Accelerating the Transition to Safer Chemistry

ESTABLISHING A COLLECTIVE VISION & IMPACT METRICS

AUGUST 2024

SAFER CHEMISTRY IMPACT FUND

Anthesis

Contents

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Bill Walsh, Director, Safer Chemistry Impact Fund **info@saferchemistryimpactfund.org**.

Foreword

This report is a message of hope about our ability to systematically reduce, and one day eliminate, chemical pollution. After reading this you may be convinced, as I am, that we can change the trajectory of toxic chemical pollution in our lifetime. Also, that we are not moving fast enough, as fast as we now know we could, to meet the challenges of our time and future generations.

Pollution was once understood mainly as a localized problem of dirty air and water near industrial facilities. Today, whether it be the PFAS chemicals contaminating almost half of US tap water, chlorinated compounds desecrating mother's milk even in remote Arctic regions, or endocrine disrupting chemicals implicated in declining sperm counts of men across the globe, chemical pollution is understood as a global crisis that rivals climate change in its potential to trigger irreversible impacts on Earth's ecological and human health.

Everyone is impacted and everyplace on Earth has been impacted. This would seem at first to make the challenge of addressing chemical pollution insurmountable. But it turns out, by focusing on the design of our products and the function of chemicals, we are learning important, hopeful truths. Chemical hazards can be accurately assessed. The number of chemicals we are dealing with is manageable. Shared data is an enabler. This problem is solvable. Collaboration is an accelerator.

Collaboration is at the heart of this report. Contributors include representatives of NGOs, former regulators, industry consultants, and critically, companies that rely upon chemistry to manufacture high performing and innovative products that are integral to our lives.

This is the first publication of the new Safer Chemistry Impact Fund. We begin by outlining a framework of metrics to measure progress towards safer chemistry and identify priorities for collective action and investment.

This report is also a call to action. Join us and contribute to accelerating science-based, data-driven efforts that meet the moment and set a course for using chemicals and chemistry in harmony with planetary boundaries and healthy life on earth.

Bill Walsh, *Director*
Safer Chemistry Impact Fund

"Our aim is to ensure safer chemistry is standard operating procedure within industry over the next five years."

Art Fong
Technical Leader for smarter chemistry
Apple

EXECUTIVE SUMMARY

OUR MISSION

Advancing science-based, data-driven solutions to systematically eliminate hazardous chemicals and replace them with verified safer alternatives, at scale.

Executive Summary

The Safer Chemistry Impact (SCI) Fund is a multi-stakeholder initiative created to mobilize global investment for systematically replacing hazardous chemicals with alternatives that are verified to be safer for humans and the environment.

Metrics are Essential to Achieving the Mission and Will Play a Key Role in the Fund.

We are making progress in reducing anthropogenic emissions of greenhouse gasses to the environment because most companies have established clear and measurable goals toward reducing carbon emissions and achieving carbon neutrality. In contrast, however, few have established goals for chemical hazard reduction, even in the face of pending chemical bans or phase-outs, let alone moved toward a goal of safer chemistry that transcends regulatory compliance. The lack of such goals may be explained by the old adage: "You can't manage what you can't measure."

Historically, chemical hazard assessments that indicate the human and environmental impacts associated with individual chemicals have been expensive, inconsistent across methods, and siloed within individual companies. Over the last decade, this has begun to change with the development of credible methodologies such as GreenScreen® for Safer Chemicals, Cradle to Cradle material health assessment, and Safer Choice—all based on the UN's Globally Harmonized Method for Classification and Labeling—GHS. In addition, there is enhanced awareness of the imperative to move beyond policies and practices that are defined by restricted substances lists (RSLs) toward more proactive chemical management practices.

Despite this progress, lack of harmonization and a central repository of chemical hazard data has perpetuated high cost for chemical hazard assessments and multiplied inconsistencies which have not only slowed the transition to safer chemistry but made standardized metrics and measurement impractical.

Comprehensive Data Underpins Safer Chemistry

As a first step toward accelerating and measuring the transition to safer chemistry, the Safer Chemistry Impact Fund has invested in the Chemical Hazard Data Trust managed by Chem*FORWARD*, a science-based non-profit organization.

Chem*FORWARD* has built upon established practices for chemical hazard assessment and has pioneered a digital infrastructure for the creation and maintenance of chemical hazard data, as well as a harmonized chemical rating system to facilitate comparison between hazard-based programs. The Chemical Hazard Data Trust is creating broad access to chemical hazard information that can empower the transition to safer chemistry by making it measurable.

The Fund's investment in the Data Trust will support the scaling of comprehensive, comparable information that will enable metrics for industry initiatives, company goal setting, and business-to-business (B2B) supply chain communications. With a centralized data trust in place, the next critical step for the Fund was to develop impact metrics for measuring progress in the transition to safer chemistry.

Developing a Common Language

Safer alternatives are those that meet functional requirements, for which comprehensive human health and environmental toxicity and fate data are available, and for which the human and environmental health hazards are moderate to low. Further, the hazard profile of the alternative should be captured within a chemical hazard assessment (CHA).

To be effective in protecting human health and the environment, any sustainable chemistry effort should take a hazard-first approach using comprehensive chemical hazard data. Exposure, risk, and life cycle considerations are all built upon a hazard assessment—getting the foundational information correct is essential. The Fund will take a hazard-first approach to accelerate and scale society's ability to implement safer chemistry from the range of available alternatives while contributing to the development of truly sustainable chemistry in the long term.[i]

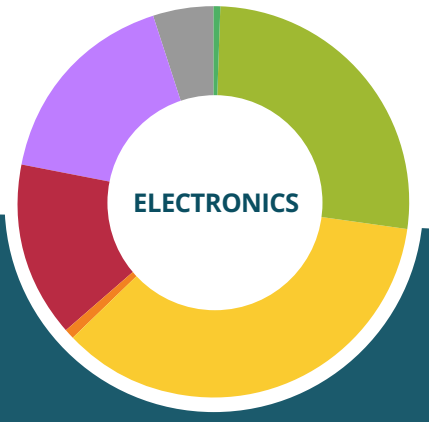
As a means of harmonizing results from different chemical hazard assessment systems, Chem*FORWARD* created a simple scale of color-coded hazard bands to facilitate comparison of results across CHA methods and demonstrate equivalency. Hazard bands can be used as a common language for chemical management programs, policies, and standards, with A, B, and C hazard bands being considered safer chemistry, while Ds and Fs are not; Us and ?s need more information before a determination can be made.

CHEM*FORWARD* HAZARD BAND	IMPLICATIONS
A	**Low hazard and low risk**
B	**Some moderate hazards but low risk**
C	**Moderate hazard, moderate risk or uncertainty that could result in moderate risk**
D	**Moderate to high hazard; emerging regulatory risk** (classification may be based on a chemical class/grouping approach)
F	**High hazards and high risk in most scenarios**
U	**CHA completed with excessive data gaps, rating is not possible**
?	**Request a CHA to inform decision**

The harmonized rating system and the centralized data trust enable characterization of the substances being used in specific industry sectors, high-priority applications, and individual products. Early analytics conducted by Chem*FORWARD* served as a proof of concept and revealed tangible progress in the use of verified safer chemistry supported by comprehensive chemical hazard assessments. Simultaneously, these reports uncovered priorities for immediate action on high hazards and filling strategic data gaps where a targeted investment in chemical hazard assessments would have an impact across brands.

Large datasets, data analytics, data visualization, and expert interpretation are used to provide clear, comparable data for baseline reporting. The same process can be used for industry, company, and supplier level insights.

Below are summary graphics for three case examples that can be found on page 34.

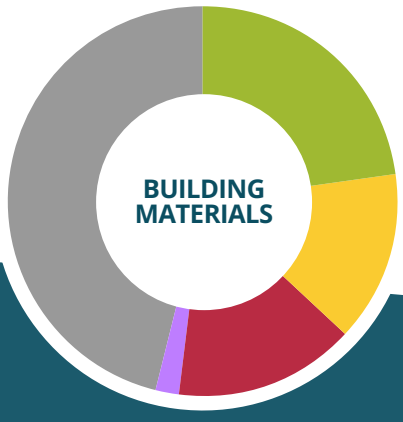


95+%
CHARACTERIZED

Shared data is enabling rapid screening or cleaners and degreasers and safer chemistry adoption at scale to benefit worker health.

70%
CHARACTERIZED

Data analytics and supply chain collaboration has accelerated progress toward safer chemistry and is redefining clean beauty.



54%
CHARACTERIZED

Analyzing 7000+ products revealed that chemical hazards are knowable, and the number of chemicals is manageable even in a complex industry sector.

This kind of analytical approach creates agency by revealing that chemical hazards are knowable, and the number of chemicals is manageable. Roadmaps emerge that allow industry initiatives, retailers, and brands to establish goals and measure progress in the elimination of chemicals of concern and the increase in use of safer chemistry. Collaboration to fill strategic data gaps and data sharing is an accelerator in this transition. With scalable investment, Fund leaders believe that toxic chemical exposure is solvable.

Metrics

With the Chemical Hazard Data Trust and harmonized hazard bands as a foundation, the Fund engaged Anthesis Consulting Group, an independent global sustainability consultancy, to lead stakeholder engagement and the development of metrics to measure progress towards and the impact of adopting preferred or low-concern chemicals. The engagement included a landscape analysis, interviews with key stakeholders, multiple in-person workshops, and a virtual workshop.

Goals for the metrics development project included:

- Understanding the leading ideas related to safer chemistry metrics;
- Developing a vision for the next three to five years;
- Refining and validating a framework for safer chemistry impact metrics to guide this transition; and
- Identifying priorities for the deployment of capital to strategically accelerate progress and quantifying the replacement of toxic chemicals with verified safer chemistry.

Many of these goals were achieved and some proved more challenging. The process itself was powerful in revealing a cross-sector willingness to embark on the transition to safer chemistry. Further information on the process, key decisions, and outcomes of the metrics work are detailed in the body of this report.

As a result of this work, the Fund will **embed safer chemistry metrics and tools in four consumer facing supply chains in five years** utilizing the following metrics:

Establishing a baseline: Metric "Zero". The Fund will utilize metric zero to characterize the chemicals being used in a given supply chain and to prioritize action and investment in the sector. It is also envisioned that retailers, brands, formulators, and chemical suppliers will utilize metric zero to set individual actions and goals that could contribute to the broader industry effort.

#	PURPOSE	GOAL	METRIC
0	**Increase knowledge about chemicals being used in a supply chain and ability to prioritize actions and investment in safer chemistry**	**Quantify the number of chemicals that have sufficient data to be characterized**	**% of characterization** • priorities for elimination (D/Fs) • quantify safer chemistry (A/B/Cs) • prioritize functional data gaps for investment

It is envisioned that year over year reporting will demonstrate progress in the reduction of data gaps (?s) and high hazards (D/Fs) as well as the quantification of safer chemistry being utilized (A/B/Cs).

Support broad adoption of metrics and tools: Metrics 1 – 5.
These metrics are applicable to the Fund's selection of projects and safer chemistry ecosystem partners over the next 5 years. Projects will be selected, funded, and evaluated based on their contribution to these metrics.

#	PURPOSE	GOAL	METRIC
1	Establish and maintain quality processes to guide the efficient creation, verification, maintenance, and interpretation of CHAs	Optimize quality, cost, and time to create comprehensive CHAs	# of days and cost for CHA creation
2	Demonstrate reduction in strategic data gaps for specific use cases	Increase number of characterized chemicals to meet priority functional needs	# chemical hazard assessments performed
3	Validate and amplify the market opportunity for safer chemistry innovation	Increase engagement along the value chain to promote innovation when safer alternatives do not exist	# of 'calls for innovation'
4	Facilitate larger collaborative efforts to drive safer chemical identification and adoption along the supply chain	Increase the number of industry efforts publicly advancing safer chemistry goals and metrics	# and scope of supply-chain or industry initiatives stimulated
5	Demonstrate adoption of safer chemistry	Increase awareness of safer alternatives for specific use cases	# of case examples published

Summary

By adopting and applying the impact metrics developed, the Fund aims to address key themes and concerns raised during the stakeholder engagement portion of this work.

Data analytics will provide a solid foundation for setting goals and measuring progress towards chemical hazard reduction. The Fund will then build upon these to create a docket of programs and projects to activate systems change across supply chains, and catalyze a collaborative, multi-stakeholder movement for safer chemistry.

"...Google is joining other industry leaders in investing in the Safer Chemistry Impact Fund to activate and accelerate the systems change needed to make this goal a reality."

Mike Werner
Head of Sustainability Programs and Innovation
Google

FULL REPORT

Introduction

METRICS DEVELOPMENT BACKGROUND

Metrics are essential to achieving the mission and will play a key role in the Fund. The Safer Chemistry Impact Fund engaged Anthesis, a third-party global sustainability consultancy to lead stakeholder engagement and the development of metrics to measure progress toward and the impact of adopting preferred or low-concern chemicals. The engagement included a landscape analysis, interviews with key stakeholders, two in-person workshops with impact leaders, and a virtual workshop.

Goals for the metrics development project included:

- Understanding the leading ideas related to safer chemistry metrics;
- Developing a vision for the next three to five years;
- Refining and validating a framework for safer chemistry impact metrics to guide this transition; and
- Identifying priorities for the deployment of capital to strategically accelerate progress and quantifying the replacement of toxic chemicals with verified safer chemistry.

We started with the premise that safer chemistry is an urgent imperative and that the transition from hazardous chemicals to safer alternatives will be a disruptor of the global economy, transforming every industry and supply chain. Successfully navigating this transition will ease the burden on climate and biodiversity while improving human and environmental outcomes.

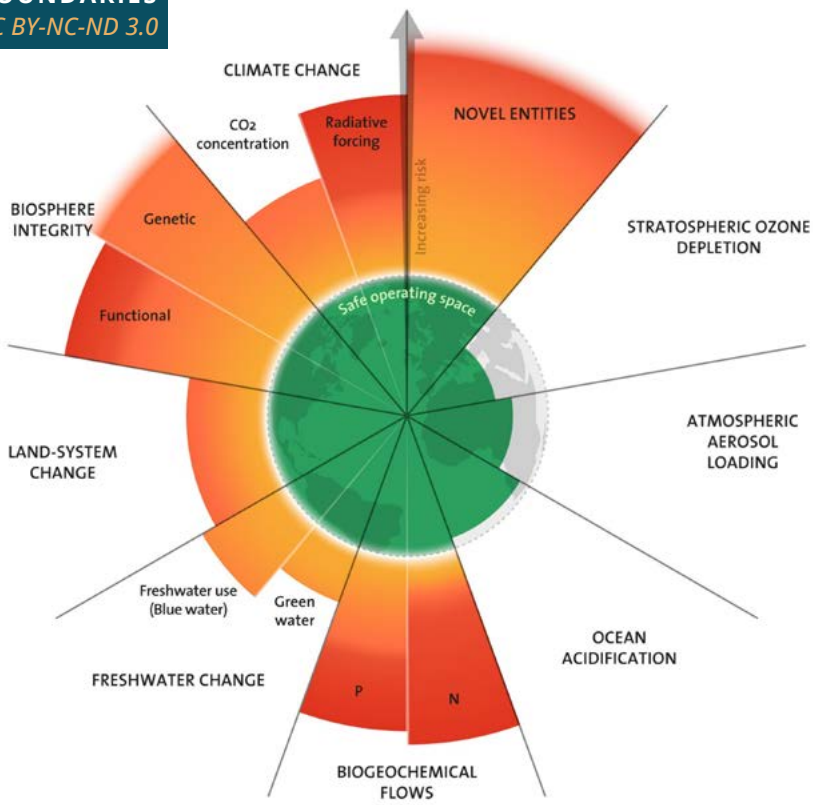
Making the Case: Safer Chemistry is Urgent and Imperative

Chemical Pollution rivals Carbon as an existential threat. A recent study published in the journal Environmental Science & Technology concludes that chemical pollution has crossed a "planetary boundary", defined as the point at which human-made changes to the Earth push it outside the stable environment of the last 10,000 years[ii].

The data indicates that humanity has already crossed the 'novel entities' (chemical pollution) and 'biogeochemical flows' boundaries by larger margins than climate/energy, rivaling the urgency of climate change due to its potential for irreversible impacts on Earth's ecological and human health.

The 'novel entities' or chemical pollution boundary encompasses man-made materials and chemicals, such as plastics and pollutants, whose unchecked production and release touches virtually every corner of the earth.

THE 2023 UPDATE TO THE PLANETARY BOUNDARIES



CREDIT: Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023.

Importantly, the **authors assert that the planetary boundary for novel entities is exceeded as annual production and release outpace global capacity for safety assessment and monitoring, and immediate actions must follow to return us to the safe operating space. To return to the safe operating space and prevent future damage, a hazard-based approach prioritizing chemical classes of concern may support the rapid identification and elimination of the most deleterious substances from manufacturing and distribution**. Stated plainly, proactively conducting chemical hazard assessments before substances enter circulation, and avoiding those with high hazards, is needed to bring this system back into balance for humans and the environment.

Over the past two decades, deaths caused by pollution have increased by 66%, driven by industrialization, urbanization, population growth, fossil fuel combustion, and the absence of adequately health-protective international chemical policy[iii]. Marginalized communities bear a disproportionate burden of the environmental and health risks due to the unequal distribution of chemical pollutants, exacerbating environmental inequalities and health disparities. However, no one is untouched. There is an emerging scientific consensus that endocrine-disrupting chemicals in consumer products and the environment may be the source of a global rise in reproductive problems in both men and women.[v] This problem only continues to grow, and population, urbanization and economic growth is estimated to double the global chemicals industry to $10 trillion by 2030[vi].

Similar to climate change, chemical pollution pushes Earth systems beyond their safe operating space. The critical nature of this issue is highlighted by its significant role in the ecological planetary boundaries' hierarchy and the emerging duty of due diligence for business entities, underscoring the need for accelerated action to prevent further burden to the global population and environmental degradation[vii,viii,ix]. While sustainability metrics currently emphasize calculating and tracking carbon emissions, there is an imperative to integrate measurable ways to tackle the novel entities crisis at hand as well with a focus on safety assessment and monitoring solutions.

Given this urgent imperative, the project team set out to benchmark leading ideas and practices.

Global Scan of Leading Ideas

Landscape

The efforts of 15 global companies across various consumer-facing sectors were reviewed for their chemical management and safer chemistry practices. Eight non-profit organizations and standards were also reviewed for their approach to chemical management and safer chemistry impact.

Key themes from the benchmarking and scouting exercise included:

- The majority of brands/retailers and organizations are focused on the reduction of chemicals of concern, as defined through regulatory or other hazard classification lists, with some going above and beyond to include additional chemical classes or GHS hazard categories in their RSLs.
- Few companies are focused on the adoption of safer chemistry.
- Most companies are surveying suppliers or using tools to determine compliance with restricted substances lists (RSLs), including direct supplier outreach or tools such as the Higg Facility Environmental Module and other sustainability assessment tools[x]. New tools and methods will be required to meaningfully measure safer chemistry uptake.
- Socio-economic scenario models tie the use of safer chemistry to broader social and economic impacts including Califonia State, under the EU REACH regulation, and World Business Council for Sustainable Development's (WBCSD) UN Sustainable Development Goal (SDG) Roadmaps and Social Life Cycle Metrics.

Interviews

In order to help the Fund prioritize its efforts on overcoming common barriers to implementing safer chemistry practices, the benchmarking exercise included interviews with eighteen stakeholders spanning industry, finance, the NGO community and government. Several common themes emerged, including:

1. Lack of access to consistent, reliable hazard data, especially—data about safer alternatives—is a barrier;
2. There is a lack of transparency, understanding, and collaboration along the supply chain around safer chemistry;
3. There is historically little incentive for upstream participation from chemical suppliers and therefore there is a lack of "buy-in" to participate in assessment and verification activities;
4. Concern over conflicting programs signals a need for alignment and harmonization among the safer chemistry ecosystem of programs, tools, and methods;
5. Incorporating mixture evaluation presents a unique challenge, and is not as unambiguous as single-chemical substitution;
6. A sector focus is likely required to ensure meaningful impact metric development;
7. There is concern around messaging the transition to "safer chemistry," implying that incumbent chemicals were known to be unsafe, yet still used.

The metrics developed during the workshop process will allow us to measure the progress strategies designed to address these challenges across sectors at a time when support for a transition to safer chemistry is growing at an unprecedented rate.

Signals of a Transition to Safer Chemistry

Strong signals of a transition to safer chemistry are emerging in both the public and private sectors. In the U.S.:

"Safer" Consumer Products Legislation

Washington State is at the forefront of implementing prevention-based policies to tackle Chemicals of Concern in products by establishing a regulatory definition of "safer"[xi] and identifying and incentivizing the adoption of safer alternatives. These include the **Safer Products for Washington Act**, the **Toxics Free Cosmetics Act**, and the **Product Replacement Program**. In addition to producing 70-80 publicly available chemical hazard assessments (GreenScreen) since 2019, the Department of Ecology (Ecology) is a paid subscriber to Chem*FORWARD* and has implemented numerous policies that have proven effective at transitioning consumer products to safer chemistry.

Other states have implemented hazard reduction policies, such as California[xii], which signed their own Toxic-Free Cosmetics Act into law in 2020. This was the nation's first state-level ban of 24 of the most toxic chemicals from cosmetics, many of which are already prohibited in the European Union. This includes formaldehyde, mercury, certain phthalates, parabens, and various PFAS chemicals.[xiii,xiv] California's law impacts a large consumer market and sets a high standard that often influences national practices due to the state's economic size and market influence.

Green Lists

The US EPA's **Safer Chemical Ingredients List (SCIL)** is one example of a "green list," a list of chemical ingredients, arranged by functional-use class, that the Safer Choice Program has evaluated and determined to be safer than traditional chemical ingredients. This list is designed to help manufacturers find safer chemical alternatives that meet the criteria of the Safer Choice Program.

Safer Supplier Policy

Google implemented a **Restricted Substances Specification (RSS) beginning in November 2023**, This program requires any solvent, flame retardant, or PFAS used in their products to have a hazard rating, regardless of whether the chemical is regulated or not. Chemicals with an F hazard rating are not permitted without pre-approval. Similarly, Apple applies strict standards to materials used in their products to ensure compliance with their Restricted Substances Specification (RSS), which includes restrictions on harmful chemicals like brominated flame retardants, heavy metals, and phthalates. Their Full Material Disclosure (FMD) program requires suppliers to provide detailed chemical compositions of the parts and materials used in Apple products, emphasizing transparency and safety in materials used.

Consumer Advocacy

The **Retailer Report Card** is a comprehensive evaluation focusing on how the largest retailers in the U.S. and Canada are taking action to eliminate toxic chemicals from their products and packaging. Published annually by the Mind the Store campaign, a program of Toxic-Free Future, the report card aims to highlight the sustainability trends among retailers, particularly their policies that restrict classes of toxic chemicals, such as PFAS, and their efforts to bring safer products to consumers. The updated report card for 2024 prioritizes safer solutions. The updated framework includes key categories for evaluation including:

- Corporate commitment to move to safer chemicals
- Knowledge of and transparency regarding hazardous chemicals
- Banning hazardous chemicals
- Implementation of safer solutions

This initiative is part of a growing movement towards safer chemicals and green chemistry solutions[xv].

Emerging EU Initiatives

Safe and Sustainable by Design (SSbD)
The SSbD framework is a non-regulatory EU initiative to stimulate a hazard-first approach to sustainability metrics and guide the innovation process for chemicals and materials. The framework aims to steer the innovation process towards the green and sustainable industrial transition, substitute or minimize the production and use of substances of concern, in line with, and beyond existing and upcoming regulatory obligations, and minimize the impact on health, climate and the environment during sourcing, production, use and end-of-life of chemicals, materials and products[xvi].

Eco-design for Sustainable Products Regulation (ESPR[xvii])
This is a regulatory EU initiative setting minimum sustainability thresholds at the product group level but also to promote transparency about Substances of Concern (SoCs) contained in products through the introduction of a Digital Product Passport (DPP). Pilot projects are already on-going and the adoption of the ESPR regulation has enshrined the SoC definition.

Corporate Sustainability Reporting Directive (CSRD[xviii])
A further regulatory EU reporting initiative expanding the scope of non-financial reporting at the corporate level to wider criteria including pollution, with a focus on Substances of Concern (SoCs)—as defined in the ESPR—and Substances of Very High Concern (SVHC)—as defined in EU REACH used, conveyed, and emitted throughout the value chain—with parallels to Scope 3 reporting for carbon. This reporting burden on corporates is justified as the EU seeks to strive for a toxic-free environment. It is also seen as a measure of risk for investors. Publicly quoted companies will need to report in 2025, so are already in the process of collecting data through their supply chains. This is expected to drive culture change in attitudes towards transparency—particularly because of the purchasing power of the larger corporates.

These examples demonstrate that policy, advocacy, and industry are all pointing toward safer chemistry as a leading indicator.

TOXIC IS EASY, SAFE IS HARD.

"It takes a lot more information to prove that a chemical is inherently safe than it does to prove that it is toxic. Just knowing that a chemical is a known carcinogen or that it causes skin sensitization can be enough to rule it out as a good candidate for most product applications. But to be sure that it is inherently benign for its intended use means that nearly two dozen human and environmental endpoints need to be considered, data gaps must be filled, and hazards should be moderate to low. A lack of hazard data does not mean that a chemical is inherently benign."

Lauren Heine, Ph.D.
Co-Founder and Strategic Advisor
Chem*FORWARD*

Establishing the Foundation for Measurement

Chemical Hazard Assessments (CHAs)

A CHA is a systematic process of assessing and classifying hazards across an entire spectrum of endpoints and severity. There are three pillars of a quality chemical hazard assessment program:

1. Methodology
2. Qualified assessors
3. Quality assurance and continuous improvement processes

Methodology. The foundation of a quality chemical hazard assessment starts with a methodology. Established in 2003, the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) is an internationally agreed-upon standard managed by the United Nations that was set up to replace the assortment of hazardous material classification and labeling schemes previously used around the world. GHS criteria is the basis for all quality chemical hazard assessment programs. Many programs also go beyond the GHS criteria that have been established as a minimum dataset.

Qualified assessors. Chemical hazard assessments should be produced by expert toxicology firms. Qualified third-party assessors gather toxicological data on selected chemicals using standard hazard classification methodologies and fill data gaps with new approach methods where feasible. Expertise should be demonstrated in one or more of the following methodologies: Globally Harmonized System of Classification and Labeling (GHS), European Chemicals Agency (ECHA) dossiers, GreenScreen for Safer Chemicals, the Cradle to Cradle Certified Material Health Assessment Methodology and/or the US Environmental Protection Agency Design for the Environment Alternatives Assessment Criteria for Hazard Evaluation.

Quality Assurance and continuous improvement. Science and interpretation are constantly evolving. CHAs cannot remain static. Robust quality assurance will help to build trust in a shared dataset. Current best practices include:

- One profile per chemical
- Peer review/verification by independent toxicologists who assure assessments are comprehensive, consistent, and credible—thereby increasing user trust
- A technical challenge process that promotes continuous improvement and results in a definitive dataset that justifies having one CHA per chemical
- A policy for reviewing, incorporating, and protecting unpublished private data into CHAs

Chemical Hazard Data Trust: A Digital Repository and Harmonized Ratings

Managed by Chem*FORWARD* and governed by a multi-stakeholder stewardship council, The Data Trust will simplify access simplify access to chemical hazard data from dozens of credible sources, curate, maintain and continuously improve the data, and harmonize the information for actionable decision support that will accelerate the global transition to safer chemistry. Each CHA comprises a comprehensive evaluation and classification of human health hazards, physical-chemical properties, and environmental fate and toxicity endpoints based on an enhanced GHS-based approach. To date, Chem*FORWARD* includes and combines criteria from the following two methodologies: (1) Cradle to Cradle Material Health Assessment Methodology (Current version: V4.0, February 2022) [xix], and (2) the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)[xx] (Current version: Rev 10, JUNE 2023).

Chem*FORWARD* has created a system of Hazard Bands that facilitate the harmonization of results across CHA methods and demonstrate program equivalencies. Hazard Bands may be used as a Prescreen A and B hazard bands, that also acknowledges the systems in place to support this are also growing and maturing.

PROGRAM EQUIVALENCY

HARMONIZED HAZARD BAND	IMPLICATIONS	CHEMICAL RATING	US EPA SCIL	GREEN SCREEN BENCHMARK
A	Low hazard and low risk	a	—	4
B	Some moderate hazards but low risk	b or c/b	green full circle	3 (3tp, 3dg)
C	Moderate hazard, moderate risk or uncertainty that could result in moderate risk	x/c, x/c-CMR(2), grey/c, c/b-CRE	green half circle, yellow triangle	2 (2tp, 2dg)
D	Moderate to high hazard; emerging regulatory risk (classification may be based on a chemical class/grouping approach)	x*, x-PB, x-PMT, x-vPvM, x/c-CM(2)-E	—	
F	High hazards and high risk in most scenarios	x-Reg, x/c-CMR(1), x/c-E, x-PBT, x-vPvB, x-vPT	grey square	1 (1tp), LT-1
U	CHA completed with excessive data gaps, rating is not possible	grey	—	BM U
?	Request a CHA to inform decision	no CHA	no CHA	No GS, LT-UNK, LT-P1

Data Analytics: Establishing a Baseline for Industry Transformation

The harmonized rating system and the centralized Data Trust enable characterization of the substances being used in specific industry sectors, high-priority applications, and individual products. Early analytics conducted by Chem*FORWARD* served as a proof of concept and revealed tangible progress in the use of verified safer chemistry supported by comprehensive chemical hazard assessments. Simultaneously, these reports uncovered priorities for immediate action on high hazards and filling priority data gaps where a targeted investment in chemical hazard assessments will have an impact across brands.

This kind of analytical approach creates agency by revealing that chemical hazards are knowable, and the number of chemicals is manageable. Roadmaps emerge that allow industry initiatives, retailers, and brands to establish goals and measure progress in the elimination of chemicals of concern and the increase in use of safer chemistry. Collaboration to fill strategic data gaps and data sharing is an accelerator in this transition. With scalable investment, Fund leaders believe that toxic chemical exposure is solvable.

Large datasets, data analytics, data visualization, and expert interpretation, such as those in the case examples found at the end of this report, are used to provide clear, comparable data for baseline reporting. The same process can be used for industry, company, and supplier level insights.

Key Insights and Opportunities

The two workshops with impact leaders revealed agreement on the definition of *safer chemistry*, the importance of a hazard-first approach, the need for high-quality chemical hazard data, and the potential of the Chemical Hazard Data Trust to enable supply chain communication and adoption of tools and metrics at scale.

To address the urgency, opportunities for impact were prioritized based on the potential for impact in 2–3 years while parallelly developing an ecosystem to accelerate innovation and alignment. These opportunities include:

1. **Information**: Most of the use of recognized chemicals of concern are in supply chains where transparency is lacking or RSLs and MRSLs are not operative or effective. In some sectors, critical chemicals have data gaps or are unassessed. Often well-studied functional alternatives with existing CHAs are available and can be substituted without needing further innovation.

2. **Adoption**: Current market penetration on the use of CHAs is at the retailer and brand levels, though there exists greater potential in advancing the concept of verified safer chemistry up and down the value chain to drive impact. A common dataset, a common "language", and common industry-level goals can accelerate the transition of supply chains to safer chemistry. Supply chains with existing transparency infrastructure (e.g. the automotive sector's Global Automotive Declarable Substance List (GADSL), apparel and textiles ZDHC Gateway, and retails use of UL Environments WERKSmart®), strong association or similar leadership, and awareness of chemicals of concern (especially related to worker and or consumer impacts) will be among those best prepared for investment.

3. **Innovation Opportunities:** A substantial part of the discussion centered around the challenges presented when a chemical of concern is identified (D or F hazard band) and no functional *known* alternatives exist. In these cases, there is not only a need to effectively make a call for innovation, but also to identify and evaluate new potential functional alternatives. Finally, even if an alternative is developed and evaluated for full functional equivalency, it is important to consider how to effectively facilitate adoption and scaling of the alternative, and the challenges that this may pose along the supply chain.

   For a subset of D's and F's, there will be no functional alternatives and innovation will be needed before a transition to safer chemistry can be achieved. The infrastructure to support innovation pipeline activities is not as well established as the chemical hazard assessment infrastructure. It is foreseeable, however, that as chemical hazard data becomes an expectation for supply chain communication, the biggest challenge for safer chemistry will be the identification of safer, functional alternatives and removing potential barriers to adopting new, innovative chemistries. The Fund can validate and amplify the market opportunity for innovation backed by data and industry partnerships to establish a rapid response network with bi-directional communications and connections to capital.

4. **Alignment**: Align safer chemistry metrics, tools, and innovation needs with related efforts in finance, government, and NGOs to accelerate progress, remove obstacles, and bring safer chemistry into ESG reporting.

Through the landscape analysis, interviews, and workshop, the SCI Fund established its goal, key activities, and metrics.

OUR MISSION

Advancing science-based, data-driven solutions to systematically eliminate hazardous chemicals and replace them with verified safer alternatives, at scale.

Safer Chemistry Impact Fund

The Safer Chemistry Impact (SCI) Fund is a multi-stakeholder initiative created to mobilize global investment for systematically replacing hazardous chemicals with alternatives that are verified to be safer for humans and the environment.

The fund will identify sectors that are ripe for safer chemistry acceleration. Considerations will include:

- Consumer-facing
- Potential to address disproportionate impacts
- Transparency/disclosure availability and expectations
- Existing digital infrastructure to support supply chain information exchange
- A coalition of the willing (respected industry association and/or collaboration)

OUR GOAL

Embed safer chemistry metrics and tools in four consumer-facing supply chains in five years.

Components of the Fund

The fund will identify, fund, scale, and measure impact solutions to embed safer chemistry across supply chains as the standard operating system.

1. DATA TRUST

As outlined previously, the Fund will help to transition the *ChemFORWARD* chemical hazard repository into a Chemical Hazard Data Trust to broaden the user base and strengthen the processes and governance of the dataset to ensure sustainable and enduring operations, leadership in science and technology, and equitable access and impact.

2. IMPACT PROGRAMS

To address the opportunities identified, the Fund will create a docket of programs and projects to activate systems change across supply chains. These will be assembled annually for the release of funds.

It is anticipated that the Fund will not accept unsolicited proposals. To achieve its goals, requests for proposals (RFPs) will be issued to address the strategic needs identified. The Fund will provide grants or contracts to organizations that have the capacity to address these strategic needs. Research and development and early-stage investments are out of scope of the Fund. Focus areas will include:

- **Impact through INFORMATION**. Establish "Metric 0" in at least 4 consumer-facing sectors, track and publish year-over-year progress
- **Impact through supply chain ADOPTION**. Invest in with Fund organizations/ programs that accelerate CHA adoption throughout targeted supply chains
- **Impact through INNOVATION OPPORTUNITY**. Highlight the market opportunity for innovation, establish a rapid response network with bi-directional communications (**need <—> solution**) and connections to capital
- **Impact through ALIGNMENT**. Align safer chemistry metrics with related efforts in finance, government, and NGOs to accelerate efforts, remove obstacles, and bring safer chemistry into ESG reporting

3. KNOWLEDGE HUB

The Fund will develop a science-based, data-driven communications strategy tailored to sectors that will serve as an engine to frame the opportunity, instill optimism, and create agency throughout the supply chain. Key messages will include but are not limited to:

- **Make the case**: Safer chemistry is an urgent priority for corporate ESG, national and international development goals
- **Industry-specific data**: Four industry-specific baseline reports will establish goals; annual reports will show progress and highlight opportunities for innovation
- **Amplify wins**: Publish case examples of alternatives adoption in specific use cases

These strategic communications have the potential to empower and create agency with facts highlighting what we know to be true: Chemical hazards are knowable. The number of chemicals we are dealing with is manageable. Shared data is an enabler. And collaboration is an accelerator.

4. METRICS

One of the critical goals of the workshop was to refine and validate a framework for safer impact metrics to guide the transition to safer chemistry in critical consumer-facing supply chains. Anthesis Consulting followed best practices to ensure that impact metrics are well-defined, measurable, and based on reliable and comparable data sources.

The Fund will adopt the following metrics to evaluate its own operations. Impact programs will be selected, funded, and evaluated based on their contribution to metrics 0 – 5. Impact programs will also be encouraged to adopt similar metrics for their work.

Establishing a baseline: Metric "Zero". The Fund will utilize metric zero to characterize the chemicals being used in a given supply chain and to prioritize action and investment in the sector. It is also envisioned that retailers, brands, formulators, and chemical suppliers will utilize metric zero to set individual actions and goals that could contribute to the broader industry effort.

It is envisioned that year over year reporting will demonstrate progress in the reduction of data gaps (?s) and high hazards (D/Fs) as well as the quantification of safer chemistry being utilized (A/B/Cs).

#	PURPOSE	GOAL	METRIC
0	**Increase knowledge about chemicals being used in a supply chain and ability to prioritize actions and investment in safer chemistry**	**Quantify the number of chemicals that have sufficient data to be characterized**	**% of characterization** • priorities for elimination (D/Fs) • quantify safer chemistry (A/B/Cs) • prioritize functional data gaps for investment

Support broad adoption of metrics and tools: Metrics 1 – 5. These metrics are applicable to the Fund's selection of projects and safer chemistry ecosystem partners over the next 5 years. Projects will be selected, funded, and evaluated based on their contribution to these metrics.

#	PURPOSE	GOAL	METRIC
1	Establish and maintain quality processes to guide the efficient creation, verification, maintenance, and interpretation of CHAs	Optimize quality, cost, and time to create comprehensive CHAs	# of days and cost for CHA creation
2	Demonstrate reduction in strategic data gaps for specific use cases	Increase number of characterized chemicals to meet priority functional needs	# chemical hazard assessments performed
3	Validate and amplify the market opportunity for safer chemistry innovation	Increase engagement along the value chain to promote innovation when safer alternatives do not exist	# of 'calls for innovation'
4	Facilitate larger collaborative efforts to drive safer chemical identification and adoption along the supply chain	Increase the number of industry efforts publicly advancing safer chemistry goals and metrics	# and scope of supply-chain or industry initiatives stimulated
5	Demonstrate adoption of safer chemistry	Increase awareness of safer alternatives for specific use cases	# of case examples published

Summary

By adopting and applying the impact metrics developed, the Fund aims to address key themes and concerns raised during the stakeholder engagement portion of this work. Including:

- **Sector focus**: Recognizing that each sector is unique allows for sector-specific approaches based on priority impacts, data and transparency needs.
- **Data**: Baselines (metric zero) identify data gaps and access to consistent hazard data can facilitate closing key data gaps.
- **Transparency**: Baselines drive transparency by establishing the knowns and unknowns at different levels of the value chain to inform where action needs to occur.
- **Focus areas**: The metrics cover the full breadth of the supply chain and can be facilitated and tracked by the fund.

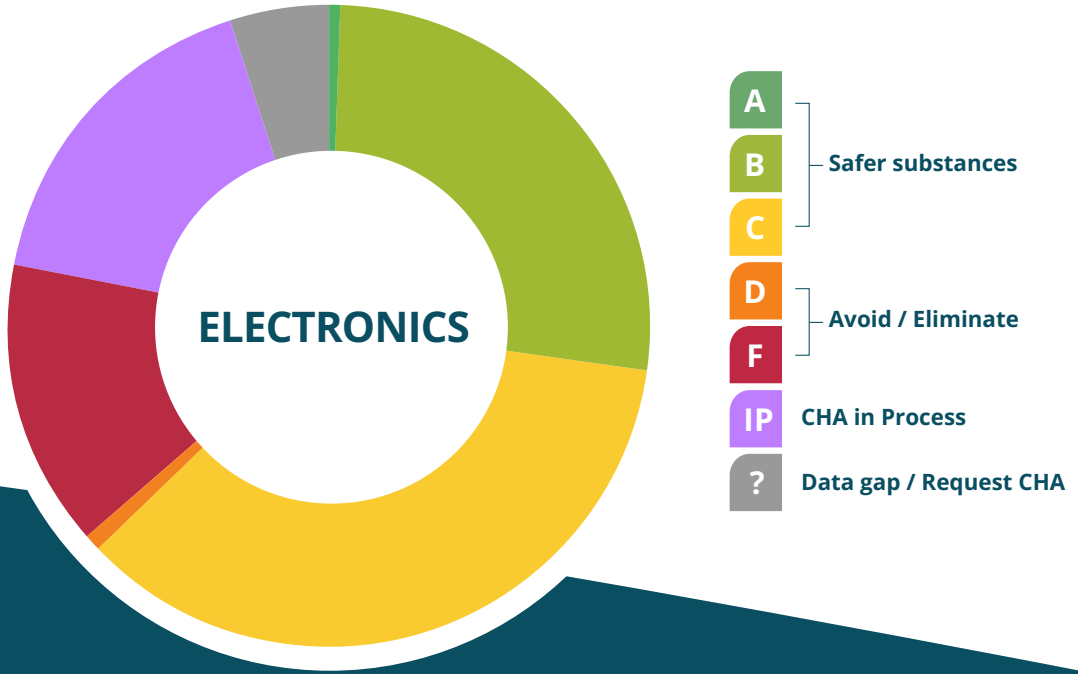
The fund will use this work to guide the investment strategy moving forward, identifying priorities for the deployment of capital to strategically accelerate progress and quantify the replacement of toxic chemicals with verified safer chemistry. These data and metrics will provide a solid foundation for setting goals and measuring progress towards chemical hazard reduction. The Fund will then build upon these to create a docket of programs and projects to activate systems change across supply chains, and catalyze a collaborative, multi-stakeholder movement for safer chemistry.

CASE EXAMPLES

CASE EXAMPLE I

RAPID SCREENING TO PROTECT WORKER HEALTH

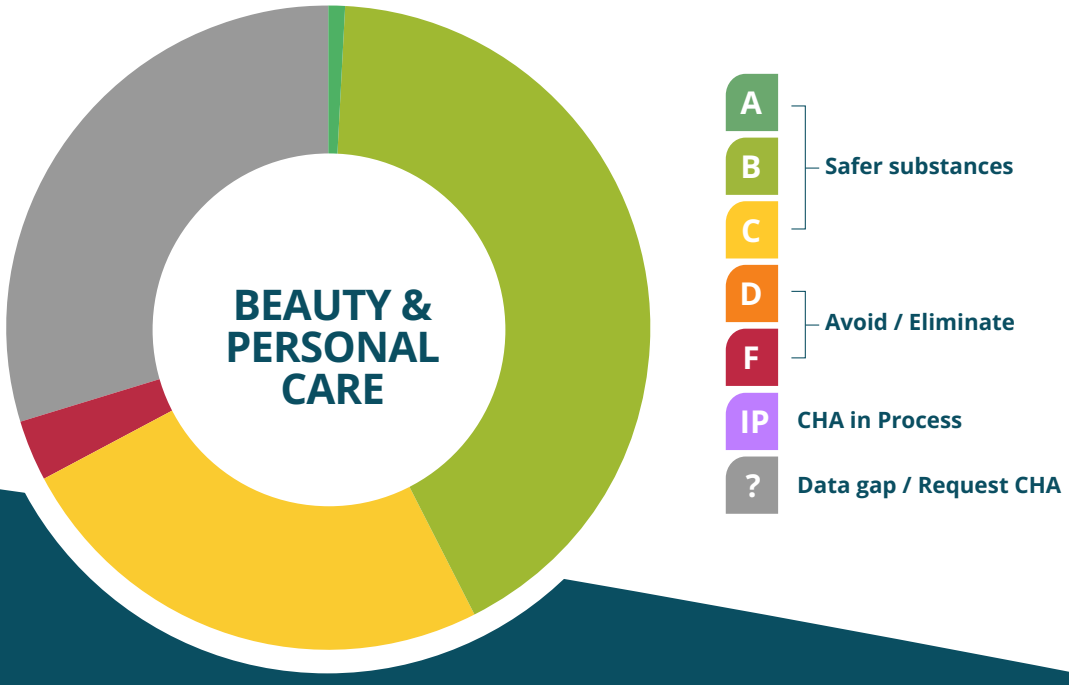
With support from Apple, Chem*FORWARD* developed a rapid screening framework powered by 100s of assessments for common ingredients in cleaner and degreaser formulations, underscoring the power of the Data Trust to address worker health concerns in one of the highest use materials in electronics manufacturing. With coverage of >95% of known ingredients, this dataset enables suppliers to rapidly screen their formulations and optimize with safer alternatives, safeguarding the health of thousands of workers in the global electronics assembly industry. These resources are accessible to all brands and suppliers at www.ChemWorks.org, demonstrating how shared data can enable safer chemistry adoption at scale.



CASE EXAMPLE II

COLLABORATION ACCELERATES SAFER CHEMISTRY

Chem*FORWARD* initiated a research project to analyze the top 100 ingredients used across >10,000 products in the beauty and personal care sector and assigned a confident hazard band to 70% of the ingredients. Initiated with data from one retailer, the project inspired leading retailers, brands, and suppliers to form the Know Better, Do Better Collaborative, making a commitment to strategically address the lack of data on ingredients and share data that is generated. In Fall 2024, the Collaborative will publish its first aggregated industry report and recommendations for collective action, demonstrating how collaboration accelerates progress toward safer chemistry.



CASE EXAMPLE III

A SAFER CHEMISTRY ROADMAP FOR BUILDING MATERIALS

Using a dataset provided by the Health Product Declaration Collaborative (HPDC), Chem*FORWARD* analyzed 7200 products containing 82,000 disclosed substances and narrowed the dataset to an actionable 3200 unique substances from 544 manufacturers. ChemFORWARD toxicologists were then able to assign a confident hazard band to 54% of the 3200 substances underscoring the power of the Chemical Hazard Data Trust. This pilot project resulted in a clear roadmap for intervention to eliminate chemicals of concern and to fill priority data gaps, demonstrating that chemical hazards are knowable, and the number of chemicals is manageable even in a complex industry sector.

NOTE: Unique to building materials, -50% of F's and ?s meet the criteria for "Special Conditions". Special Conditions recognize that there are practical limitations to disclosure and characterization of substances and materials listed by CAS# (e.g.form specific, polymers, variable composition, geological materials, etc.). In these cased, Trade name assessments from individual suppliers are recommended to fully understand the hazard profile.

Endnotes

[i] Sustainable Chemistry is a concept that considers variables in addition to hazard and toxicity, including climate impacts, ecosystem impacts, equity, and social justice. See, e.g., https://static1.squarespace.com/static/633b3dd6649ed62926ed7271/t/63ed54f40173a27145be7f74/1676498167281/Defining-Sustainable-Chemistry-Report-Feb-2023.pdf

[ii] The 2023 update to the Planetary Boundaries Licensed under CC BY-NC-ND 3.0. CREDIT: Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023.

[iii] Fuller, R., Landrigan, P. J., Balakrishnan, K., Bathan, G., Bose-O'Reilly, S., Brauer, M., ... & Yan, C. (2022). Pollution and health: a progress update. The Lancet Planetary Health, 6(6), e535-e547.

[iv] Johnston, J., & Cushing, L. (2020). Chemical exposures, health, and environmental justice in communities living on the fenceline of industry. Current environmental health reports, 7, 48-57.

[v] https://www.scientificamerican.com/article/reproductive-problems-in-both-men-and-women-are-rising-at-an-alarming-rate/

[vi] United Nations Environment Programme. (2019). Global chemicals outlook II: from legacies to innovative solutions: implementing the 2030 agenda for sustainable development.

[vii] Colombo, E. (2023). Unpacking Corporate Due Diligence in Transnational Climate Litigation: A Planetary Perspective. ex/ante, 2023(Special issue), 35-51.

[viii] https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en#legislation

[ix] Gergely, T. (2022). a Bolygó legújabb Határa THE NEWEST PLANETARY BOUNDARY. Magyar Tudomány, 183(11), 1476-1487.

[x] Howtohigg.org

[xi] "Safer alternative" means an alternative that is less hazardous to humans or the environment than the existing chemical or chemical process. A safer alternative to a particular chemical may include a chemical substitute or a change in materials or design that eliminates the need for a chemical alternative. See RCW 70A.350.010, https://app.leg.wa.gov/rcw/default.aspx?cite=70A.350.010

[xii] SaferStates.org

[xiii] https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB2762

[xiv] https://www.ewg.org/news-insights/news/2020/06/everything-you-need-know-about-californias-toxic-free-cosmetics-act

[xv] RetailerReportCard.com

[xvi] EU Commission Recommendation 2022

[xvii] https://www.ewg.org/news-insights/news/2020/06/everything-you-need-know-about-californias-toxic-free-cosmetics-act

[xviii] https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

[xix] Cradle to Cradle Material Health Assessment Methodology (February 2022)

[xx] Globally Harmonized System of Classification (GHS) (Rev 9)

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TOXIC CHEMICAL EXPOSURE IS SOLVABLE.

Together we will accelerate the transition to safer chemistry.

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