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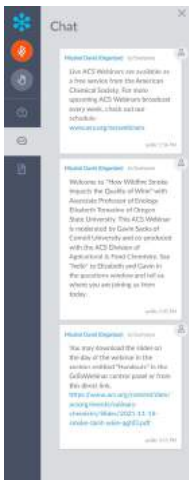


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A Career Planning Tool For Chemical Scientists



ChemIDP is an Individual Development Plan designed specifically for graduate students and postdoctoral scholars in the chemical sciences. Through immersive, self-paced activities, users explore potential careers, determine specific skills needed for success, and develop plans to achieve professional goals. **ChemIDP** tracks user progress and input, providing tips and strategies to complete goals and guide career exploration.

<https://chemidp.acs.org>

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Career Consultant Directory




- ACS Member-exclusive program that allows you to arrange a one-on-one appointment with a certified ACS Career Consultant.
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ACS Career Resources



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ACS Scholar Adunoluwa Obisesan

BS, Massachusetts Institute of Technology, June 2021
(Chemical-biological Engineering, Computer Science & Molecular Biology)



“The ACS Scholars Program provided me with monetary support as well as a valuable network of peers and mentors who have transformed my life and will help me in my future endeavors. The program enabled me to achieve more than I could have ever dreamed. Thank you so much!”

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Bonus Episode




By: Greg Frank and Peter Jensen

Carolyn Bertozzi and K. Barry Sharpless chat about sharing the 2022 Nobel Prize in Chemistry

December 6, 2022

Bonus Episode

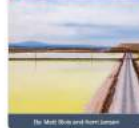


By: Maria Percec and Greg Frank

Bioorthogonal, click chemistry clinch the Nobel Prize.

October 9, 2022

Episode #48




By: Matt Stone and Peter Jensen

Lithium mining's water use sparks bitter conflicts and novel chemistry

September 13, 2022

Bonus Episode




By: Peter Jensen and Matt Stone

Happy 100th birthday, John Goodenough!

For John Goodenough's 100th birthday, Stereo Chemistry revisits a fun-favorite interview with the renowned scientist

July 25, 2022

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Advancing ACS' Core Value of Diversity, Equity, Inclusion and Respect

Resources

<p>Inclusivity Style Guide Designed to help staff and members use language and images that respect diversity in all its forms.</p>	<p>ACS Webinars on Diversity Covering diversity and inclusion at the workplace.</p>
<p>ACS Publications DEIR Hub See what ACS Publications is doing for fostering inclusivity in scholarly publishing.</p>	<p>ACS Volunteer and ACS Meetings Code of Conduct Fostering a positive and welcoming environment for attendees, volunteers and staff.</p>
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Diversity, Equity, Inclusion, and Respect
**Adapted from definitions from the Ford Foundation, Center for Social Justice:

<p>Equity** Seeks to ensure fair treatment, equality of opportunity, and fairness in access to information and resources for all. We believe this is only possible in an environment built on respect and dignity. Equity requires the identification and elimination of barriers that have prevented the full participation of some groups.</p>	<p>Diversity** The representation of varied identities and differences (race, ethnicity, gender, disability, sexual orientation, gender identity, national origin, tribe, caste, socio-economic status, thinking and communication styles, etc.) collectively and as individuals. ACS seeks to proactively engage, understand, and draw on a variety of perspectives.</p>
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Inclusion**
 Builds a culture of belonging by actively inviting the contribution and participation of all people. Every person's voice adds value, and ACS strives to create balance in the face of power differences. In addition, no one person can or should be called upon to represent an entire community.

Respect
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<p>Thurs., March 9, 2023 2:00-3:15pm ET</p> <p>Exosomes in Drug Delivery and Therapeutics</p> <p>Co-produced with CAS, a division of the American Chemical Society</p>	<p>Wed., March 15, 2023 2:00-3:00pm ET</p> <p>Successful Transitions: Strategies for Adapting to a New Role</p> <p>Co-produced with the ACS Younger Chemists Committee and the ACS Committee on Ethics</p>	<p>Thurs., March 16, 2023 2:00-3:00pm ET</p> <p>Toxicology 101: Chemicals and their Toxic Effects</p> <p>Co-produced with the ACS Office of Career and Professional Education</p>

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Product Lifecycle Analysis at Scale: Measuring the Environmental
Impact of Complex Products, Supply Chains, and Industries



PETER SALING, PhD
Director Sustainability
Methods, BASF



MICHAEL OVERCASH, PhD, MS
Chief Executive Officer,
Environmental Genome Initiative



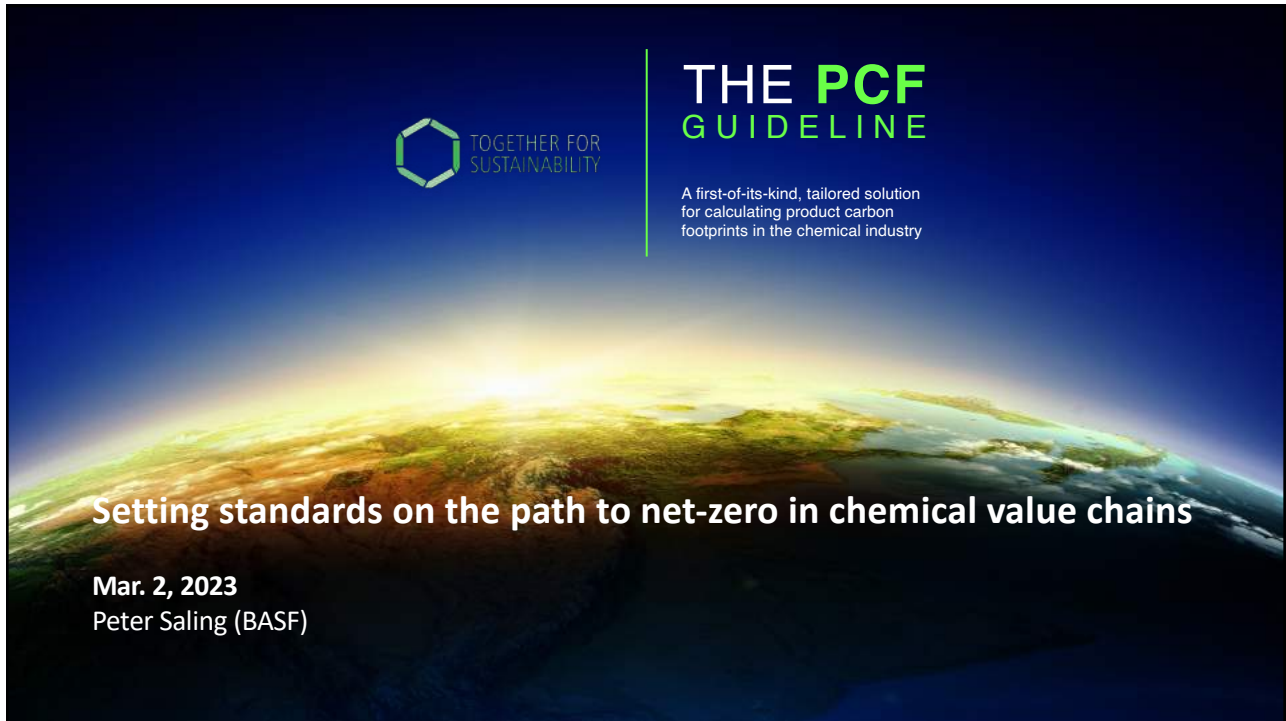
JEFFREY WHITFORD, MBA
Head of Global Corporate
Responsibility and Life Science
Branding, MilliporeSigma



ALAN STEVEN, PhD
Chief Scientist,
CatSci

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THE PCF GUIDELINE

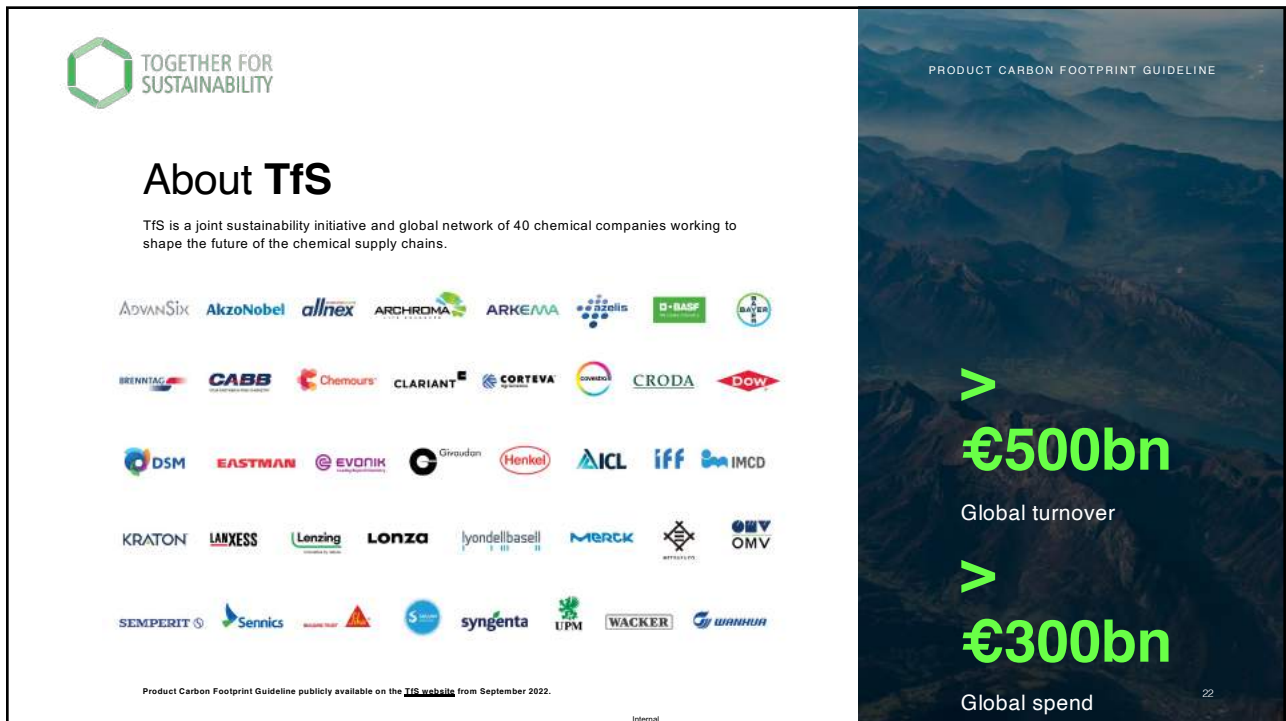
TOGETHER FOR SUSTAINABILITY

A first-of-its-kind, tailored solution for calculating product carbon footprints in the chemical industry

Setting standards on the path to net-zero in chemical value chains

Mar. 2, 2023
Peter Saling (BASF)

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TOGETHER FOR SUSTAINABILITY

About TfS

TfS is a joint sustainability initiative and global network of 40 chemical companies working to shape the future of the chemical supply chains.

Product Carbon Footprint Guideline publicly available on the [TfS website](#) from September 2022.

Product logos: ADVANSIX, AkzoNobel, allnex, ARCHROMA, ARKEMA, azelis, B-BASF, BAYER, BRENTAG, CABB, Chemours, CLARIANT, CORTEVA, covestro, CRODA, DOW, DSM, EASTMAN, EVONIK, Giroudan, Henkel, ICL, iff, IMCD, KRATON, LANXESS, Lenzing, LONZA, lyondellbasell, MERCK, OMV, SEMPERIT, Sennics, syngenta, LPM, WACKER, WANHUA

PRODUCT CARBON FOOTPRINT GUIDELINE

> €500bn
Global turnover

> €300bn
Global spend

Internal

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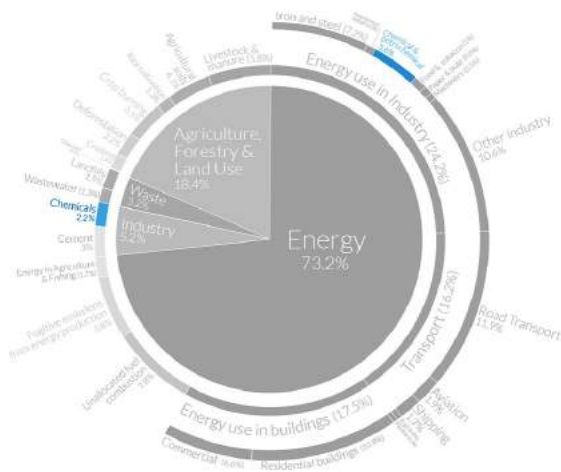


The Why

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Does the carbon footprint of chemicals matter?

With 6% of total contribution, the chemical industry is a large GHG emitter. In addition, chemicals products impact nearly all value chains



“ Over **95% of all manufactured goods rely on some form of industrial chemical process.** Most industry sectors make use of chemical products, from energy generation and transportation, to information and communication technology (ICT) and construction. ”

Source: 1 Hanna Ritchie, 2020 - Sector by sector: where do global greenhouse gas emissions come from? Chemical sector highlighted; 2 ICCA, 2019.

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The What

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Decarbonization should be eventually driven by procurement and consumer behavior



Take PCF as quantitative factor in purchasing decision

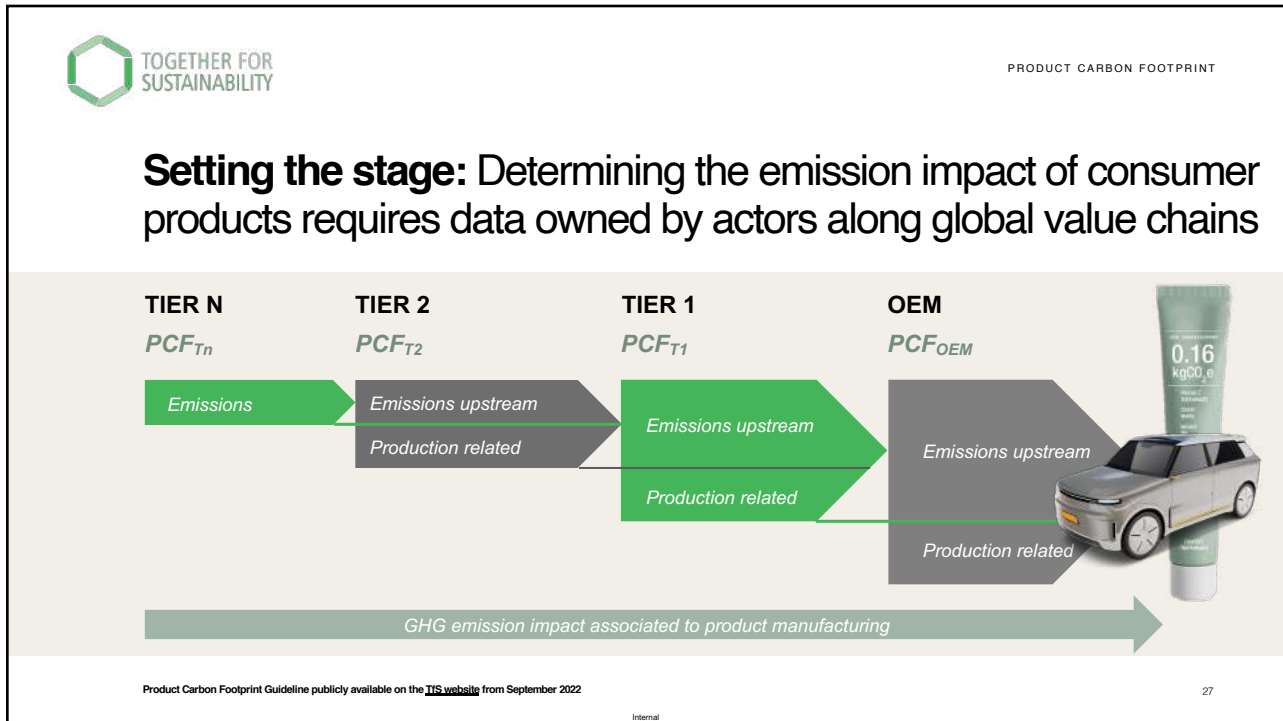


Take PCF as quantitative factor in consumer decision

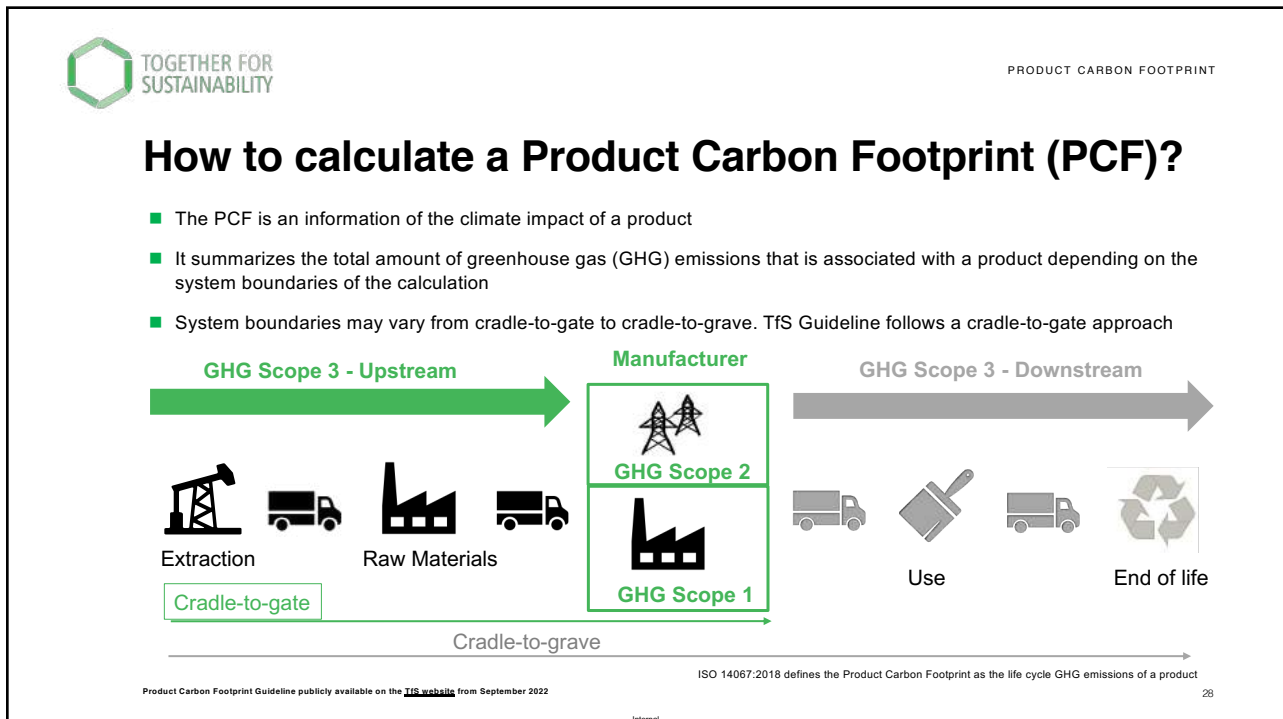
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Internal

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TOGETHER FOR SUSTAINABILITY

PRODUCT CARBON FOOTPRINT

Harmonization is needed for calculation: the PCF Guideline by TfS

The gold standard for calculating chemical product carbon footprints (PCFs).



First-of-its-kind, industry-specific guidance on calculating chemical PCFs.

Empowers companies to produce **higher quality carbon footprint data**.

Allows comparison of chemical PCFs across companies.

Tailored to meet unique challenges when calculating chemical PCFs.

Compliant with ISO and GHG Protocol accounting standards.

Open source, “drop-in” solution available to other industries using chemical material.

Product Carbon Footprint Guideline publicly available on the [TfS website](#) from September 2022.

Internal

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TfS PCF Guideline: A drop-in sectoral guideline

Illustrative



- **95% of manufactured goods** rely on some form of chemical processing.
- The chemical, plastics & process industry serves a **huge number** of downstream value chains.
- To avoid gaps in emission accounting, it is essential to have **consistent ways** to determine a PCF of chemical raw materials upstream, irrespectively of the application segment.
- Therefore, TfS positions its PCF Guideline for the chemical industry as a **drop-in sectoral guideline** to dovetail with downstream sectoral rule-books.
- The TfS PCF guideline is **aligned** with **ISO** and **GHG Product Protocol** as well as captured in the **PACT** program of WBCSD.

Product Carbon Footprint Guideline publicly available on the [TfS website](#) from September 2022.

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Guideline structure: 5 practice oriented chapters



Product Carbon Footprint Guideline publicly available on the [TfS website](#) from September 2022.

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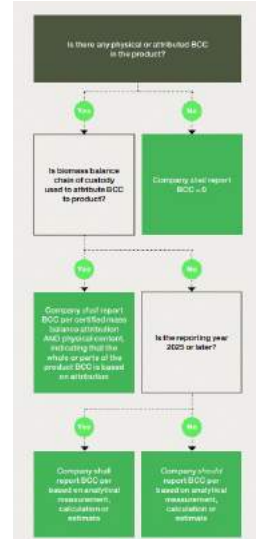


TfS PCF Guideline: Biogenic carbon

- In alignment with ISO 14067, biogenic removals from CO₂ uptake during biomass growth shall be included in the PCF calculation (**PCF, incl. biogenic CO₂ uptake**)
- Additionally, all **biogenic emissions** (e.g., methane emissions from manure application) and further emissions from relevant processes (e.g., cultivation, production & harvesting of biomass) shall be included in the PCF calculation.
- Report also **PCF excl. biogenic CO₂ uptake** for alignment with current PEF and GHG Protocol requirements¹
- **Total carbon content** and **biogenic carbon content (BCC)** to be reported alongside the PCF
- Biogenic carbon content may be **both** due to **physical presence** in the product **and** due to **attribution** in biomass balance

Note: 1. CO₂ biogenic removals and emissions not considered, but biogenic CH₄ biogenic emission included

Product Carbon Footprint Guideline publicly available on the [TfS website](#) from September 2022.



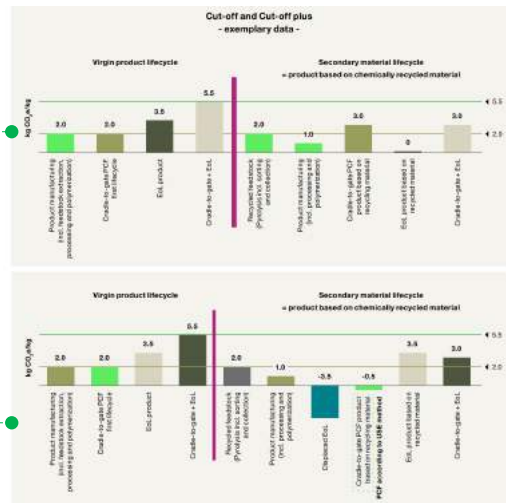
Other requirements:

Company shall indicate if BCC is based on physical base or attribution.
BCC shall be corrected after any economic allocators applied in supply chain.



TfS PCF Guideline: Material recycling

- The impact of material recycling (e.g., chemical recycling, distillation of materials, mechanical recycling) to be included in the product lifecycle inventory and system boundary
- If **material recycling happens within the product system boundaries**, the impact shall be included in the PCF of the product
- If material recycling happens **outside of the product system boundaries**, **2 approaches** can be followed. Selection to be reported.
 - **Cut-off**
 - **Upstream System Expansion - USE** (if alternative treatment directly replaces a final disposal and both options are known and well documented)



Product Carbon Footprint Guideline publicly available on the [TfS website](#) from September 2022.



Pre-read

PRODUCT CARBON FOOTPRINT

TfS PCF Guideline:

Defined list of data attributes (metadata) to be exchanged along between companies in the value chain

Product Carbon Footprint Guideline publicly available on the [Internet](#)

Table 5.20

Category	Attribute	Further information (reference and unit)	Example	Mandatory		
Company and product	Company name	Legal Name of Data owner	Mycoo	yes		
	Company ID	Abbreviated ID	8g-w11	yes		
	Product name name	Product Name	Green Ethanol	yes		
	SKU	SKU Number	88-08-0	yes, if applicable		
	Declaration key	Code of analysis of the product (internal key)	1 kg	yes		
PCF	Product description including reference to the solution for which PCF is calculated	Technical description of product or goods	Ethanol, 95% solution	yes		
	PCF and Biogenic emissions (and removal)	Unit/PCF	kg of net/total PCF, kg CO ₂ e/kg product	99.08 / 0.007	no	
		Cradle-to-gate PCF in kg CO ₂ e/kg product	2.0 kg CO ₂ e/kg Ethanol	yes		
	PCF and Biogenic emissions (and removal)	Cradle-to-gate PCF in kg CO ₂ e/kg product	0.7 kg CO ₂ e/kg ethanol	yes, from 2020 on		
		Separated into emission values	1. Fossil CO ₂ emissions (kg CO ₂ e/kg product) 2. Biogenic CO ₂ emissions (kg CO ₂ e/kg product) 3. Land use change emissions (kg CO ₂ e/kg product) 4. Biogenic removal (kg CO ₂ e/kg product) 5. Avoided CO ₂ emissions (kg CO ₂ e/kg product)	Separated emission values (yes, from 2020) (net total 1, 2+3+4+5)	yes	
	Reference period (calendar year) (if changed, specify the start and end date)	Reference period	Year/Period of PCF calculation	2021, v.2.0	yes	
		Geography, see specific possibilities	Location of production (global)	Global, Europe, Germany or Luxembourg, 27003, Germany	yes	
		Allocation method used for recycled carbon content	Allocation method used for recycled carbon content	Allocation method used for recycled carbon content	Mass-based	no
			Type of recycled carbon content	Type of recycled carbon content	Physical or chemical	no
		Additional information - climate and use CO ₂ avoided	CO ₂ avoided carbon content	kg CO ₂ avoided/kg product	0.3 kg recycled CO ₂ Ethanol	no
Allocation method used for CO ₂ avoided	Allocation method used for CO ₂ avoided		System expansion and substitution	no		
Additional information - transport	CO ₂ avoided carbon content	kg CO ₂ avoided/kg product	0.3 kg recycled CO ₂ Ethanol	no		
	Allocation method used for CO ₂ avoided	Allocation method used for CO ₂ avoided	System expansion and substitution	no		

* For fossil biogenic CO₂ emissions and removal, all data is derived from datasets, based on fossil CO₂ emissions that are calculated as fossil CO₂ or fossil CH₄ (also the CO₂ avoided during the calculation) on the production level in the product.

Category	Attribute	Further information (reference and unit)	Example	Mandatory	
Boundary & standards	Technological reference *	Technological description	Distillate	yes, from 2025 on	
	Cradle-to-gate PCF	CO ₂ in scope from 1 to 3	CO ₂ 1 to 3	yes, from 2025 on	
	Primary resources PCF	PCF in %	PCF 50%	yes, from 2025 on	
	Scope of secondary data and services	Items only in scope of secondary data of reporting company	ALCO Carbon 100% recovered U.S. open source	yes	
	Allocation method used	Type of allocation	Mass allocation	yes	
Additional information - climate and use CO ₂ avoided	Verification approach from external QS expert, Third Party verification - Product Specific, Third Party Verification - Systemic Approach (Process)	Verification approach from external QS expert, Third Party verification - Product Specific, Third Party Verification - Systemic Approach (Process)	Verification by Veritas USA expert	yes	
	Additional information - climate and use CO ₂ avoided	CO ₂ avoided carbon content (physical or chemical)	kg CO ₂ avoided/kg product	0.3 kg recycled CO ₂ Ethanol	yes, from 2020 on
		Allocation method used for recycled carbon content	Allocation method used for recycled carbon content	Cut-off, substitution or system expansion	yes
	Additional information - transport	CO ₂ avoided carbon content (physical or chemical)	kg CO ₂ avoided/kg product	0.3 kg recycled CO ₂ Ethanol	no
		Allocation method used for CO ₂ avoided	Allocation method used for CO ₂ avoided	System expansion and substitution	no
Additional information - general	CO ₂ avoided carbon content	kg CO ₂ avoided/kg product	0.3 kg recycled CO ₂ Ethanol	no	
	Allocation method used for CO ₂ avoided	Allocation method used for CO ₂ avoided	System expansion and substitution	no	

* Other long-run systems, i.e. thermal process in the value chain that is calculated.

Bringing transparency along the value chain

Neopentylglycol Pure with certified Net Zero PCF



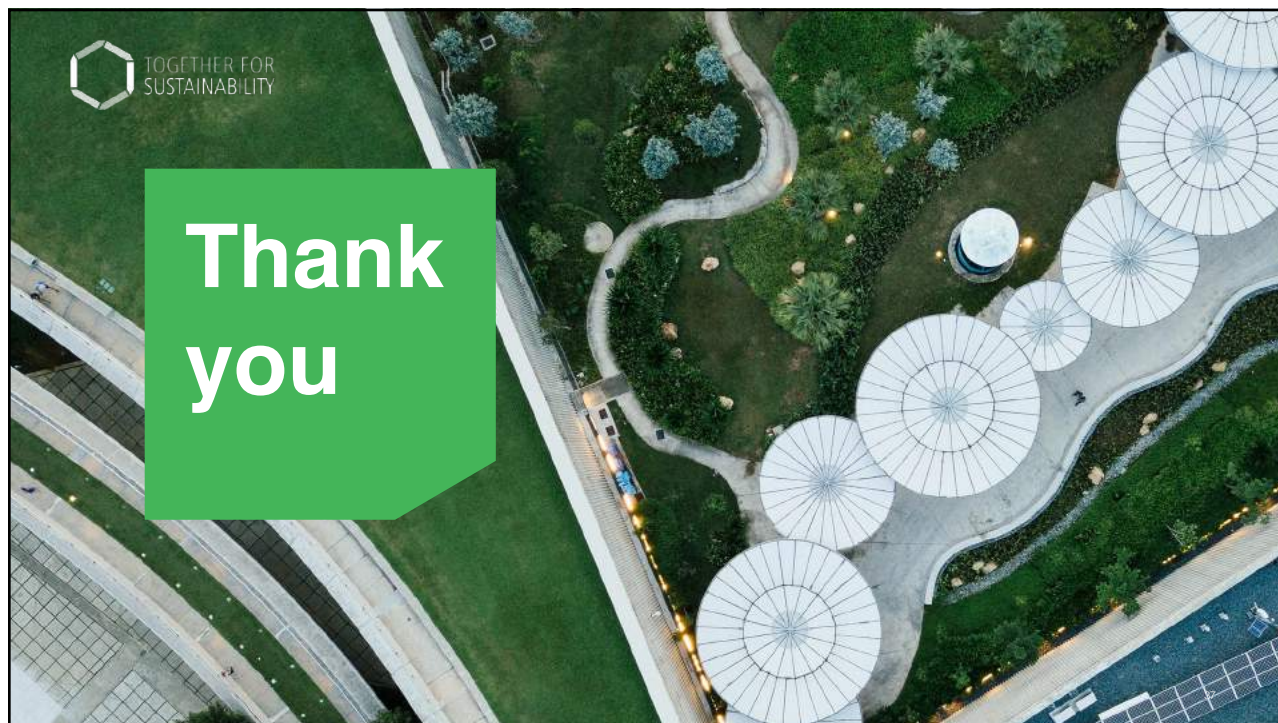
Certificate of Achievement
BASF SE

has achieved carbon neutrality and is committed to on-going carbon neutrality of the total carbon footprint of its
Neol® Neopentylglycol Pure Liquid ZeroPCF and Propionic Acid ZeroPCF_EU




Carbon Trust certification of the cradle-to-gate product carbon footprint of Neopentyl Glycol ZeroPCF and Propionic Acid ZeroPCF





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 **THE ENVIRONMENTAL
GENOME INITIATIVE**
Mapping the building blocks of human creativity

Life Cycle Inventories – Approaches and Analytics

Dr. Michael Overcash
CEO

American Chemical Society
Green Chemistry Institute
March 2, 2023
www.environmentalgenome.org
mrovercash@earthlink.net

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Environmental Genome - Objectives

1. Database to open the environmental sustainability window of global product decisions

- An information source, not a tool to make decisions (Big Data – size of human genome)
- It is analytics that translate the EG data to important software and community needs

2. Provide a comprehensive contribution to two major environmental impacts

- a) Global warming (carbon footprint) –global impact (net-zero effort)
- b) Chronic disease potential - prevention of 70% - 90% of chronic disease which is assessed by epidemiologist to be from environment of which multi-media environmental pollutants are significant.

Impact –about 1 billion people globally and about 160 million in U.S. with chronic disease

Environmental sustainability is a more specific concept and boundaries

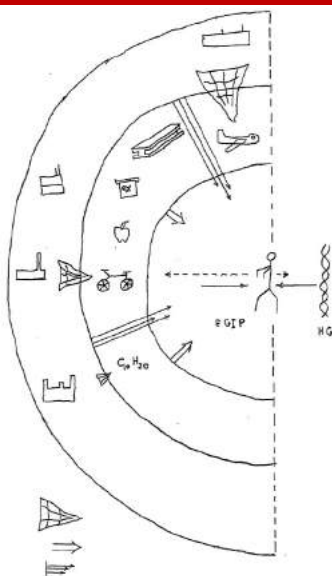
- The global standard for the measurement tool is referred to as **life cycle analysis** (LCA), for which there is a widely understood methodology (known as ground truth)
- The core data (life cycle inventory) quantify change. Transparency is now the key to acceptance.
- The environmental impacts are built from the core data and are at the choice of the organization's priority values (metrics such as energy resource consumption, carbon or water footprint, human health, etc.)
- Rarely involves any economic parameters, like cost, profit, etc.
- Economic Input/Output methods have variations from ground truth of 200% -1,000% and so have proven to not meet quality standards for most life cycle studies.

How to manage the product and services issue?

- There are trillions of trillions global products
- The life cycle analysis results are a very significant factor in environmental sustainability, but are largely hidden or unknown quantification data for decision-making
- Most common statement in life cycle community, **“We do not have the data”**
- Breakthrough – virtually all the trillions of trillions of products are made with a small set of chemicals or materials – known as the chemicals-in-commerce and the life cycle inventory of these is known as the gate-to-gate.
- **100,000 chemicals made at 1 metric ton/year** –the essential ingredients in make any product
- Virtually no chemical stands alone, but is in the knot of supply chain (cradle-to-gate)

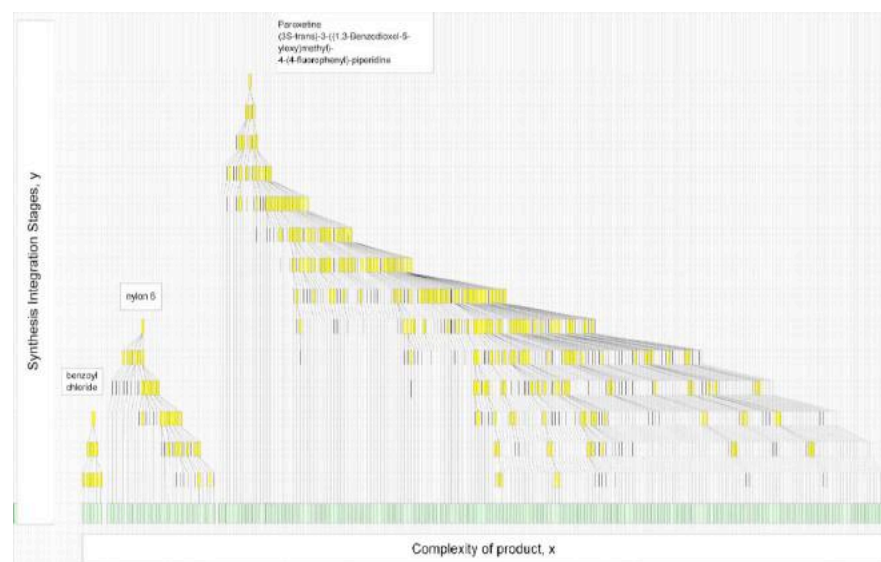
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Discovery sketch of the existence of an environmental genome of industrial products to mirror human genome as effects to human health (2001)



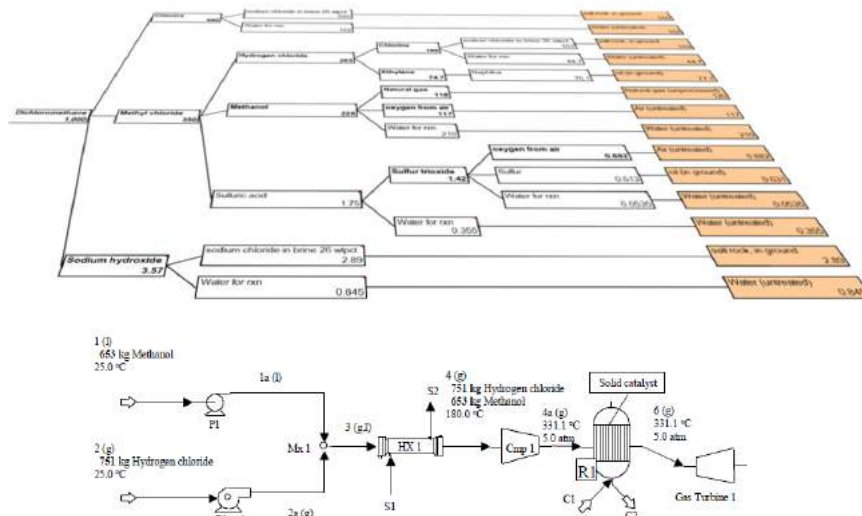
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Structure Discovery – Pyramidal: Repeatabl Across the Web of Chemicals And Materials



Repeating environmental genome structures for three chemical manufactured from natural resources to completed chemical structure

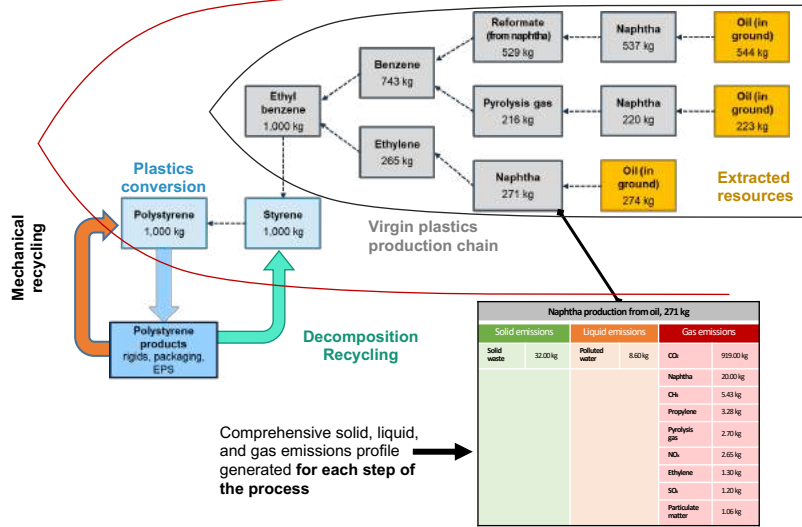
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Environmental Footprint Analysis And Circularity

Environmental Genome* data used to assess manufacturing process emissions across the supply chain.

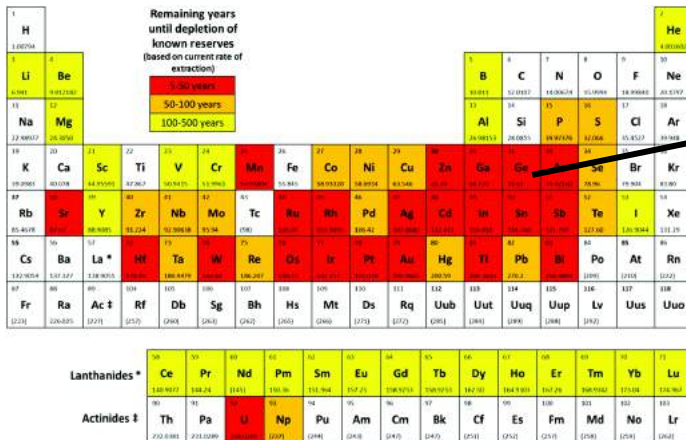


*Polystyrene mapping method follows mass balance approach which has been identified by Ellen MacArthur Foundation as a key tool required to achieve circularity in advanced recycling.

Comprehensive solid, liquid, and gas emissions profile generated for each step of the process

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Environmental Genome Discovers Specific Products Impacted by 22 Critical Scarce Elements

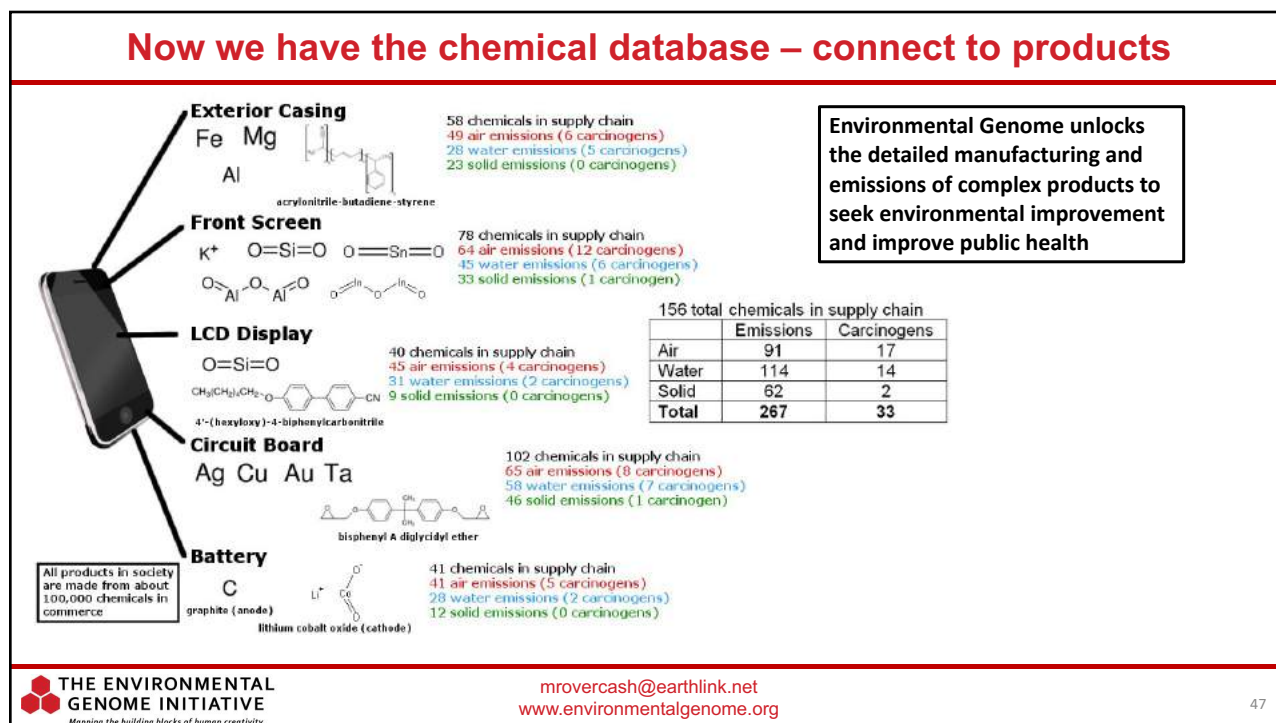


Environmental Genome Maps the 65 Germanium Chemicals-in-Commerce Into Products (critical electronic transistors, semiconductor, fluorescent bulbs, catalysts, optical equipment, wide-angle lenses)

Periodic table displaying critical elements (A. Hunt, Element Recovery and Sustainability, Royal Society of Chemistry, Cambridge, UK, 2014)

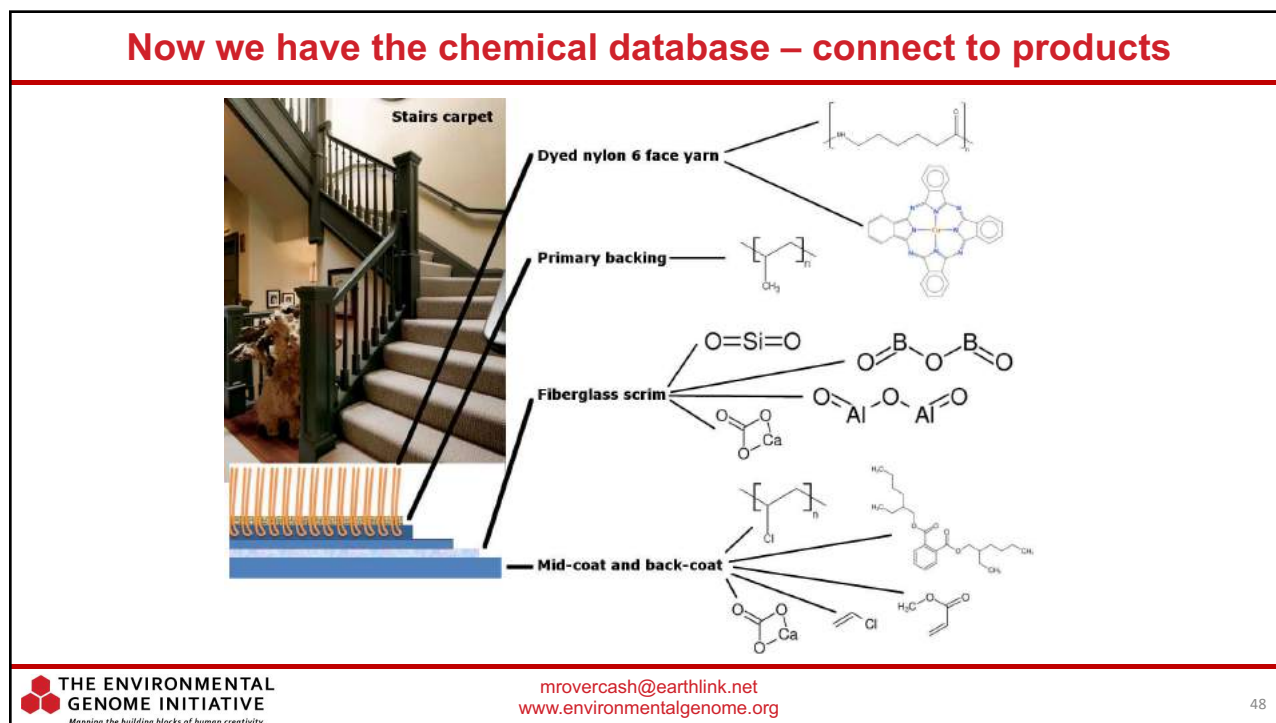
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Now we have the chemical database – connect to products



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Now we have the chemical database – connect to products



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Environmental Sustainability Gains by Carpet Selection

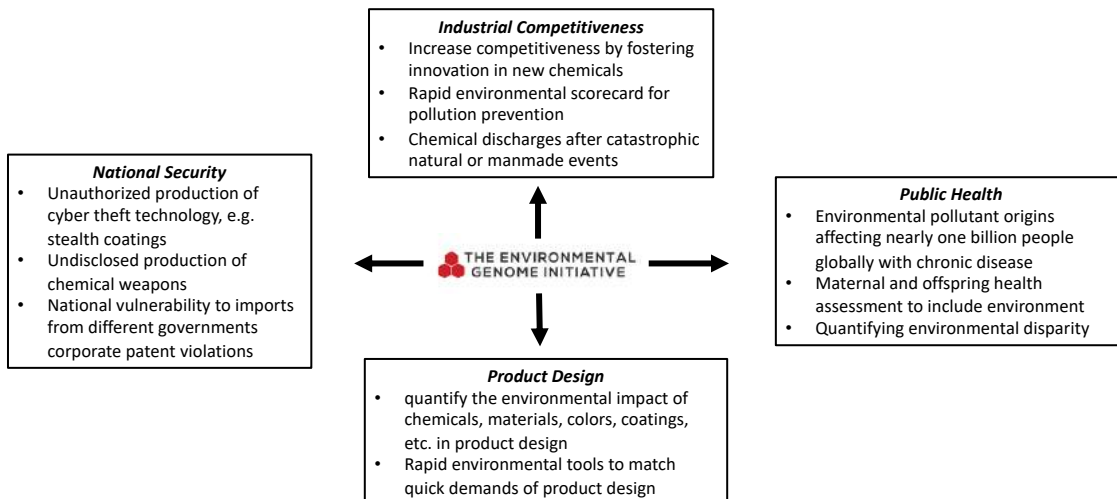
- The look and feel of the carpet is the face fiber, often nylon
- The connection to the floor is referred to as the backing and the two main choices are styrene butadiene latex and polyvinyl chloride layer
- The Environmental Genome database was used to establish the fossil energy investment and the carbon footprint on a per square yard basis (for the same face fiber and style)
 - Polyvinyl chloride layer 129 MJ natural resource energy/sq yd and 9.4 kg CO_{2eq}/sq yd
 - Styrene butadiene latex 63.5 MJ natural resource energy/sq m and 5.1 kg CO_{2eq}/sq m
- For an average Software As A Service firm of 2,000 employees, 33,000 sq yd of flooring, the selection of the SBL backing provides an environmental energy savings of 2.2 million MJ and 158 tons CO_{2eq} to the company sustainability scorecard, for the same style carpet – a product impact

Healthcare Organizations and Environmental Sustainability

- A significant product decision can add to the carbon footprint improvement – the use of reusables instead of disposables
- Textiles are one reusable category (surgical gowns, incontinence pads, isolation gowns, microfiber cleaning devices)
- One typical Raleigh, NC hospital (425 beds)
- The selection of reusables reduced their carbon footprint by 47 tons CO_{2eq} per year, but also reduced annual cost for using these products by 40% - 50%. Additionally, a reduction of 90+% in landfill costs

All these very diverse analytics depend on information in The Environmental Genome

This is innovative because no one has envisioned the power of creating an indexed environmental view of all industrial chemistry.



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Roles of Corporations and Foundations

- Support the goals of building the quality EG environmental database for themselves and others
- Identify priorities in the chemicals-in-commerce for next stage in EG life cycle mapping
- Gain recognition for the corporate future vision of building the Environmental Genome
- Demonstrate important new sustainability direction for their future goals
- Participate in the EG Mapping Board
- Sponsor presentations or webinars for broader groups of practitioners actively involved in details of developing alternatives or decisions on environmental sustainability
- Provide technical and financial resources

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Conclusions

- Product life cycle inventories can guide environmental sustainability progress, but also keep us away from adverse or unintended directions. These are the basis of Ecolabeling and our understanding of supply chains
- All decisions for environmental sustainability should be measured – the concept of a common yardstick is strategic and reflects core values
- Corporate participation in mapping the EG is expanding but others are encouraged to become involved in setting priorities, resources, and links to products.

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Perspectives on the Environmental Genome

- “Advancing environmental health research offers us the best opportunity for preventing disease –because you can’t change your genes, but you can change your environment.”
Director of the U.S. National Institute of Environment Health Science
- “The human genome is held in awe as it created each of us. The environmental genome of industrial products must be respected for it is what we as humans have truly created.”
Royal Society of Chemistry, Green Chemistry Journal 2016

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**THE ENVIRONMENTAL
GENOME INITIATIVE**
Mapping the building blocks of human creativity

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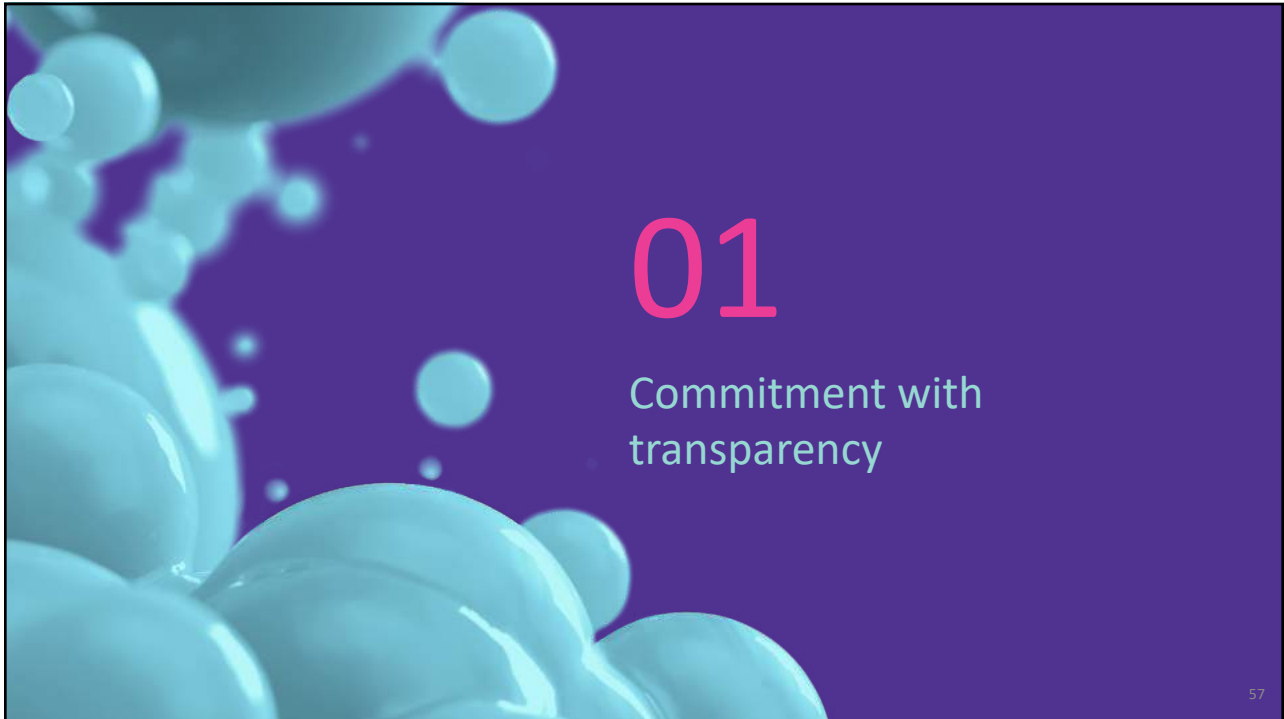
**Sustainability Practically
Applied**

Driving Sustainability in Science
March 2023

Jeffrey Whitford
Head of Sustainability and Social Business Innovation

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Combating climate change

Renewable Energy & Reduce Emissions

Goal: 03

Focus area: **Climate change and emissions**

Our 2030 goals

- Lower **direct greenhouse gas emissions** as well as **emissions from energy purchases** (Scope 1 and 2) **by 50%** (2020 baseline).
- **80% of purchased electricity from renewable sources.**
– 2020 baseline of **42%**
- Reduce **indirect greenhouse gas emissions** from the value chain (Scope 3) by 1,500 metric kilotons of CO₂ equivalents.

Category	2020	2021	2022 (prelim)
SCOPE 1	194,505	156,810	154,087
SCOPE 2	106,389	104,518	47,643
SCOPE 1 & 2	301,000	261,328	201,730

- 33% reduction in Scope 1 & 2 vs. 2020
- 78% renewable electricity as of Dec '22




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**Design for Sustainability (DfS)
New Product Development Process**

Under **DfS**, the **Product Development Process** consists of three main steps:

- 1** Brainstorm life cycle impacts, opportunities and customer voice
- 2** Assess and select target criteria
- 3** Develop the product and assess improvement

➔  **Greener Alternative Products**

60 Greener Products and Solutions: Helping Customers Minimize Environmental Impacts 2023

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* CO2 equivalent savings compared to traditional Stericup

Design for Sustainability: Greener Alternative Products Stericup® E sterile filters

Sterile filtration – without the funnel.
Reduced plastic lab waste to meet customer feedback and reduce resource use
Same quality and performance with minimal changes to workflow

Up to **26%** less plastic Up to **20%** less corrugated & plastic packaging

10.5 tons CO₂e saved in 2021*
FSC-certified corrugated packaging



BEFORE



AFTER

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Greener Products and Solutions: Helping Customers Minimize Environmental Impacts 2023

03

When everyone has access

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Greener Products and Solutions
DfS: Re-engineering

Our re-engineering focus consists of two components:

1 12 Principles of Green Chemistryⁱ

We utilize the 12 Principles of Green Chemistry to re-engineer existing products and provide cutting-edge greener products and tools to customers.

2 DOZN™

Through this industry-first framework, we clarify what is “greener” about our re-engineered greener alternatives.

ⁱ Paul T. Anastas and John C. Warner, 1991

Design for Sustainability (DfS): Re-engineering
DOZN™ in Action: β-Amylase

β-Amylase—an enzyme commonly found in sweet potatoes—hydrolyzes starch into sugar.



6,000 lbs
of sweet potatoes



2,000 lbs
of sweet potatoes



1,900 gallons
of acetone



No organic solvent required



Significant use
of electricity



No additional electricity required
to increase temperature and pressure



Greener Products and Solutions: Helping Customers Minimize Environmental Impacts 2023

DOZN™2.0– A Quantitative Green Chemistry Evaluator | 2021

DOZN™2.0– A Quantitative Green Chemistry Evaluator

Product Example: β -Amylase Scorecard

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Path Forward

Biorenewable Solvent Substitutions

Cyrene™—a **bio-based**, dipolar aprotic solvent that is a **safer, more sustainable alternative** for DMF and NMP—both of which are under increased regulatory restriction through REACH. Exclusively available from MilliporeSigma.

Product	Biobased CO ²	Traditional CO ²
Cyrene	1.4 kg CO ² /L	8.2 kg CO ² /L NMP
Acetone	1.77 kg CO ² /L	4.6 kg CO ² /L
Butanol	1.76 kg CO ² /L	4.6 kg CO ² /L
Ethanol	.52 kg CO ² /L	3.03 kg CO ² /L



Safer Solvents and Auxiliaries
The CO₂ footprint of Cyrene™ is **5x smaller** than NMP.

Greener Products and Solutions: Helping Customers Minimize Environmental Impacts 2023
Dimethylformamide (DMF), N-Methyl-2-pyrrolidone (NMP)

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Design for Sustainability (DfS): Re-Engineering DOZN™ 2.0



Customer Engagement Tool

Easy access to our quantitative green chemistry calculator for comparison against the *12 Principles of Green Chemistry*

- Allow customers to score their own products and processes
- Provides flexibility to apply diverse product portfolio
- Utilizes readily available data
- Based in accepted industry practices
- Easy to access and free to use

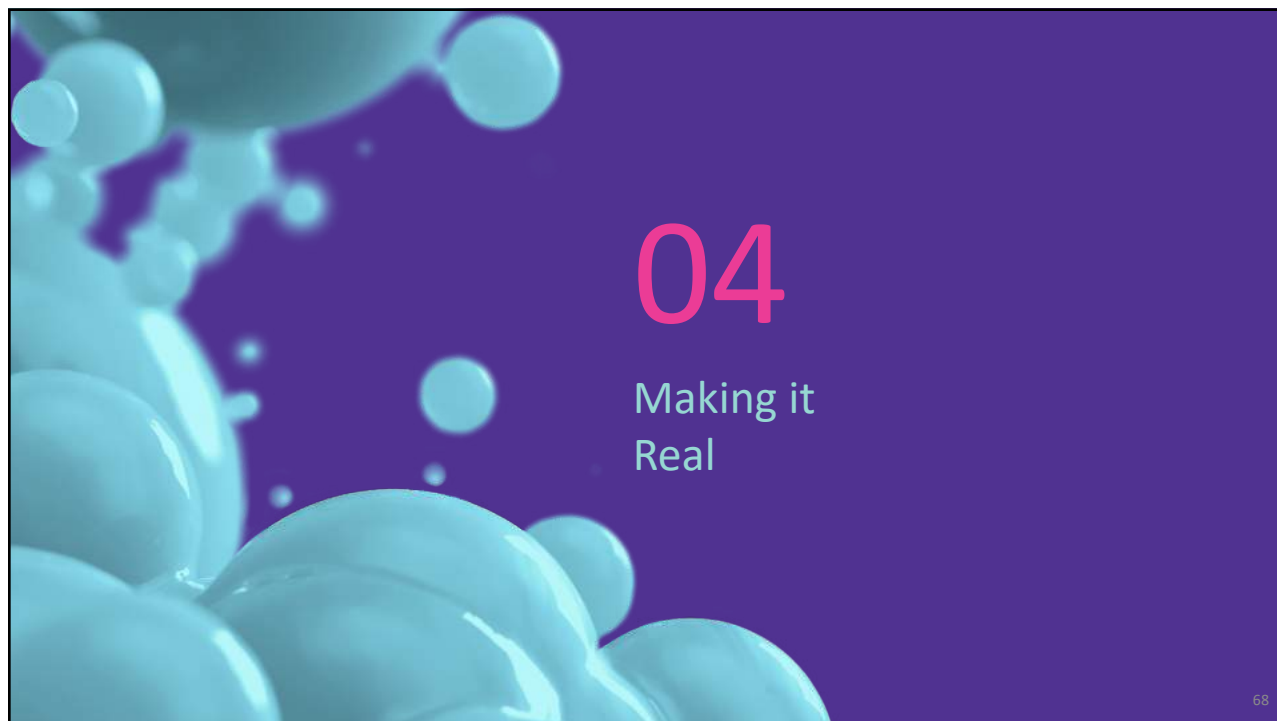
- Launch the tool here:

www.sigmaaldrich.com/dozn



Greener Products and Solutions: Helping Customers Minimize Environmental Impacts 2023

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Greener Products and Solutions Education Advocacy



We're **increasing access to Green Chemistry education** at higher education institutions worldwide, preparing the **scientists of tomorrow** by:

- Establishing **safer lab procedures**
- Instilling **industry best-practices**
- **Reducing** resource waste
- Answering to **environmental challenges**

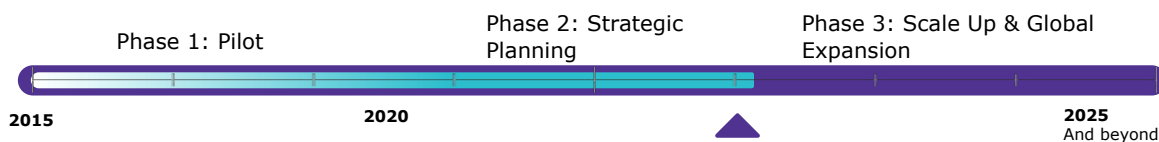


Green Chemistry Education Partnership



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Greener Products and Solutions: Helping Customers Minimize Environmental Impacts 2023

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TWENTY-SEVENTH ANNUAL GREEN CHEMISTRY & ENGINEERING CONFERENCE

June 13-15, 2023 | Long Beach, CA & Hybrid

*Closing the Loop:
Chemistry for a Sustainable Future*

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2. An institution in a country classified by the World Bank as lower-middle-income or is in Central/South America or the Caribbean
3. An International ACS Student Chapter
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 ACS Green Chemistry Institute
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THE LIVE Q&A IS ABOUT TO BEGIN!

Keep submitting your questions in the questions window!

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ACS Green Chemistry Institute

Empowering people to reimagine chemistry and engineering for a sustainable future.



Vision
A sustainable future facilitated by the transforming power of chemistry and engineering.

Mission
To catalyze the implementation of innovative approaches to chemistry and engineering that enable sustainable development across the globe.

Strategic Areas

Science	Education	Industry	Equity
Advance research, scholarship and innovation in green and sustainable chemistry and engineering	Enable the implementation of green chemistry and engineering across the education sector	Accelerate the industrial adoption of green and sustainable chemistry and engineering	Facilitate equity in the adoption of green chemistry, engineering, and sustainability practices worldwide

American Chemical Society
<https://www.acs.org/greenchemistry>
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ACS Campaign for a Sustainable Future



SUMMITS: MOBILIZE
CHEMISTS TO CONTRIBUTE
TO SDG'S



GREEN AND SUSTAINABLE
CHEMISTRY PLATFORM



SUSTAINABLE CHEMISTRY
GRANTS PROGRAM

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NEXT WEEK!



Thurs., March 9, 2023 | 2:00-3:15pm ET

Exosomes in Drug Delivery and Therapeutics

Co-produced with CAS, a division of the American Chemical Society



Wed., March 15, 2023 | 2:00-3:00pm ET

Successful Transitions: Strategies for Adapting to a New Role

Co-produced with the ACS Younger Chemists Committee and the ACS Committee on Ethics



Thurs., March 16, 2023 | 2:00-3:00pm ET


Toxicology 101: Chemicals and their Toxic Effects

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