be equivalent between the E-PRTR and U.S. TRI despite no common CAS number. Source: Planet Tracker.

E-PRTR	U.S. TRI
Arsenic and compounds (as As)	Arsenic compounds
Cadmium and compounds (as Cd)	Cadmium compounds
Chromium and compounds (as Cr)	Chromium compounds (except for chromite ore mined in the Transvaal Region)
Copper and compounds (as Cu)	Copper compounds
Lead and compounds (as Pb)	Lead compounds
Mercury and compounds (as Hg)	Mercury compounds
Nickel and compounds (as Ni)	Nickel compounds
Zinc and compounds (as Zn)	Zinc compounds

Overall, putting these two tables together suggests that **there are 47 common or very similar reporting lines between the E-PRTR and U.S. TRI out of the 91 total required reporting lines in the E-PRTR**.

It is notable that the **E-PRTR seems to have a broader focus in its reporting than direct chemical toxicity**. For instance, it includes lines for reporting Carbon Dioxide, Total Nitrogen and Total Phosphorous releases. These would seem to be more focused on climate change and eutrophication than direct toxicity of the released chemicals. The TRI does require reporting of nitrate compounds (water dissociable; reportable only when in aqueous solution), which may also be focused on eutrophication impact.

What to make of the differences between the EU and U.S.?

There are a variety of reasons why a chemical might be on the reporting required list in one region and not in another. We discuss some of them below.

Firstly, as noted previously, **nomenclature differences** could mean that differences are artificial, and the underlying chemicals are the same. As discussed, the use of CAS numbers should minimize this as an issue.

Secondly, **a chemical may not be used in one region**, either due to a difference in business practices or perhaps because it has been banned in the region. We examined the EU REACH database to see if it notes bans on a lot of substances. We found that very few chemicals seem to be completely banned in the EU, so this is unlikely to be the driver of the difference in reporting requirements.

Thirdly, differences in **the way reporting is approached**. As mentioned, the E-PRTR seems to require reporting of higher-level groups of chemicals, whilst in general the U.S. TRI seems to be more specific. This means that although **the E-PRTR might seem to cover a lot less than the U.S. TRI (91 reporting lines versus 720), it may capture many of the same chemicals within its higher-level groupings**.

Fourthly, as discussed above, the EU and U.S. take **different approaches when it comes to using hazard or risk in assessing dangerous chemicals**. This could lead to differences in whether a chemical is worthy of being included in reporting requirements. The interesting point here is that the EU hazard based approach is generally regarded as more precautionary and would be ostensibly be expected to generate more chemicals to be reported upon (in contrast to the seeming reality).

Case studies

The differences outlined above matter. When corporates are pressured by NGOs or investors to disclose data or set targets, doing so presents challenges for global companies who have to report annually to different regulatory regimes. The lack of harmonization between reporting systems can make the comparison of toxic releases between facilities and companies biased, or just downright unfair.

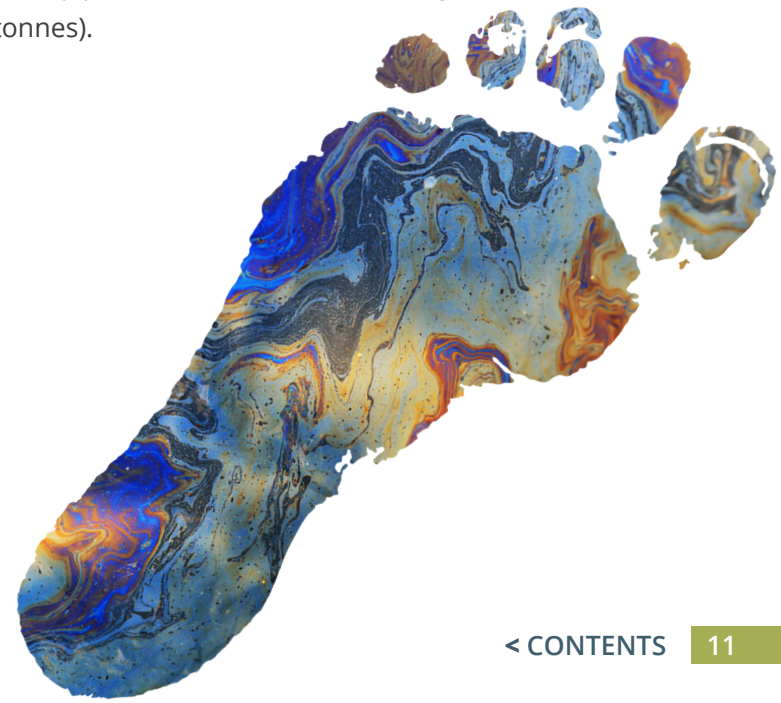
The same goes for financiers. Banks and shareholders who want to assess the risk of PFAS-related toxic releases or assess the toxic footprint of a portfolio will have a hard time doing so on an even basis.

The two case studies that follow outline how companies and financiers can currently combine the data from the U.S. TRI and the E-PRTR in order to assess their toxic footprint. For the corporate case study we have chosen ExxonMobil as it has a global footprint with numerous facilities in both our U.S. and EU analyses - 14 facilities in the United States, two in both Belgium and the Netherlands, and one in Germany. For the investor example we have chosen Pzena Investment Management, a value investor headquartered in New York City, because it held USD 36 billion in 40 companies across our study universe and has stated the importance of ESG by asserting that *"Assessing the potential impact of ESG issues on a company is therefore critical to our investment process"*.[b]

The corporate's toxic footprint: ExxonMobil (XOM)

Exxon (XOM) attracts significant interest from the financial community because of its current and future role in combatting climate change, but also due to the toxic releases it creates from its refining and petrochemical operations. It has 19 facilities included in Planet Tracker's U.S. and EU toxic footprint analyses, with around 126,000 tonnes of toxic releases coming from its facilities in 2021 – an 8% increase on 2020. Since 2015, toxic releases have fluctuated between 112,000 tonnes (2020) and 146,000 tonnes (2018).

Figure 1 shows the distribution of Exxon's petrochemical facilities and also the proportion that each activity contributes towards Exxon's toxic footprint. Plastic and resin manufacturing are responsible for 67,000 tonnes of releases, followed by petrochemical manufacturing (28,000 tonnes), and then petroleum refineries (22,000 tonnes).



b https://www.pzena.com/our-esg-investing-approach/

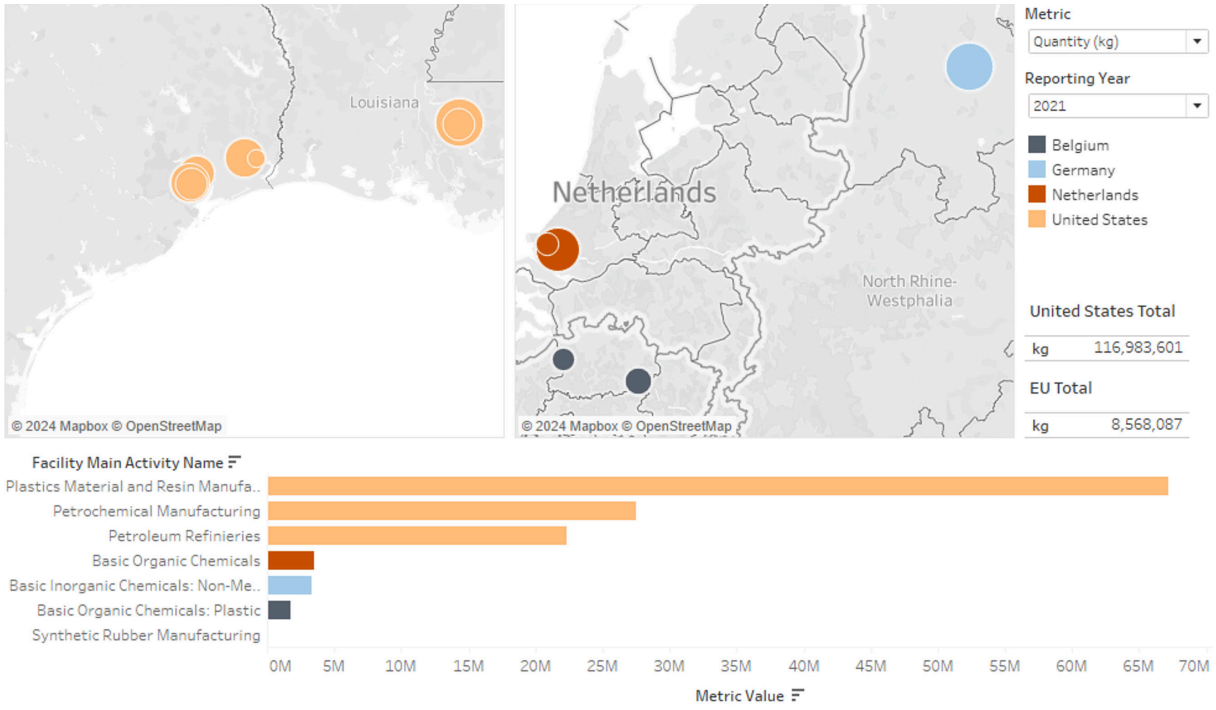


Figure 1: Exxon Mobil's 2021 petrochemical toxic footprint, measured in kilograms, across Texas, Louisiana, Belgium, Germany, and the Netherlands.

The data is useful for investors and lenders looking to engage with Exxon on its green credentials. Exxon discloses that it has reduced its footprint by >10% since 2016 but doesn't mention anything about chemical or toxic releases in its 2023 Advancing Climate Solutions report. However, it does mention that its facility in Baton Rouge, its largest polluter with 43,000 tonnes of toxic releases in 2021, completed a major polypropylene expansion in Q4 2022 to increase its production capacity by 450,000 tonnes.[3] Investors can use tools like Planet Tracker's toxic footprint dashboards to monitor releases in conjunction with corporate infrastructure projects to anticipate increases in releases and any negative impacts that this these may entail.

We also note that Exxon is an example of why investors should push for more transparency on the nature of toxic releases. When we look at Exxon's ecotoxicity and human toxicity impact in the EU (instead of the physical amount released in kg) the impacts go to zero as we are not able to map the EU's pollutant categories to a specific pollutant and thus estimate the toxicity value. The EU toxic releases from Exxon's EU plants are hazardous waste, non-methane volatile organic compounds (NMVOCs), carbon monoxide (CO), sulphur oxides (Sox), and total organic carbon. We have no idea what's in the hazardous waste so cannot assign a toxicity value, while the rest of the categories do not have a toxicity value. The lack of detail in the EU reporting means investors in Exxon cannot be certain what toxic impacts they are financing and thus accurately model potential risks.

The financial institution's toxic footprint: Pzena Investment Management (IM)

Founded in 1995, Pzena IM has an approach to ESG investing which highlights how ESG controversies could negatively impact companies in the short-term, but also how ESG laggards may provide opportunities to drive long-term returns.[2] They have also published a Biodiversity Primer which outlines specifically how chemicals can be both short-term and long-term drivers of financial risks. For instance, highlighting "reputational events" such as spills and pollution by companies such as Bayer (BAY), and the increasing regulation of chemicals, especially in the EU.[4]

Planet Tracker's U.S. and EU Toxic Footprint dashboards, combined below in Figure 2, could help investors like Pzena IM monitor and measure these risks.

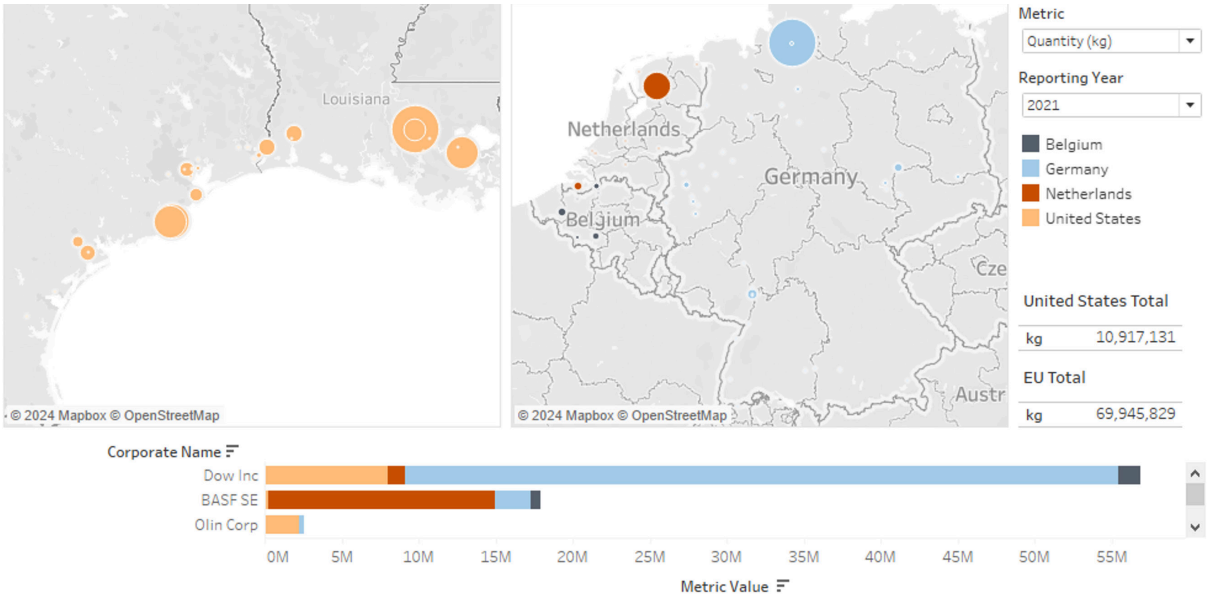


Figure 2: Pzena Investment Management's 2021 petrochemical toxic footprint, measured in kilograms, across Texas, Louisiana, Belgium, Germany, and the Netherlands

The information shows that the majority of toxic releases from Pzena's holdings occur in Germany, with *Dow* (DOW) being a major contributor, releasing over 46,000 tonnes of chemicals in 2021, followed by *BASF* (BAS) in the Netherlands (14,800 tonnes), and then Dow's facilities in the U.S. (8,000 tonnes). However, due to how chemicals are reported in the U.S. and EU, not all releases can be mapped accurately to toxicity values. This means that if Pzena IM chose the biodiversity metric (ecotoxicity), facilities operated in the US by Olin Corp, Dow, and BASF would be revealed as the top three companies. The same is true when selecting the human health metric, measured in DALYs.

The dashboard provides valuable information to financiers wanting to have informed, targeted discussions with corporates on material ESG issues. The unit of measurement is an important choice as rankings can change based on what is selected. Investors can go further using our U.S. and EU dashboards, for instance, by viewing accidental toxic releases, as well as the releases of "confidential" toxic chemicals.

Conclusions

Planet Tracker has previously warned of the potential risk to investors from the release of toxic chemicals into the environment – see our report *Novel Entities: A Financial Time Bomb*.

Given this risk, **we believe investors should welcome a robust regulatory regime as providing some level of protection against future litigation risk, assuming the rules are followed**.

As discussed in this report, **the EU and U.S. take a different approach to regulating toxic chemicals. Generally, the EU's hazard based approach is viewed as more burdensome for businesses given it operates on a more precautionary basis and thus is more restrictive. However, it is also likely to reduce future litigation risk because of that more precautionary principle.**

For investors, **we believe greater transparency is a critical request to make of both regulators and corporates irrespective of the geography of operation and reporting. Only with transparency for the products being produced, by volume and location, can they make a judgement about potential or actual risks from toxic releases. Given the growing threat of litigation, this transparency should be an increasingly urgent ask of chemical industry corporates**.

We would also urge caution about corporates seeking to arbitrage between different regulatory regimes and move production to geographies with more lax enforcement or requirements. This might seem to provide a near-term benefit by reducing red tape and delay pressure to develop less toxic alternatives. However, Planet Tracker believes **investors should worry about the longer-term risks from litigation and potential loss of market access** should other regions ban imports of hazardous chemicals or those which are associated with environmental and human health damage in the supply chain.

References

1 *What is the Toxics Release Inventory? | US EPA*

2 *CAS REGISTRY | CAS*

3 ExxonMobil (2023) Advancing Climate Solutions. Progress Report. Available *here*.

4 Pzena Investment Management (2022) Biodiversity Primer. Available *here*.

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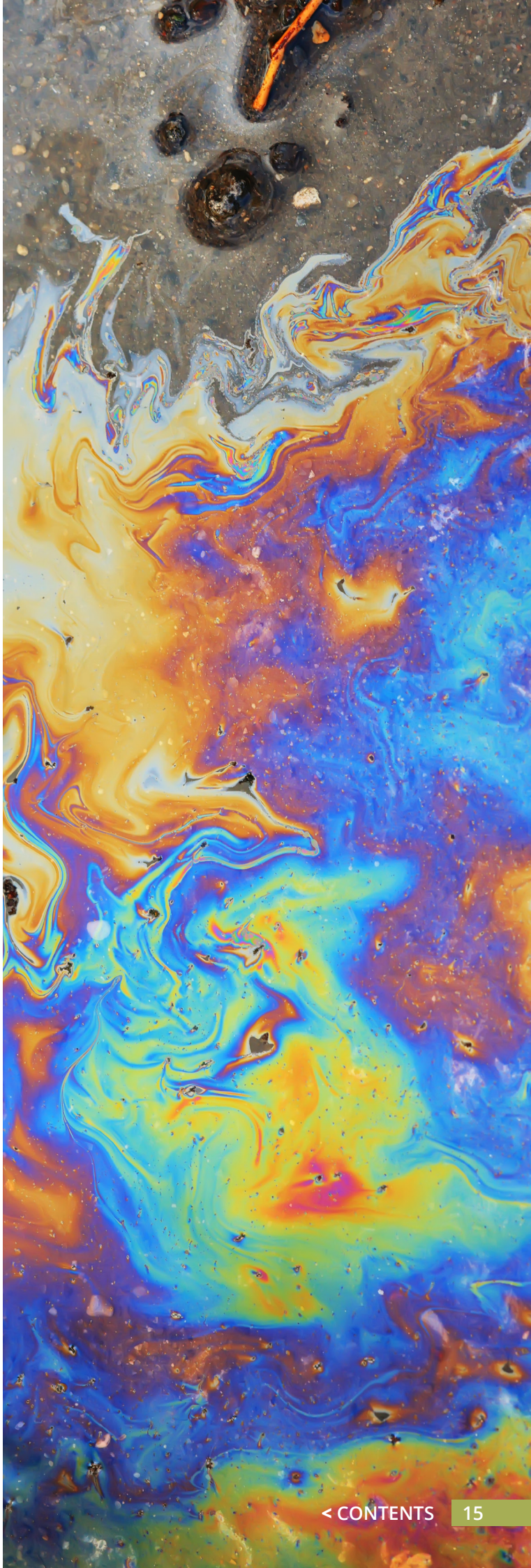

ABOUT PLANET TRACKER

Planet Tracker is an award-winning non-profit financial think tank aligning capital markets with planetary boundaries. Created with the vision of a financial system that is fully aligned with a net-zero, resilient, nature positive and just economy well before 2050, Planet Tracker generates break-through analytics that reveal both the role of capital markets in the degradation of our ecosystem and show the opportunities of transitioning to a zero-carbon, nature positive economy.

PLASTICS TRACKER

The goal of Plastics Tracker is to stem the flow of environmentally damaging plastics and related-products that are creating global waste and health issues by transparently mapping capital flows and influence in the sector starting from resins production through to product use. By illuminating risks related to natural capital degradation and depletion, investors, lenders and corporate interests across the economy will be enabled to create more sustainable plastics products.

ACKNOWLEDGEMENTS

Authors: Richard Wielechowski, Chris Baldock, Filippo Grassi, John Willis (Planet Tracker)

WITH THANKS TO OUR FUNDER

Flotilla
FOUNDATION

Suggested citation: Wielechowski R., Baldock C., Grassi F., Willis J.: A Tale of Two Systems: Comparing toxic chemical reporting requirements in the U.S. and EU – Planet Tracker (2024).

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