TOXIC FOG

Known Unknowns

Planet Tracker

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When **ASSESSING** the **PETROCHEMICALS** and **PLASTICS** industry, **TOXIC EMISSIONS** are often either **IGNORED** or **FORGOTTEN** by the **FINANCIAL MARKETS**

CONTENTS

INTRODUCTION

Planet Tracker's Toxic Footprints[i] report revealed the investors behind petrochemical toxicity in the US Gulf States of Louisiana and Texas. When assessing the petrochemicals and plastics industry, toxic emissions are often either ignored or forgotten by the financial markets.

This follow-up research paper reveals the known unknowns of toxic releases, those issues hidden from the public's and investors' view and which the Environmental Protection Agency (EPA) is not permitted to reveal.

We also highlight how the data could be made more user-friendly. Financial institutions should demand transparency for toxic emissions so that they can conduct a thorough risk assessment of their investments.

KEY POINTS

Below are the major toxic emission known unknowns identified by Planet Tracker:

Hidden from view

1. Companies can classify their chemicals as 'trade secrets' which permits them to hide the substances' name.
2. There is more granular information on pounds released (TRI) than for RSEI metrics (Hazard and Score).
3. When a chemical is removed from the TRI chemical list, then all instances of releases are removed from the RSEI dataset; the history is eradicated.
4. If chemical releases are sent to offsite Class 'C' landfills, it is assumed that no chemicals escape or are leached to groundwater in the RSEI calculations. A perfect disposal system is assumed.
5. Acute[1] human and environmental toxicity are not included in the calculation of the RSEI metrics - instead RSEI metrics focus on chronic toxicity impacts. Also, RSEI Hazard does not include environmental fate and transport modelling or adjustments for population exposure.
6. The split of production and non-production waste is important, as the latter is infrequent, often from one-off occurrences and is excluded from permitted emission release thresholds. Non-production emissions and their media (air, land, water) are given a pass in the EPA Basic Files dataset.

In need of improvement

7. TRI metric is limited, as one pound of chemical release does not have the same impact when compared to one pound of another chemical. Consider the impact of one pound of mercury and one pound of arsenic released into the environment, for example.
8. The TRI Basic files do not provide geographic information on the end destination; more information is available on Basic Plus documents, but these are more time consuming for companies to use and understand.
9. TRI is a self-reported metric and does not include when a facility has breached its legal limit of releases.
10. EPA does not provide a context of "high RSEI Scores" or "high RSEI Hazard values"; a categorisation of high/medium/low would be beneficial to understand what the ranking of the facility means.

[1] Definition of Acute Toxicity: Any poisonous effect produced within a short period of time following an exposure, usually 24 to 96 hours, EPA / Vocabulary catalogue.

EXPOSING TOXIC RELEASES

Planet Tracker's research paper, Toxic Footprints, uncovered the prevalence, toxicity and human health effects of chemical pollutants (as measured by the EPA) and the facilities most accountable for them. It then overlayed this with the financial market participants that are supporting them. A link was established between facilities, facility owners, corporates and investors. It removed the excuse from investors of not knowing about these pollutants and it empowered them to take meaningful action to mitigate future risk.

The analysis focused on the petrochemical and refining industries in the U.S. Gulf Region states of Louisiana and Texas. Combined, these two states account for more than one-quarter of the country's total petrochemical facilities. Both refineries and petrochemical facilities are examined, as the former often provides feedstocks used by the latter. The high concentration of petrochemical facilities in this region is because the Gulf is a centre for U.S. oil and gas resources more generally, including about one-fifth of domestic oil production, about half of natural gas processing plant facilities and nearly half of refining capacity along with considerable technical expertise in the oil & gas industry.

Planet Tracker identified over 7,400 financial institutions currently supporting petrochemical plants in the U.S. Gulf States through equity, debt or financing (which facilitate loans or underwrite issues). There is an opportunity for investors to pressure the facilities responsible for these toxic footprints to change the way they operate. Presently, fines for toxin violations are not significant enough to materially impact the operators or investors. However, a tightening of regulatory standards could dramatically change this.

By revealing the most serious offenders in the industry, Toxic Footprints and Planet Tracker's accompanying data dashboard[ii] provide a toolkit for investors to understand this industry and link pollutants, facilities and financial institutions.

The research used publicly available data from the EPA, mainly from two different datasets - the Toxics Release Inventory (TRI) and the Risk Screening Environmental Indicators (RSEI) - but also revealed the information that facilities and their operators are able to hide from investor and public scrutiny. In this paper we unveil these known unknowns. The toxic curtain should be drawn back allowing the data to be subjected to public scrutiny. Financial institutions should require this information so that a full risk assessment can be undertaken, and a proper risk/reward evaluation conducted.

THE KNOWN UNKNOWNS OF EPA

Planet Tracker's analysis for our report on Toxic Footprints identified some concerns with the Environmental Protection Agency's (EPA) dataset. In turn, this raises questions about the data that refineries and petrochemical facilities are able to report, yet still be compliant with the regulations. For more information on the data usage, we recommend reading the EPA Data Guidebook[iii] and Methodology Annex.[iv]

The EPA provides three datasets to measure the impact of chemical releases, each of them having a specific indicator:

The Toxic Release Inventory (TRI) measures the physical quantity of the chemical release.

"TRI tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. U.S. facilities in different industry sectors must report annually how much of each chemical is released to the environment and/or managed through recycling, energy recovery and treatment. The information submitted by facilities is compiled in the Toxics Release Inventory. TRI helps support informed decision-making by companies, government agencies, non-governmental organisations and the public".[v]

The Risk-Screening Environmental Indicators Score (RSEI score) estimates the risk of the release to human health.

"A RSEI Score is a unitless value that accounts for the size of the chemical release, the fate and transport of the chemical through the environment, the size and location of the exposed population, and the chemical's toxicity".[vi]

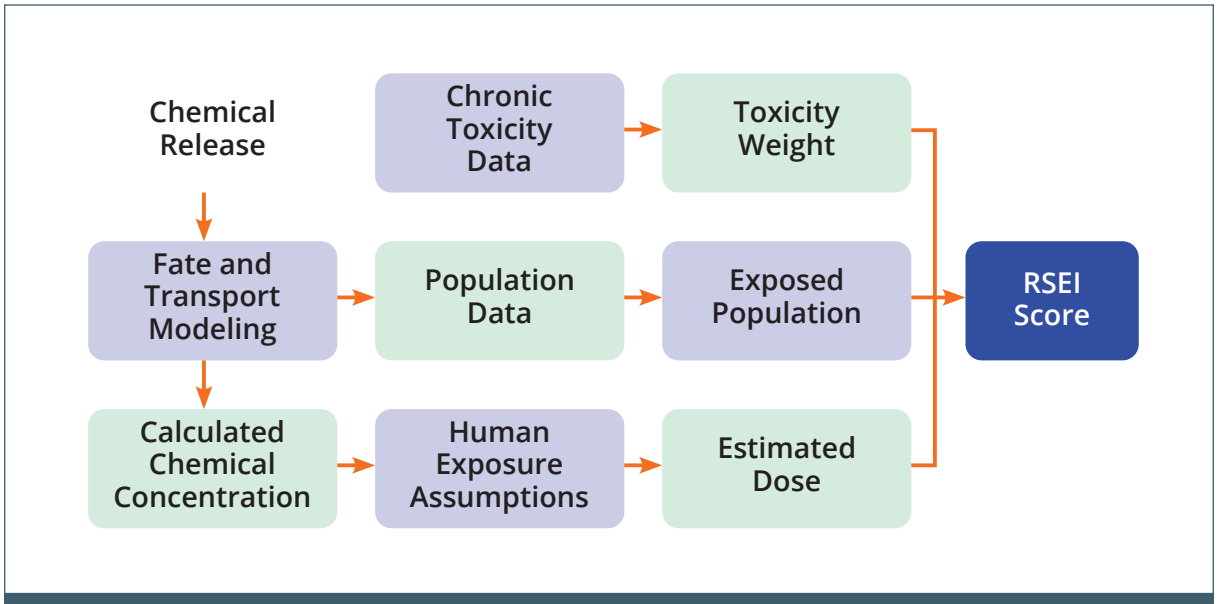

Figure 1: The graphic summarizes how RSEI Scores are constructed. A RSEI Score is calculated as toxicity weight multiplied by the exposed population multiplied by the estimated dose. Source: EPA-RSEI

The Risk-Screening Environmental Indicators Hazard (RSEI hazard) assesses the hazard posed by the chemical release.

"RSEI Hazard, also called toxicity-weighted pounds, is a result that accounts for the size of the release and the chemical's toxicity. RSEI Hazard can be calculated for any TRI release or transfer. When RSEI Hazard is calculated over the set of modelled releases (on-site releases to air, water, and off-site transfers to POTWs or incineration), it is labelled "RSEI Modelled Hazard" to emphasize that not every possible release or transfer is included".[vii]

These known unknowns fall into two main groups. There are those data which are **hidden from view** but are permissible under present regulations. The second group is where Planet Tracker believes data **could be improved** or further explanation offered.

HIDDEN FROM VIEW

1 Trade secrets

Issue: To avoid public disclosure of toxic chemical releases, facility operators and owners can claim a release contains 'trade secret' chemicals. The TRI dataset will contain data on the amount released and to what media, under the chemical name 'Trade Secret'. **The RSEI dataset will contain no toxicity information on these chemicals**. This is because there could be many different chemicals classified under the same trade secret category, thus making it impossible to understand the toxicity data.

Note: If looking at a facility level release, toxicity information for trade secrets can be identified by assuming that the trade secrets chemical is based on what the facility usually releases. However, if looking at the aggregated view, then information for toxicity cannot be found, as different chemicals of different toxicities have been aggregated. The RSEI metric does not contain any information trade secrets chemicals.

Example: Berkshire Hathaway and American Acryl own petrochemical facilities that release trade secret chemicals. In 2019, Berkshire Hathaway's Deer Park Plant run by Lubrizol[2] released over 46,000 pounds of production-related trade secret chemicals. Between 2007 and 2019, American Acryl's Bayport Plant[3] released between 14,000 and 144,000 pounds annually. If we examine the non-trade secret emissions, American Acryl's three main chemical releases between 2015 and 2019 are acrylic acid, hydroquinone and maleic anhydride, which account for over 99% of their production-related releases. This may or may not give an indication of possible trade secret emissions - see Figure 2.

[2] Lubrizol

[3] American Acryl

to **AVOID** public disclosure of

TOXIC CHEMICAL releases, facility

OPERATORS & OWNERS can claim a

release contains **TRADE SECRET** chemicals

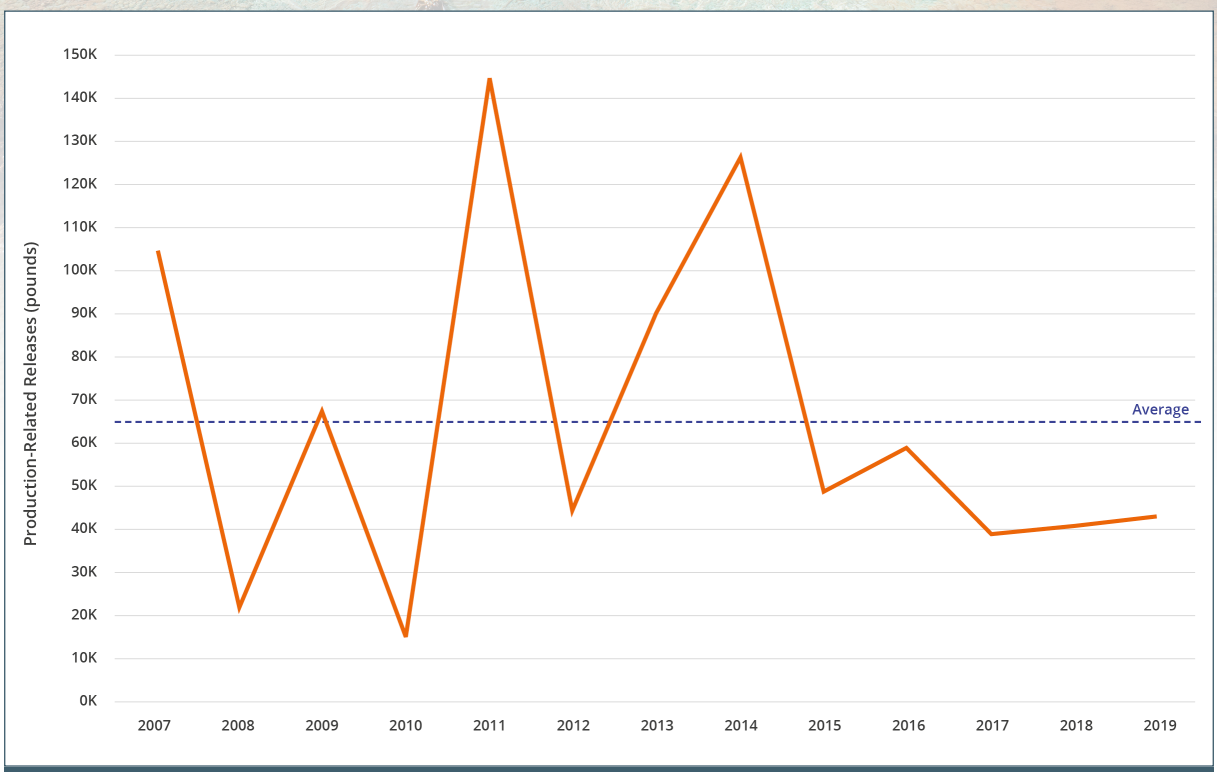

Figure 2: Trade Secret Production-Related Releases by American Acryl. Source: US EPA.

2 Inconsistency in data entries

Issue: There are different datasets for each of the EPA toxic release metrics, which leads to the following:

- the number of chemicals in the three datasets is inconsistent, meaning the TRI dataset contains more chemicals than RSEI Hazard and RSEI Score. There might be perfect coverage, but RSEI metrics provide aggregated information which makes it unclear whether all chemicals are included or not. Specifically, the TRI categorises chemical releases in 72 different ways. The categories provided include means in which the chemical has been released and how and where the chemical has been disposed. Chemical hazard (RSEI Hazard) and chemical risk (RSEI Score) data are placed into eight and five categories respectively. Ideally there should be 72 metrics across all datasets to ensure all chemicals have been included in each metric. Despite the fact that EPA advises that "RSEI Hazard can be calculated for any TRI release or transfer", it also emphasises that in the "RSEI Modelled Hazard" not every possible release or transfer is included, leaving an open window that the three metrics may not match.

- there are six occasions where the medium is recorded as "unknown" in the datasets and therefore it is difficult to identify if the medium is air, land or water.

Example: When looking at releases in the air, TRI has identified 11 chemicals, whilst RSEI Score has identified only 3 and RSEI Hazard only 2. Additionally, there are 6 chemicals categorised as unknown media and 10 are mixture of air/land/water in the TRI dataset - see figure 3.

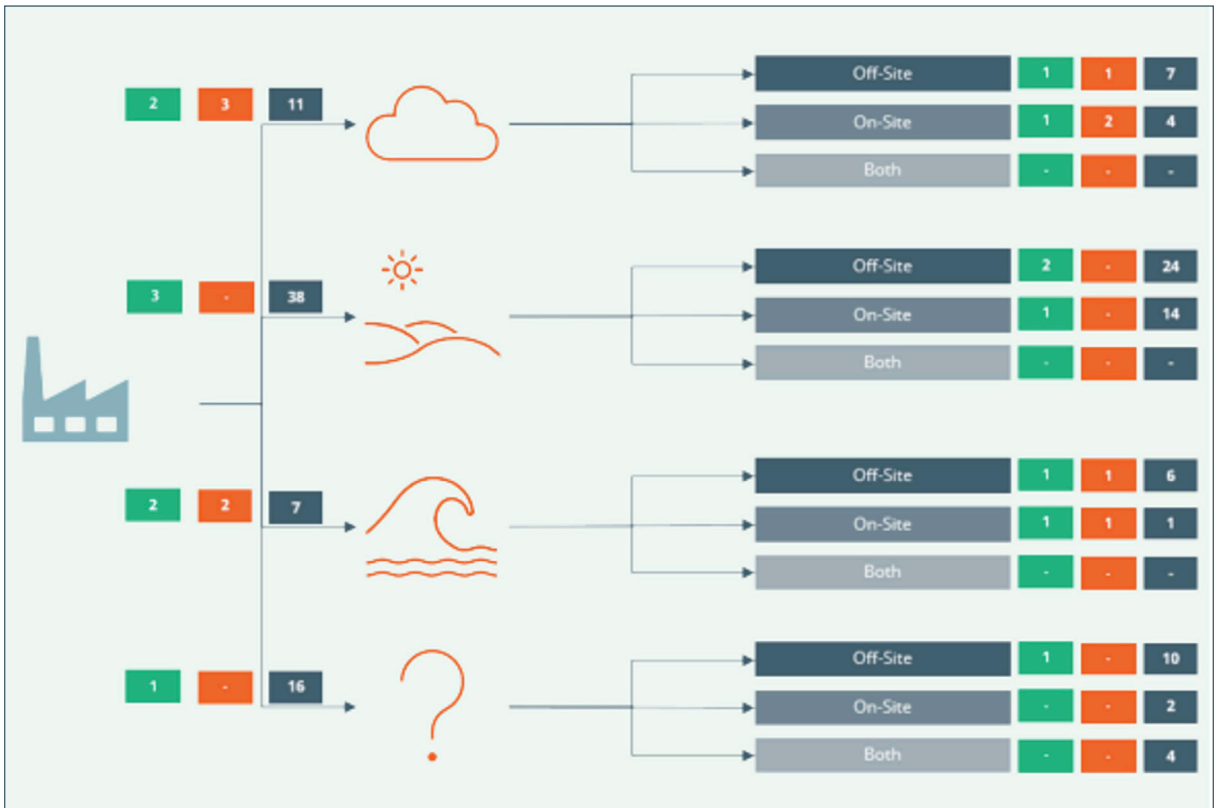

Figure 3 : The Number of Categories of Toxic Chemical Releases to Air, Land, Water and Unknown Media Mapped to the Following Metrics: RSEI Hazard (green); RSEI Score (orange); TRI (grey). Source: Planet Tracker.

3 Eradicating history

Issue: The RSEI dataset contains toxicity information regarding the chemical releases found in the TRI. However, when a chemical is removed from the TRI chemical list, then all instances of releases of that chemical are removed from the RSEI dataset, for all years. For instance, if ethylene oxide were removed from the TRI chemical list, RSEI would remove all information related to ethylene oxide, for all years in RSEI. There would be no sign of its existence in RSEI until it is returned to the TRI chemical list. Changes to the TRI list of chemicals can be found here, which shows that 30 chemicals have been removed from the list between 1987 and 2003.

Example: No chemicals have been removed from the list since RSEI began producing data in 2007. One chemical, hydrogen sulfide, was removed from the list in 1995 and then reinstated again in 2012. Since the creation of the RSEI dataset and up until reporting year 2019, 36 chemicals had been added to the TRI list. For the reporting year 2020, the EPA is adding 172 per- and polyfluoroalkyl substances (PFAS) to the toxic chemicals list. The EPA is setting a reporting threshold of 100 pounds for each PFAS added to the list.[viii]

In October 2021, in response to a petition, EPA proposed to add 12 chemicals to the EPCRA section 313 toxic chemical list,[ix] as per below:

1. Dibutyltin dichloride; 683-18-1
2. 1,3-Dichloro-2-propanol; 96-23-1
3. Formamide; 75-12-7
4. 1,3,4,6,7,8-Hexahydro-4,6,6,7,8,8-hexamethylcyclopenta[g]-2-benzopyran; 1222-05-5
5. N-Hydroxyethylethylenediamine; 111-41-1
6. Nitrilotriacetic acid trisodium salt; 5064-31-3
7. p-(1,1,3,3-Tetramethylbutyl)phenol; 140-66-9
8. 1,2,3-Trichlorobenzene; 87-61-6
9. Triglycidyl isocyanurate; 2451-62-9
10. Tris(2-chloroethyl) phosphate; 115-96-8
11. Tris(1,3-dichloro-2-propyl) phosphate; 13674-87-8
12. Tris(dimethylphenol) phosphate; 25155-23-1

The EPA believes that available data show these chemicals have moderately high to high human health toxicity and/or are highly toxic to aquatic organisms. None of these chemicals appear in the TRI Chemical List Changes published in July 2022.[x]

4 Burial Sites

Issue: If chemical releases are sent to offsite to Class 'C' landfills, it is assumed that no chemicals escape or are leached to groundwater in the RSEI calculations.

"Class 'C' (or Subtitle 'C') establishes a federal program to manage hazardous wastes from cradle to grave. The objective of the Subtitle C program is to ensure that hazardous waste is handled in a manner that protects human health and the environment. To this end, there are Subtitle C regulations for the generation, transportation and treatment, storage or disposal of hazardous wastes.

Subtitle C landfills include Hazardous Waste Landfills; facilities used specifically for the disposal of hazardous waste. These landfills are not used for the disposal of solid waste".[xi]

Examples:

- Hazardous waste is regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA). Chemical releases to RCRA Subtitle C landfills are captured within the TRI under questions 75 and 78 – surface impoundments and landfill. States can adopt their own approach for managing hazardous waste under this programme, or the EPA will implement requirements if a programme is absent.[xii]

- If chemical releases are sent to either of these RCRA Subtitle C facilities, it is assumed that no chemicals escape, or are leached to, media such as groundwater in the RSEI calculations. Therefore, no impact on human health is calculated and no chemical risk metric is provided. There are important releases from petrochemical facilities that are sent to other landfills which could have significant impacts on human health. These releases include asbestos, styrene, copper compounds, aluminium dust, zinc compounds, barium compounds and manganese compounds. Four times the amount of waste has been sent to Other Landfills than RCRA Subtitle C landfills from petrochemical facilities since 2007.

5 Lack of toxicity evidence

Issue: Acute human toxicity and environmental toxicity are not included in the calculation of the RSEI metrics, instead RSEI metrics have been built based on chronic data - see Figure 1. Their exclusion could significantly impact which chemicals and facilities should be focussed on. Additionally, unlike RSEI Score, RSEI Hazard does not include environmental fate and transport modelling or adjustments for population exposure. RSEI Hazard should be interpreted carefully; in some cases, high RSEI Hazard may not be associated with high potential risk for human exposure.

Example: Asbestos is the number one chemical to focus on for the publicly owned petrochemical facilities we examined in the Toxic Footprint report according to the RSEI Hazard metric (see dashboard). However, the RSEI score for asbestos is very low as a lot of asbestos goes to landfill which is assumed by EPA to be well managed and have little or no impact on human health or the environment. So, by just using the RSEI Score metric would miss asbestos. For chemicals that are included in both RSEI Hazard and RSEI Score metrics, a similar effect could be seen. Because acute human toxicity and environmental toxicity are not considered, a chemical which is important using the RSEI Hazard metric could drop down the list using the RSEI Score metric when it impacts the environment and/or causes acute human toxicity. Also, it depends where this chemical is finally disposed. For example, if sludge containing arsenic is applied to agricultural land, then the impact of humans consuming food from this land is not included in the EPAs calculations for either RSEI Hazard or RSEI Score.

6 When is production, non-production?

Issue: The split of production and non-production waste[4] is important, as the latter is infrequent, often from one-off occurrences and independent of the permitted rates; therefore, the facilities are not negatively impacted by these releases.

Example: Hurricane damage that causes a spill of plastic pellets into local waterways would be classified as a non-production release, as would the same spill resulting from a catastrophic failure plant equipment even if caused by poor maintenance or negligence. Production-related releases occur due to the day-to-day running of the facility and are a constant, expected source of toxic releases.

However, since 1990, there have been 56 storms, ranging from tropical depressions to hurricanes, that have made landfall within the Plastics Production Corridor. See Stormy Outlook for climate change risks in the U.S. Gulf of Mexico. Their paths are shown by the lines in Figure 4, with each line representing the path of one of the 56 storms since 1990.[xiii]

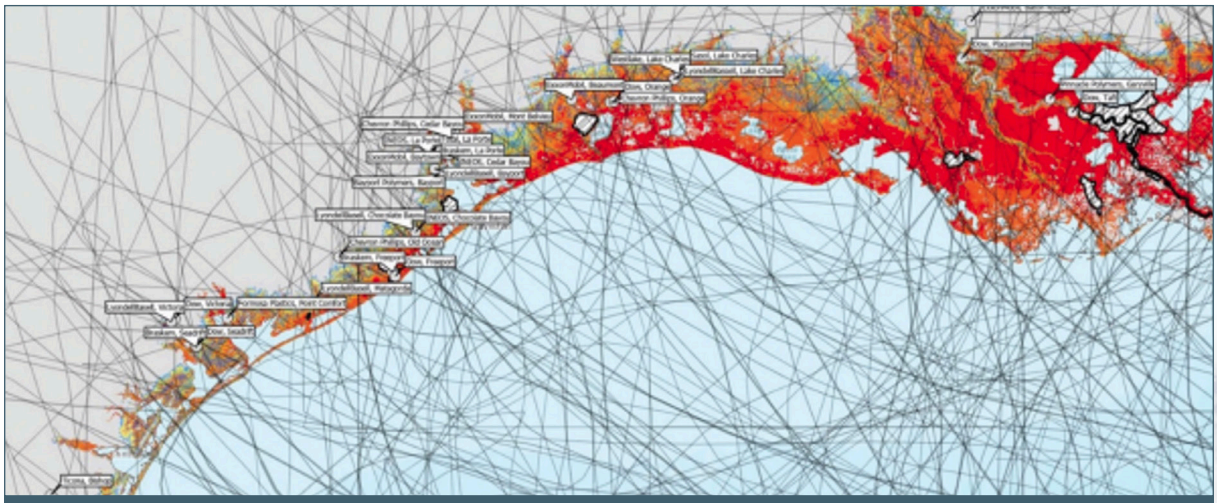

Figure 4: Hurricane Storm Surge - Risk in Plastics Production Corridor Overlaid with Lines (black) from Hurricanes, Tropical Storms and Depressions 1990 to 2020, U.S. National Oceanographic and Atmospheric Administration (NOAA). This employs the SLOSH[5] model. See 'Stormy Outlook' for further details.

[4] The EPA differentiates between the production and non-production waste as follows: Production-related waste is "the quantity of chemical waste generated at a facility as a result of normal, routine production processes and reported as managed." Non-Production-related waste is "the quantity of waste containing TRI chemicals resulting from one-time, non-routine events, rather than from standard production activities. Examples include spills and catastrophic events, such as natural disasters".

[5] The Sea, Lake and Overland Surges from Hurricanes (SLOSH) model developed by the National Weather Service (NWS) estimates storm surge heights resulting from historical, hypothetical, or predicted hurricanes. It takes into account atmospheric pressure, size, forward speed and track data. These parameters are used to create a model of the wind field which drives the storm surge.

IN NEED OF IMPROVEMENT

7 Incomplete metrics

Issue: The TRI metric is limited as one pound of chemical which does not have the same impact as one pound of another chemical.

Example: One pound of mercury released to water causes a very different impact compared to one pound of asbestos sent to landfill.

- Exposure to mercury: Mercury, even small amounts, may cause serious health problems and is a threat to the development of the child in utero and early in life. Mercury may have toxic effects on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes.

- Exposure to asbestos: In addition to lung cancer and mesothelioma[6], asbestos exposure can also cause cancer of the larynx and ovary. Current evidence also suggests asbestos exposure may cause cancer of the pharynx, stomach and colorectum.

- TRI Pounds metric is the one with complete coverage across all chemicals, but the pounds released of different chemicals cannot be compared because of their different impacts. Thus, EPA created the RSEI Hazard and RSEI Score metrics. However these miss key impacts and do not cover all chemicals as previously mentioned and therefore these metrics are still incomplete.

[6] Mesothelioma is a cancer caused by asbestos. It most commonly occurs in the linings of the lungs or the abdomen.

8 Missing data

Issue: The TRI Basic files do not provide information on end destination and it is therefore sometimes not possible to identify to which media off-site releases go. In most instances, the location of off-site releases is unknown. Only the end-method treatment is known, for example incineration at an Energy Recovery Facility, recycling, or treatment at a Waste Management Facility. More information is available in the Basic Plus documents, but these are more time consuming for companies to use and understand. A tool like EasyRSEI for TRI release information would be very useful.

Example: In Louisiana and Texas, 98% of production and non-production related toxic emissions are released off-site by weight. Off-site Transfers to Disposal (61%), Recycling (20%) and Energy Recovery (14%) account for most of the releases - see Figure 5.

98% of RELEASES are going OFF-SITE

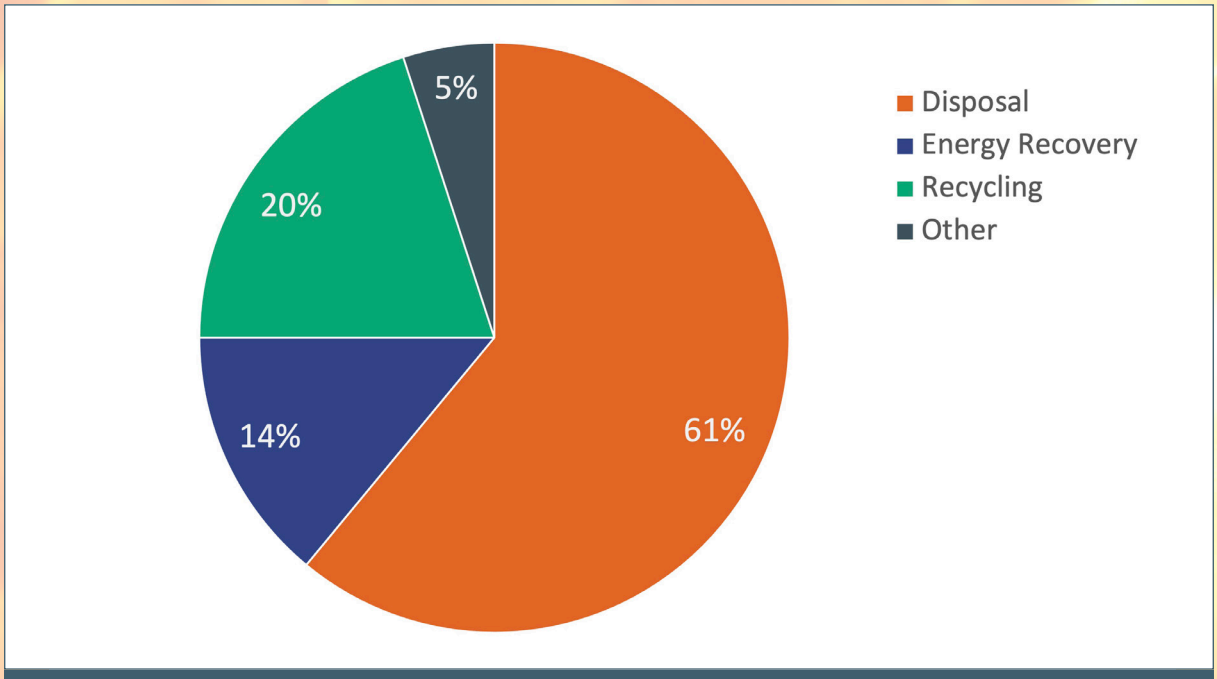

Figure 5: Off- site transfers in Louisiana and Texas. Source: TRI 2019.

9 Lack of Legal transparency

Issue: TRI metric does not include when a facility has breached its legal limit of releases and there is no standardised platform providing data on whether the facilities' emissions are within the legal requirement or even what this requirement is. Instead, legal requirements fall under State law and access to the information therefore depends on each State's policies and portals. Further, the quantities of the chemicals are self-reported and inevitably it is left to the discretion of the facility to provide accurate information on its toxic releases. As a result, both the lack of legal reference and the self-reporting nature of this metric raise questions over its strength as a system of measurement.

Example: For facilities that operate in Louisiana, information relevant to legal permits can be found in the database of the Louisiana Department of Environmental Quality. However, the State's system is not very intuitive, for instance. It is not easily searchable. Instead, you have to look for each individual facility, then open all their scanned permits to see whether they operate within their legal limits. This is a time-consuming process, not user-friendly and does not allow mass reporting.

10 Missing definitions

Issue: The EPA does not provide a context of "high RSEI Scores" or "high RSEI Hazard values"; the user of EPA data could reasonably expect to be able to calculate this. However, a RSEI Score is calculated as the toxicity weight of the chemical multiplied by the estimated dose, multiplied by the number of people potentially exposed. These three components go into the calculus of deriving a RSEI Score for a chemical release, facility, industry sector, geographic area, etc. The three components are multiplied because each component (toxicity, exposure, and population) contributes in a multiplicative way to the overall magnitude of the impact.

Therefore, the RSEI Score is an absolute number that, without context, shows neither the impact that the facility may have on the environment or human health, nor whether they operate within the legal permits. EPA advises that this metric can be used to prioritise which facilities and companies to engage with, based on their relative potential to negatively impact the human health of local populations.

Example: In our findings, Olin Corp is the most hazardous corporate in the U.S. Gulf States, with its two facilities in the area accounting for over 52% of total chemical releases - see Table 1 (for more info, check Toxic Footprint report and dashboards). The corporate's total RSEI Hazard, the combination of the physical quantity of the toxic chemical released in pounds and its toxicity factor, is 77 trillion. This significantly high number measures the potential of chemical releases to cause harm. It is a unitless measurement that on its own cannot link a facility to specific damages on the environment and human health, nor does it tell the user whether the facility has breached any of its environmental permit conditions. Neither are threshold values or categories provided to the user to help interpret large values. One such example that might help a user could be that a *"RSEI Hazard value of over 1 trillion presents significant risk to local communities if releases are not managed properly."*

Table 1: Top toxic producers in the U.S. Gulf / Source: Planet Tracker

Company	Facility	% of toxic releases
Olin Corp	Freeport Olin	35.3%
Olin Corp	Blue Cube - Plaquemine	17.4%
Covestro	Covestro	11.2%
Valero Energy	Premcor – Port Arthur	8.9%
BASF	BASF	2.7%

IN NEED OF CHANGE

Presently, companies can hide behind a toxic curtain and avoid scrutiny of their toxic releases. Furthermore, some EPA rules and their complex datasets allow for opaqueness and fogginess by operators of these facilities. In this report we have highlighted ten major failings.

For example, petrochemical facility operators can classify their chemicals as 'trade secrets' which prevents public disclosure of their toxicity data. Assumptions on toxic releases include the supposition that chemical releases, which are sent offsite to Class 'C' landfills, incur no chemical escape in the RSEI calculations. Furthermore, the TRI metric does not include when a facility has breached its legal limit of releases. **This toxic fog is deliberate.**

In order to promote a favourable business environment, chemical companies lobby to minimise environmental regulations. Lobby disclosures show that the American Chemistry Council, an industry trade association for American chemical companies, has spent USD 39.6 million over the last ten quarters (from Q1 2020 through to Q2 2022). During the same period the top four toxic polluters in the U.S. Gulf of Mexico, which own the five most polluting facilities in the region and accounting for 75.5% of total toxic pollution - Olin Corp, Covestro, Valero, BASF - together spent USD 10.5 million - see Table 1 and Figure 6.

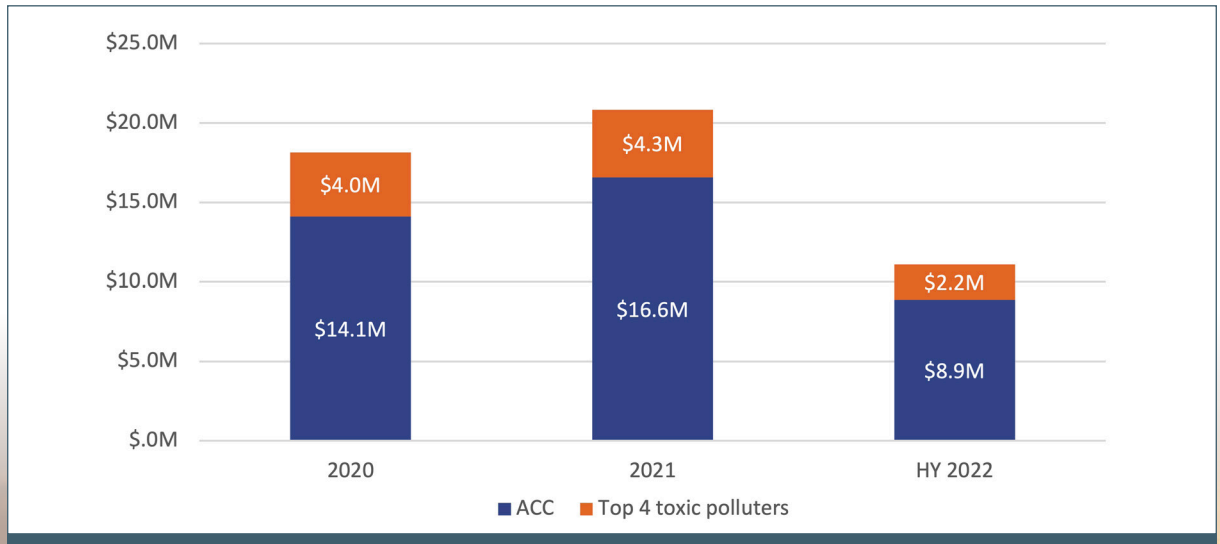

Figure 6: Lobbying Disclosures by the American Chemistry Council & the Top Four Toxic Polluters in the U.S. Gulf States of Louisiana and Texas (Q1 2019-Q2 2022)
Sources: Office of the Clerk, U.S. House of Representatives – Lobby Disclosure and U.S. Senate Lobby Disclosure - Lobbying Disclosure Act (LDA) Reports; 'Toxic Footprints' (page 8) - Planet Tracker

Financial institutions have a duty to put a stop to this fogginess. How are they able to undertake a proper risk/reward assessment for themselves or their clients without understanding their toxic footprint and their effect on the environment and human health, especially on the local communities around these facilities?

It's time for some proper **DUE DILIGENCE** on the

PETROCHEMICAL INDUSTRY

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ABOUT PLANET TRACKER

Planet Tracker is a non-profit financial think tank producing analytics and reports to align capital markets with planetary boundaries. Our mission is to create significant and irreversible transformation of global financial activities by 2030. By informing, enabling and mobilising the transformative power of capital markets we aim to deliver a financial system that is fully aligned with a net-zero, nature-positive economy. Planet Tracker proactively engages with financial institutions to drive change in their investment strategies. We ensure they know exactly what risk is built into their investments and identify opportunities from funding the systems transformations we advocate.

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.

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