

Transitioning the Chemical Industry: Towards Sustainable Chemicals and Materials

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'Require Safer Substitutes and Solutions for a Non-Toxic Economy'

Bev Thorpe --Consultant Program Manager, Clean Production Action – March 28, 2023

The Louisville Charter is a roadmap to fundamentally transform the chemical industry



- Endorsed by 125 organizations
- The charter was updated in 2021 to clarify the chemical industry transition roadmap, highlight this industry's contribution to the climate crisis; advance environmental justice in impacted communities and prevent false solutions

<https://comingcleaninc.org/louisville-charter/endorse>

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I am Bev Thorpe, a program manager at Clean Production Action, a nonprofit that designs and delivers tools and strategies for safer chemicals.

I am the lead author of the Safer Substitutes and Solutions Policy Paper in The Louisville Charter. It is called the Louisville Charter because it is named after the area of Louisville, Kentucky, known as Rubbertown, where industrial facilities have historically released millions of KGS per year of toxic air emissions into the surrounding community.

The charter has been updated to more explicitly confront the chemical industry's contribution to the climate crisis and provide principled guidance for advancing environmental justice in communities disproportionately impacted by harmful and cumulative chemical exposure, while avoiding false solutions. The updated Louisville Charter has been endorsed by over 100 organizations representing environmental justice and grassroots communities, environmental and health nonprofits, and leaders in the medical, public health, business, science and research communities. In the next 10 minutes I will

highlight 2 of the ten recommendations in the Solutions Paper – which are the need to reduce the complexity and production of chemicals; and the need to establish a hazard-first approach in all decision making. The last 2 slides will summarize two further opportunities to move forward.

The energy/chemicals/plastics link needs more scrutiny – consumption needs to be cut

Plastics consume 70% of petrochemicals; and 90% of all Chemicals of High Concern.

<https://www.cleanproduction.org/resources/entry/plastics-scorecard-resource>

Communities in the US are opposing proposed plastics expansion and promoting transition planning for workers

International scientists call for cap on production and release of chemicals

NEWS | 19 January 2022

Safe planetary boundary for pollutants has been exceeded, study finds

By 2050, 50 percent of the growth in oil demand will be related to plastics production, surpassing that for transport.

Appeal filed against air permit approval for a \$9.4 billion petrochemical complex in "Cancer Alley"

14 February 2020
#ZeroWasteCalifornia

The need to reduce the complexity and the overall production of chemicals is a priority.

We know the chemical sector is the third largest industrial source of greenhouse gasses. In fact, the International Energy Agency calls the “petrochemicals sector a key “blind spot” in the global energy debate.”

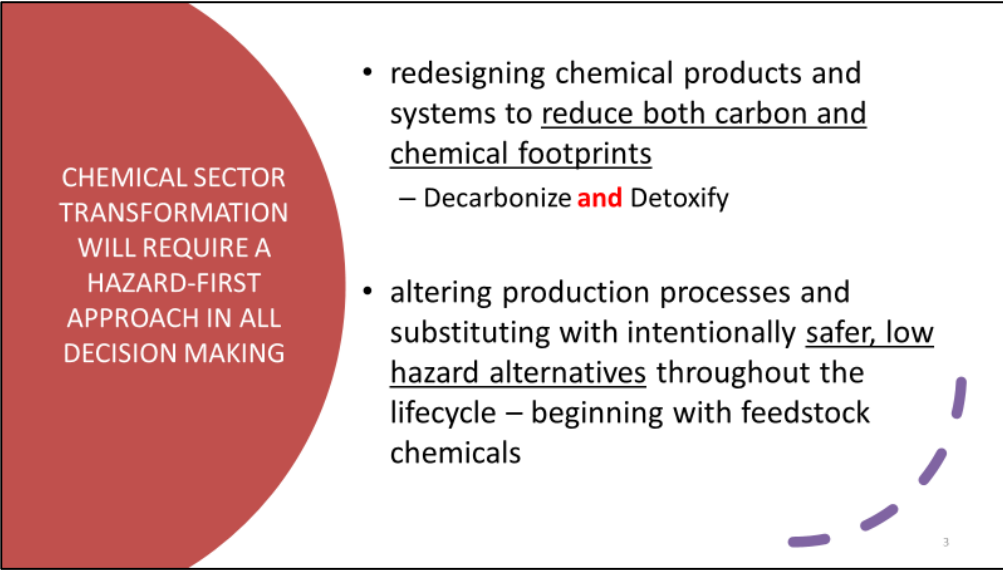
Petrochemicals are expected to drive half of global oil demand growth between now and 2050. Much of this projected increase is based on a doubling of plastic production in the next 20 years.

This will mean an increase in the production and use of hazardous chemicals. The production of plastics consumes 70% of petrochemicals and 90% of all Chemicals of High Concern. It is amazing to me to think that half of all plastics in use today were produced in the last twenty years.

Communities in the US, who have faced decades of hazardous emissions from petrochemical facilities are opposing new facility permits. Last September, a Louisiana judge canceled the air permits for a proposed \$9 billion petrochemical and plastics complex in a Louisiana region nicknamed “Cancer Alley,”

home to several major petrochemical facilities and refineries where residents suffer high rates of cancer. If approved, it would have become one of the world's largest production facilities for plastics and plastic feedstocks.

Just as we are at 'code red' for climate change mitigation, we are at 'code red' for chemical pollution as outlined in a paper last year by Linn Persson and others. As they state, 'The use of toxic chemicals has now crossed the point at which human-made changes to the Earth push it outside the stable environment of the last 10,000 years.' Yet we continue to see a doubling of chemical production every twelve years with a corresponding further increase predicted. Recently, a group of researchers from universities across Europe and elsewhere have called for a fixed limit on chemical production and release – similar to carbon targets aimed at ending greenhouse gas emissions. So, reducing the complexity and overall production of chemicals is an essential part of the roadmap.



CHEMICAL SECTOR TRANSFORMATION WILL REQUIRE A HAZARD-FIRST APPROACH IN ALL DECISION MAKING

- redesigning chemical products and systems to reduce both carbon and chemical footprints
 - Decarbonize **and** Detoxify
- altering production processes and substituting with intentionally safer, low hazard alternatives throughout the lifecycle – beginning with feedstock chemicals

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A hazard-first approach is essential in all decision making. We hope this prevails in the European Commission's Safe and Sustainable by Design policy framework and roll out. The use of safer, low hazard chemicals throughout the lifecycle of a product also applies to the design of feedstock chemicals.

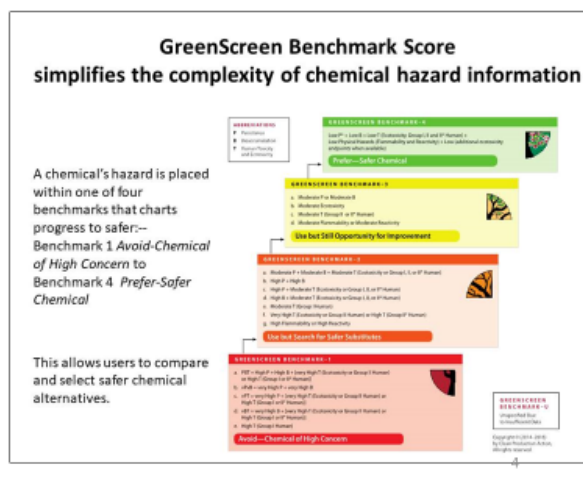
Safer alternatives needed for majority of current petrochemical building block chemicals

Currently seven building block chemicals are the basis for 90 percent of organic petrochemical production.

GreenScreen hazard assessments reveal five are Benchmark-1 chemicals 'chemicals of high concern' -- and two are Benchmark-2 'use but search for safer substitutes.'

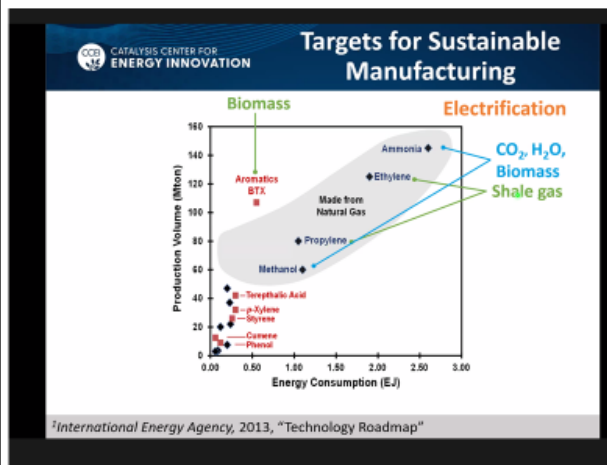
The 7 platform chemicals are:

- **methanol**;
- olefins—**ethylene, propylene**, and **butadiene**;
- aromatics— **benzene, toluene, and xylene**.



Currently 7 building block, or platform chemicals, are the basis for 90 percent of organic petrochemical production. We applied the results of a hazard assessment of each of these seven chemicals using the GreenScreen for Safer Chemicals – a globally recognized hazard assessment tool that helps companies identify chemicals of high concern and safer alternatives. GreenScreen uses a scientifically rigorous and transparent methodology to benchmark chemicals into 4 categories which companies find useful to simplify the complexity of chemical hazard assessments. As you can see methanol, butadiene, benzene, toluene and xylene are all benchmark 1 chemicals– or chemicals of high concern'. Ethylene and propylene are Benchmark 2 chemicals (described as Use – but search for safer substitutes'). So why is this information important?

Using Biobased carbon to make hazardous feedstock chemicals is not sustainable



R&D being directed into fossil-free carbon for manufacturing chemicals

These include non arable biomass, lignocellulose, algae, chitin, biocrude from sewage and food waste, and carbon from CO₂ capture

But there is no 'joined-up' focus on detoxifying --resulting in same hazardous chemicals production and use

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Because having a sole focus on reducing the carbon footprint of chemicals is not sustainable. This screenshot of an IEA technology roadmap for sustainable manufacturing is ten years old – but describes the trajectory for R&D into producing the same hazardous chemicals but with alternative feedstocks. Although there is much research into non arable biomass, lignocellulose, algae, chitin, biocrude from sewage and food waste and carbon capture, there is no joined up focus on detoxifying. We need to integrate green chemistry principles into the decarbonization push.



Funding and R&D needs a Hazard-First focus to avoid false solutions:

- “We introduce a ... framework that determines the most profitable processes to produce benzene, toluene, and/or xylenes from biomass via methanol.”
- <https://pubs.acs.org/doi/10.1021/acs.energyfuels.6b00619>
- **benzene, toluene, and xylene are all chemicals of high concern**
- There is no ‘green benzene’

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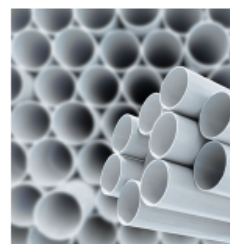
We know BTX can be produced using biomass. But why would we continue to produce persistent, bioaccumulative and toxic compounds? Benzene will still be a class 1 carcinogen no matter how it is produced. Emissions from biorefineries producing these BTX chemicals will still impact the health of surrounding communities. And these hazards exist through the value chain. For example, independent testing found hundreds of popular personal care items in the US to be contaminated with benzene, prompting several big brands to voluntarily re- call dozens of products.

Ensure roadmaps to a circular economy prioritize chemical hazard reduction and full material disclosure to avoid false solutions.

Biobased Polyvinyl Chloride (PVC) – is certified by the Roundtable on Sustainable Biomaterials – but lacks consideration of chemical hazard

Advancing the transition to a bio-based and circular economy

The Roundtable on Sustainable Biomaterials (RSB) provides collaborative partnerships, innovative solutions and trusted certification for a just and sustainable transition to a net positive world.



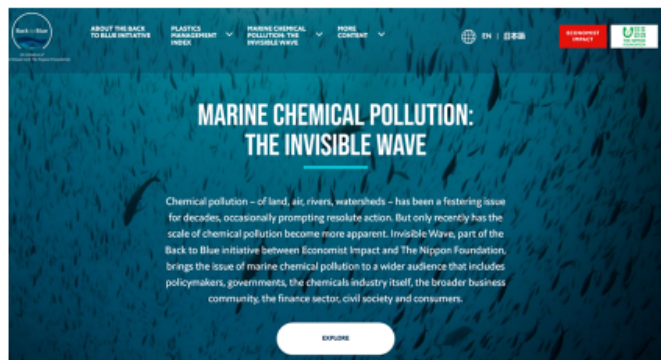
'Bio-naphtha' is still a high hazard chemical; vinyl chloride monomer and additives used in PVC lifecycle are chemicals of high concern

The Louisville Charter emphasizes the need for transparent chemical hazard data to advance a safer circular economy. This is one example of a false solution that is described in the Solutions plank of the Louisville Charter because it lacks the integration of chemical hazard. In this case a company converted wood-based residue into hydrocarbons for mixing with Vinyl chloride monomer which is an IARC group 1 carcinogen – along with other additives of concern - to produce PVC flooring which now carries this RSB certification.

Reward and incentivize innovation in safer chemicals production through financial incentives

Investors, financial bodies and regulators keen to support protection of biodiversity and environmental justice could:

- remove \$20 billion/year subsidies on fossil fuel developments and reallocate to safer chemical design
- tax the use of hazardous chemicals;
- integrate chemical footprint reduction goals and investment in safer chemicals into all ESG reporting
- Outline a just transition plan for impacted workers and communities during the transition



Ocean Business Action Platform has developed a set of Sustainable Ocean Principles. Major investment funds are working with the UN Global Compact to support companies using the principles as a reporting mechanism.

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The last 2 slides lay out a couple more recommendations cited in the Louisville Charter Solutions paper. The Transition roadmap will need to reward and incentive innovation in safer chemical production that includes removing the \$20b/year subsidies on fossil fuel developments and reallocate to safer chemical design – not just to renewable energy incentives. New reporting mechanisms and ESG reporting can be another incentive for investors to push both a decarbonization and detoxification roadmap.

To date most of the reporting on Environment, Social and Governance (ESG) measures under ESG reporting has focused on persuading companies to reduce their climate emissions—hence the global wave of corporate pledges to reach a net zero carbon impact. While the focus on climate will remain, momentum is also growing for investments that are net zero, nature-positive and socially just. For example, Shareholder activist group ShareAction launched a campaign in September 2021 targeting the chemicals industry over its carbon emissions from the seven building block chemicals arguing that phasing out these seven platform chemicals would provide the sector with a credible decarbonization pathway. This example offers creative opportunities to put the focus on both the chemical footprint and carbon footprint of these chemicals, and together plan a fundamental shift to renewable platform chemicals with low chemical hazards.

Scale benefits to local communities through smaller-scale, decentralized, and modular chemical and material manufacturing facilities



Principles of Green Engineering

- “Actively engage communities and stakeholders in development of engineering solutions”

Local communities need to be at the table from the beginning of any proposal for new chemical production facilities.

“Producing the same cancer-causing chemical with wood pulp instead of fossil fuels won’t help fenceline communities. Those facilities are still going to be in our backyard. The real solution is to stop producing chemicals that cause cancer, and move all production away from where human beings live.” – Louisville resident

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The transformation of the chemical sector needs to be truly transformative including new types of production, ownership, and relationship to the communities in which they operate. Just as with the development of decentralized renewable energy production, a transformed chemical sector could scale benefits to local communities through smaller-scale, decentralized and modular chemical and material manufacturing facilities. But an active involvement with the community will be key for success. I leave you with a quote from a Louisville community resident.

THANK YOU FOR LISTENING

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