Creating sustainability and economic benefits through investments in green and sustainable chemistry

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Overview

This presentation is meant as an introduction to chemical opportunity for investors. Please review this presentation before our meeting, where we can happily elaborate on any of the following sections:

1. Introduction to sustainable chemistry and chemical opportunity
2. Decreasing the use of hazardous chemicals
3. Growth of sustainable chemicals
4. Case studies of sustainable chemicals
5. Vision for a full transition to sustainable chemicals
6. Conclusions

What Do We Mean: Defining Green and Sustainable Chemistry

"**new** designs and innovations in chemistry

that provide valuable **functions and services** of chemicals, materials, products, and production processes

without causing harm to human health and the environment,

while **meeting broader sustainable development** objectives"

UN Environment Programme (UNEP)

The Broad Constituency Expert Committee on Sustainable Chemistry Definition

"Sustainable chemistry

is the development and application of chemicals, chemical processes, and products

that benefit current and future generations without harmful impacts to humans or ecosystems."

A Significant Investment Opportunity

"In 2017, the [chemical] industry was worth more than US dollars 5 trillion. By 2030, this will **double**."
- UN Global Chemicals Outlook II

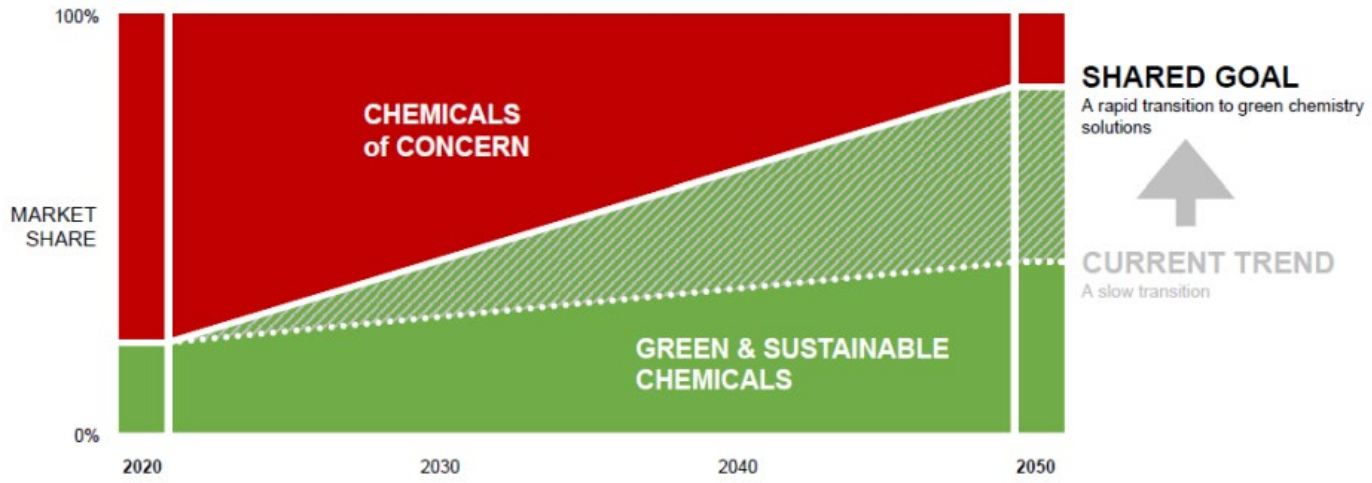


IMAGE SOURCE: Institute for Safer Chemical Alternatives, 2021

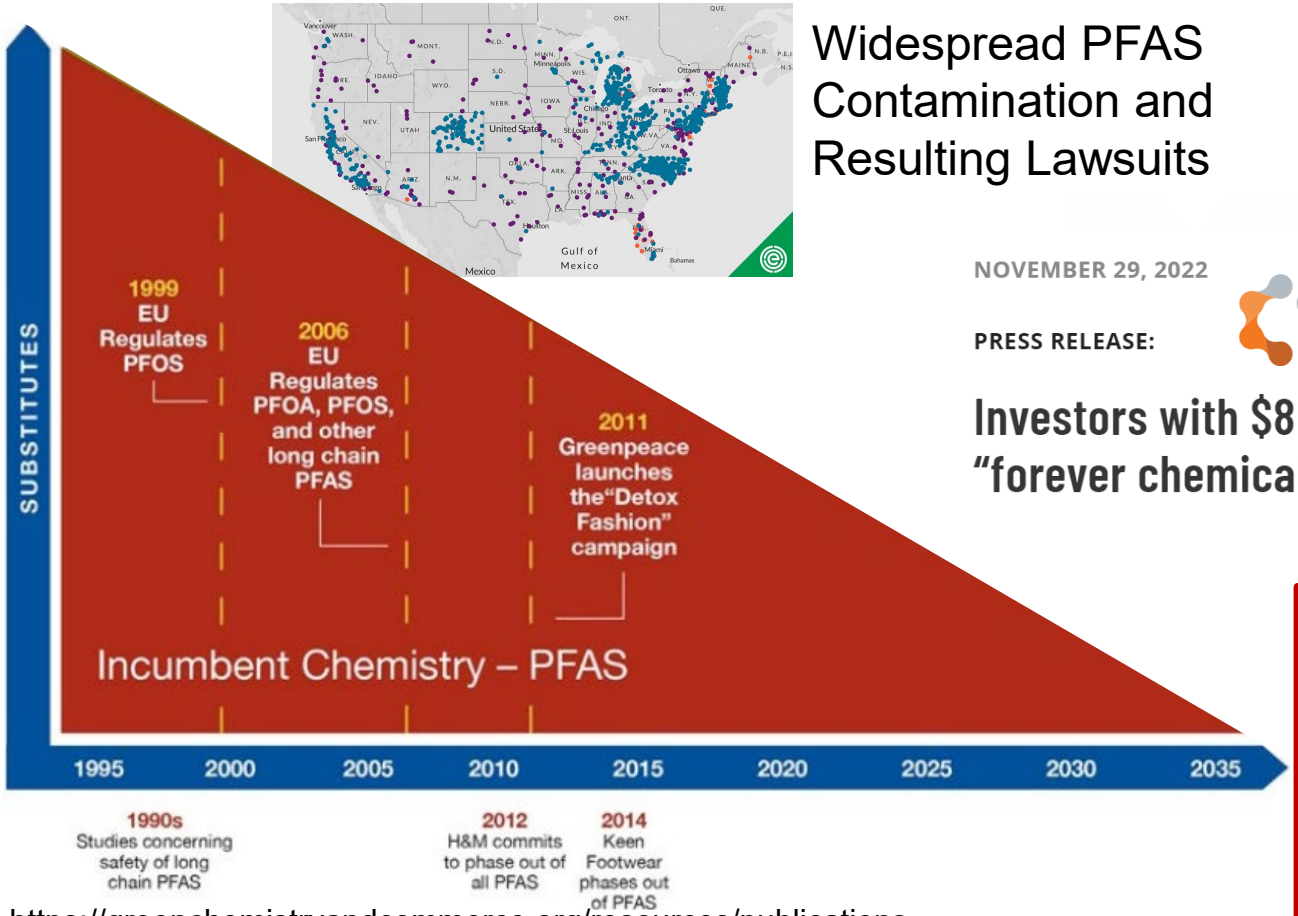
Green and sustainable chemistry

- Foundational to multiple industries
- Enables multiple societal goals
  - Health and equity
  - Climate
  - Circularity
  - Biodiversity
- Driven by market demand (and government policy)
- Facilitated by government support

Decreasing the use of hazardous chemicals

- Pressure from
  - Regulations
  - Downstream companies
  - Litigation

We know we have the tools drive reductions in hazardous chemicals



Widespread PFAS Contamination and Resulting Lawsuits

Group Effort: Scientists, NGOs, Regulators, Consumer-facing Companies, Investors and (eventually) PFAS Producers

NOVEMBER 29, 2022

PRESS RELEASE:

chemsec

Investors with $8 trillion call for phase-out of dangerous "forever chemicals"

FORBES > BUSINESS

BREAKING

3M Will Discontinue Use Of Hazardous PFAS 'Forever Chemicals' By 2025

https://greenchemistryandcommerce.org/resources/publications

Chemicals of concern have been reduced

"Companies with over $1 trillion in annual revenue from seven business sectors participated in the 2021 CFP Survey.

Over one year, they collectively reported chemical footprint reductions of **83.4 million pounds/37.8 million kilograms**."

2022 Chemical Footprint Project Report

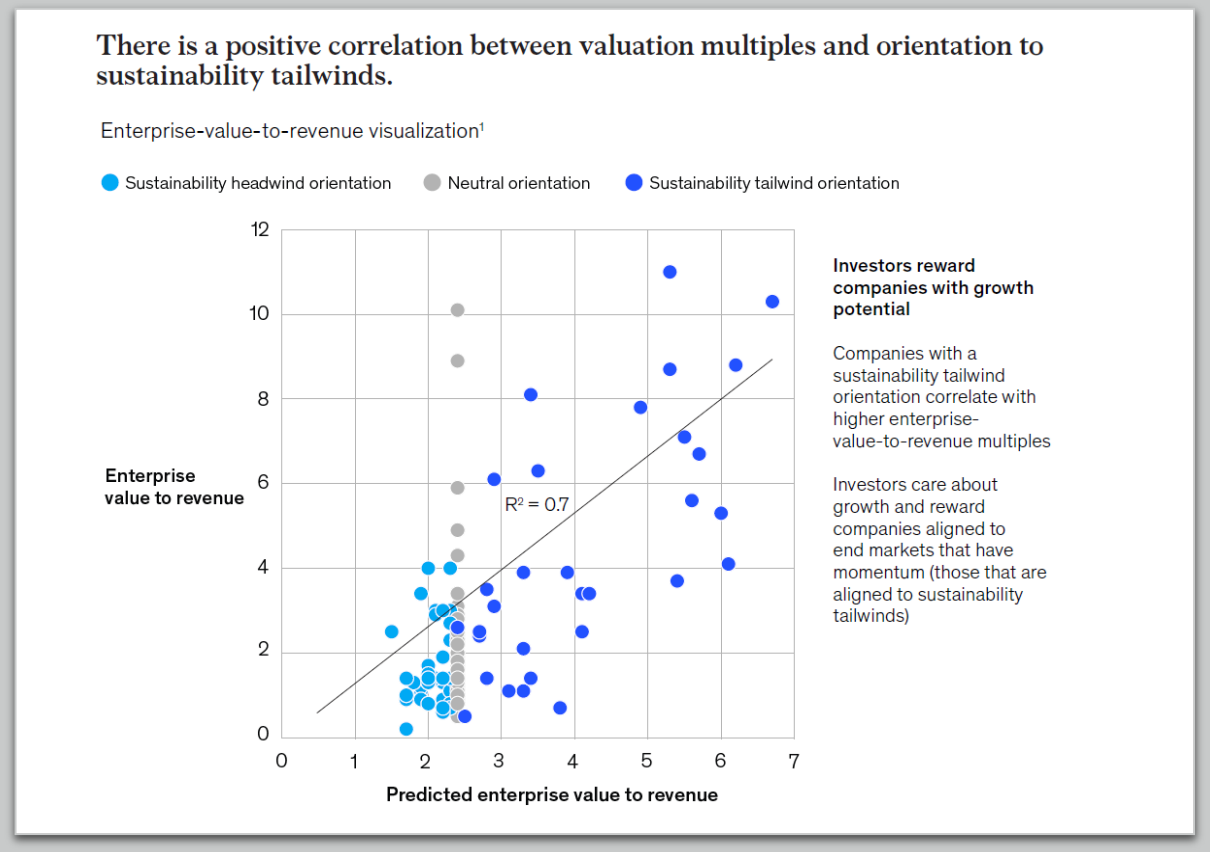
Clean Production Action

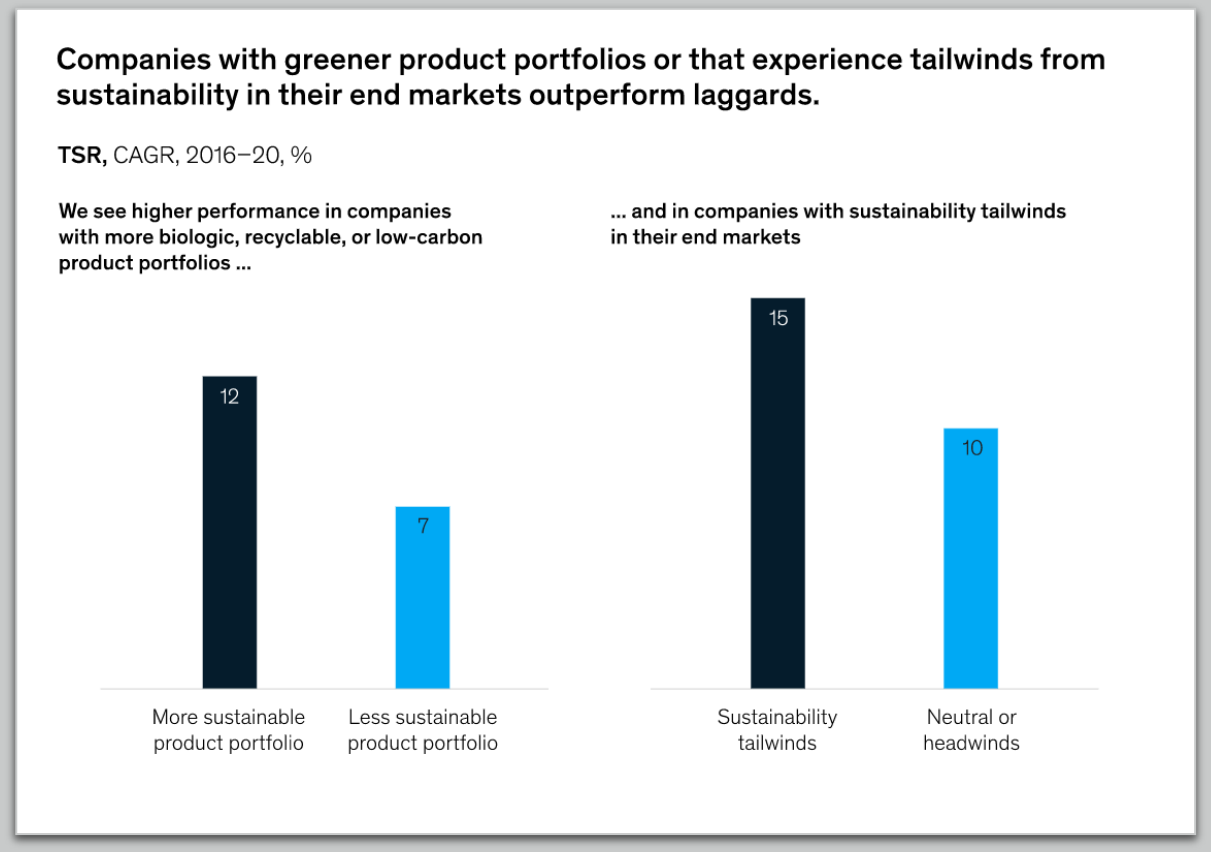
Sustainable chemicals are growing

- Growth in the market due to
  - Sustainability
  - Consumer preferences
  - Trusted consumer-facing certifications

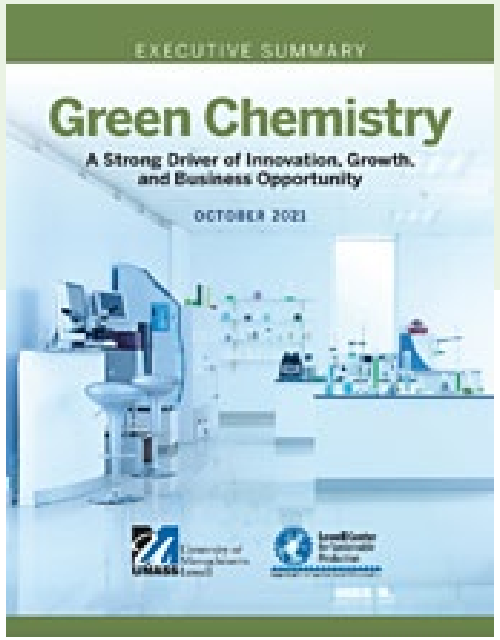
Significant growth opportunities in production of safer chemicals

Source: McKinsey Report





https://www.mckinsey.com/industries/chemicals/our-insights/chemicals-and-capital-markets-growing-sustainably



Significant growth opportunities in safer products

GC3 Report: Green Chemistry: A Strong Driver of Innovation, Growth, and Business Opportunity

FIGURE ES.3
Market growth of green chemistry products.

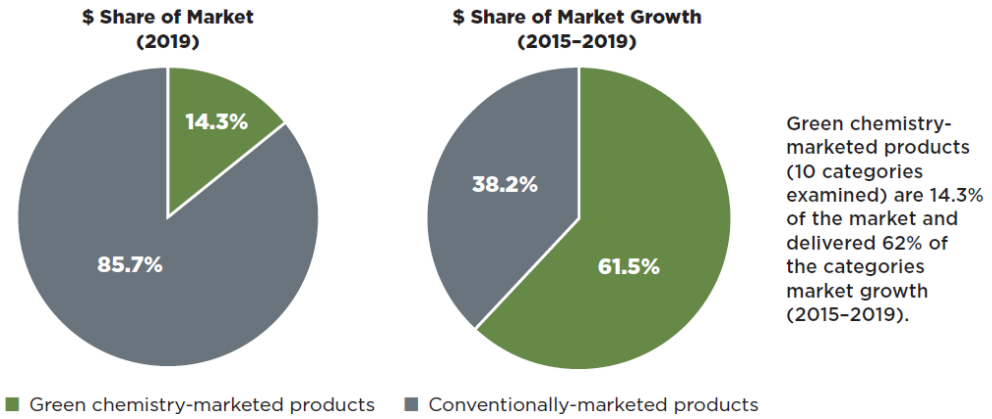
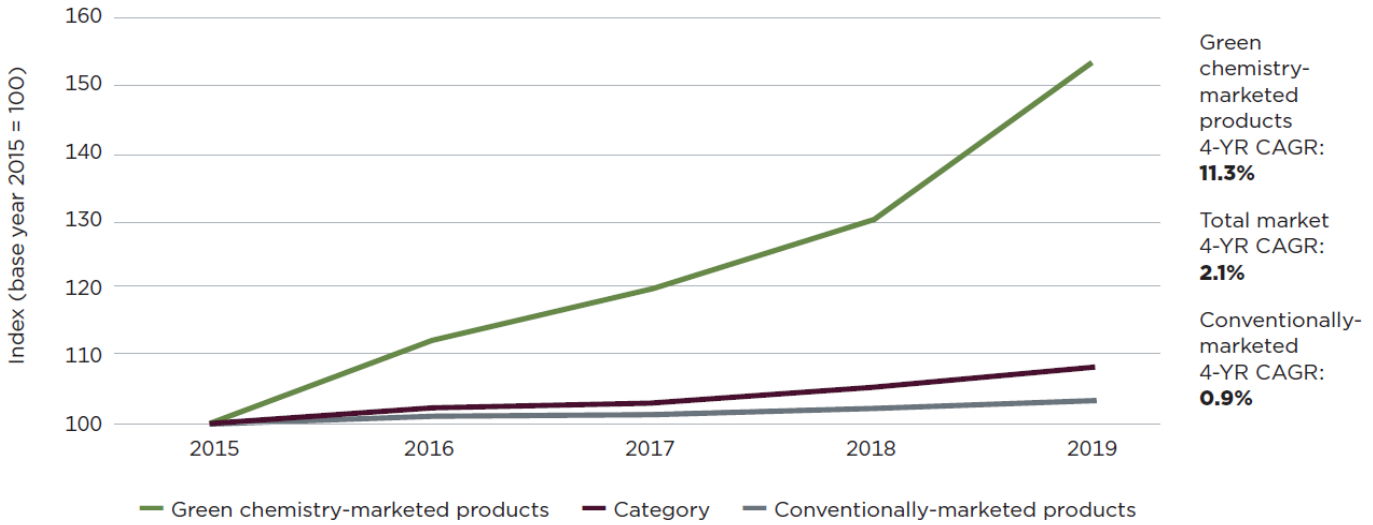


FIGURE ES.2
Growth of green chemistry marketed-products from 2015–2019.



From 2015–2019, green chemistry-marketed products (10 categories examined) grew 12.6 times faster than their conventional counterparts, and 5.4 times faster than the market.

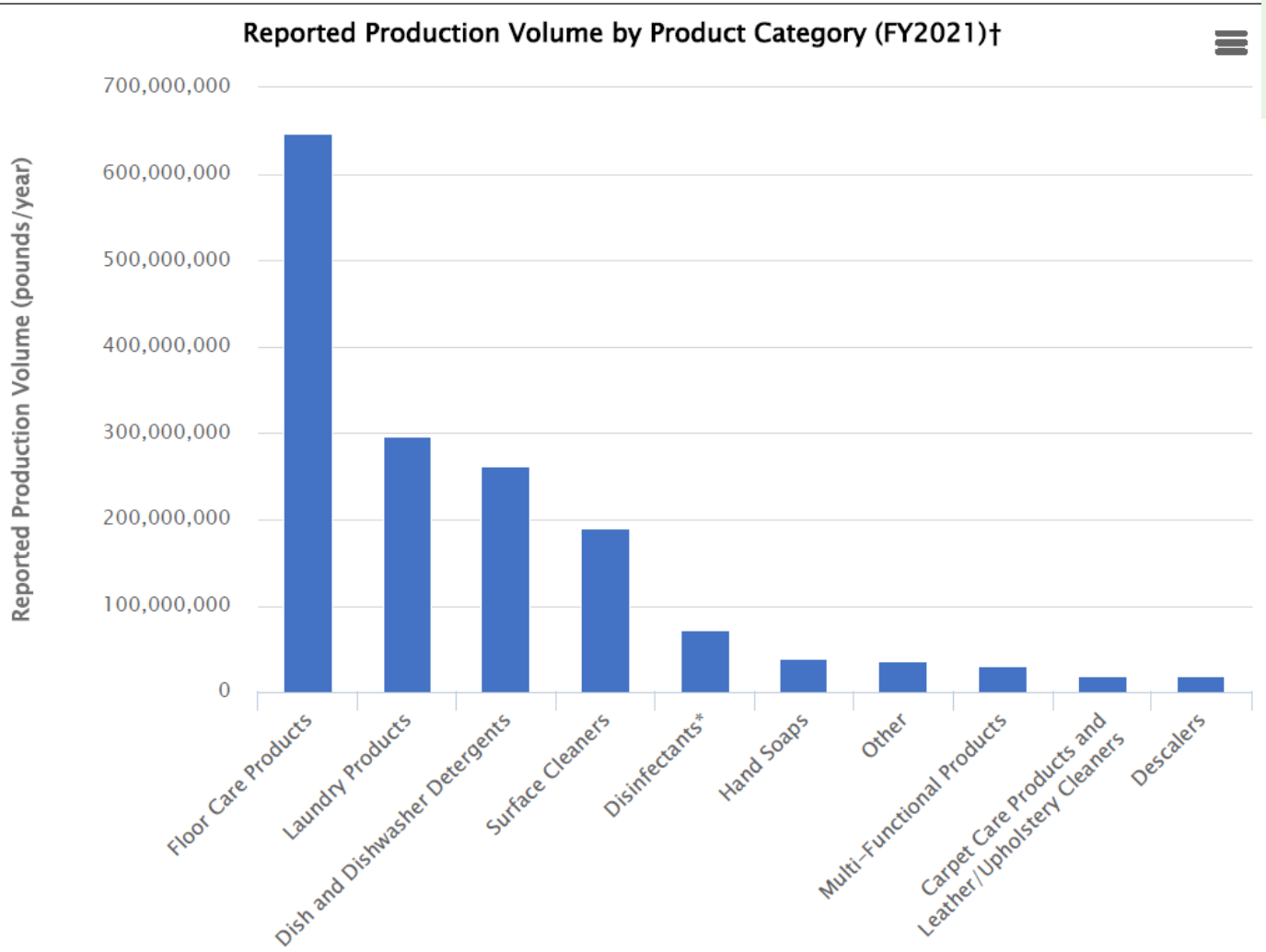
https://greenchemistryandcommerce.org/resources/publications

Growth of EPA Safer Choice Products

- Total Volume of Safer Choice Certified Products – 1.6bn lbs

- Number of chemicals listed on the EPA Safer Chemical Ingredient list >1000

The bar graph below illustrates total volume of Safer Choice- and DfE-certified products by category



Examples of Sustainable Chemistry Solutions

- Companies have scaled and marketed solutions to …
  - Volatile Organic Compounds (a form of air pollution)
  - Bisphenols, an endocrine disruptor
  - PFAS, a forever chemical
  - Fossil-based and hazardous chemical building blocks

Adoption will happen one chemical at a time, there is no ‘blanket’ approach to this

Innovative solutions exist for VOCs

Problem: Traditional cleaners release volatile organic compounds (VOCs) from solvents that can cause respiratory harm and other forms of toxicity in indoor environments

Retailer and regulatory action: Restrict release of VOCs/solvents

Opportunity: Eastman developed a biodegradable low-VOC solvent, Omnia, based on principles of green chemistry and approved by the EPA Safer Choice

Pressure on chemical risk spurs innovation…and opportunity

"CEP Panel concluded that there is **a health concern** from dietary BPA exposure for all age groups"

EU's EFSA Panel on Food Contact Materials, Enzymes and Processing Aids (CEP), 2021 Report

Environmental Science & Technology

Article

pubs.acs.org/est

Evidence of Absence: Estrogenicity Assessment of a New Food-Contact Coating and the Bisphenol Used in Its Synthesis

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Supporting Information

Problem: Bisphenol-A (BPA) in can linings causes harm to hormonal and reproductive systems

Retailer and (later) regulatory action: Phasing out BPA in products

Opportunity: Non-endocrine disrupting bisphenol developed by Valspar (image) and Eastman, approved by scientific community

Safer solutions exist for PFAS

Retailer and regulatory action: Phasing out PFAS in products

Innovation: PFC-free durable water repellent chemicals that are approved by textile sectoral initiatives (Bluesign and ZDHC)

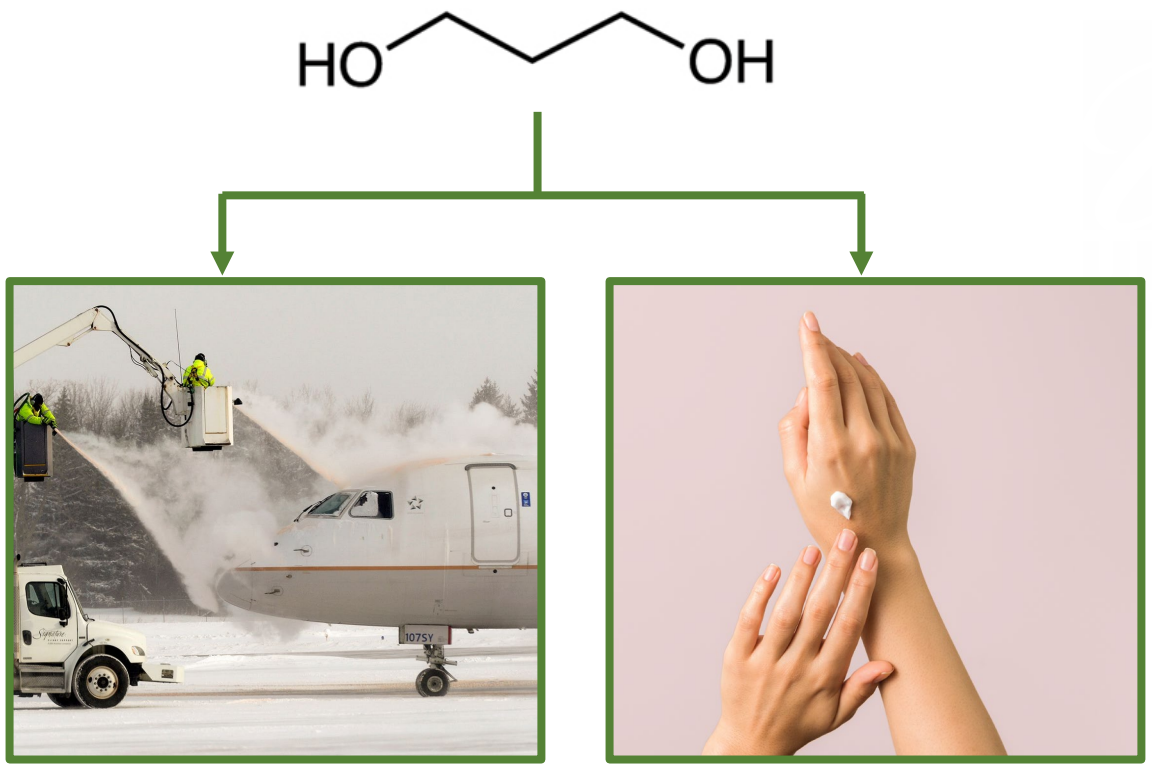
Opportunity: Scaling these solutions and other applications

BIONIC FINISH®ECO

chemsec MARKETPLACE

Successful example of safer, biobased platform chemicals going into products

Biobased 1-propane diol



DuPont Tate & Lyle BioProducts™

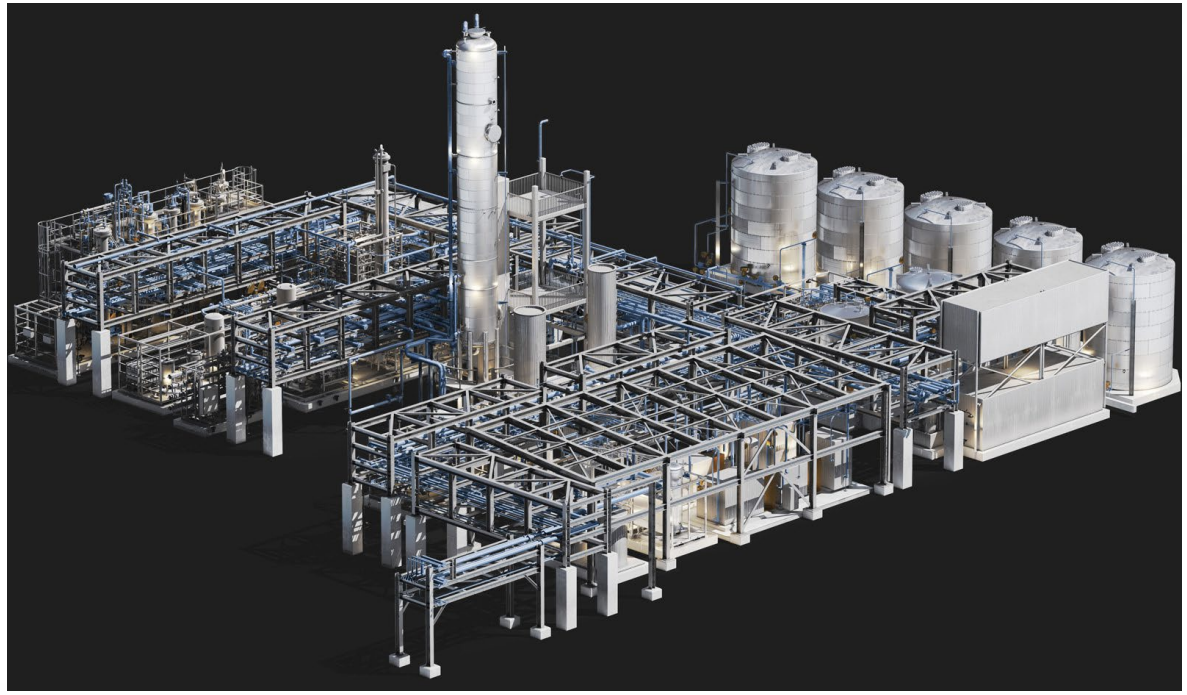
- Technology by Genomatica
- 50,000 tons/year scale
- Certified as USDA Biobased
- 56% less GHG emissions
- 42% less non-renewable energy

than fossil-based 1-propane diol

Solutions to petrochemical feedstocks exist and are scalable

Solugen “Bioforge”

Based in Houston, TX



Biobased feedstocks that are transformed into **safer chemicals**

- Low energy
- Low emissions
- Distributed
- High community involvement
- 10,000 ton per year capacity
- $2 billion valuation

Funding round Series D was led by Kennivik, Lowercarbon Capital, and Refactor Capital

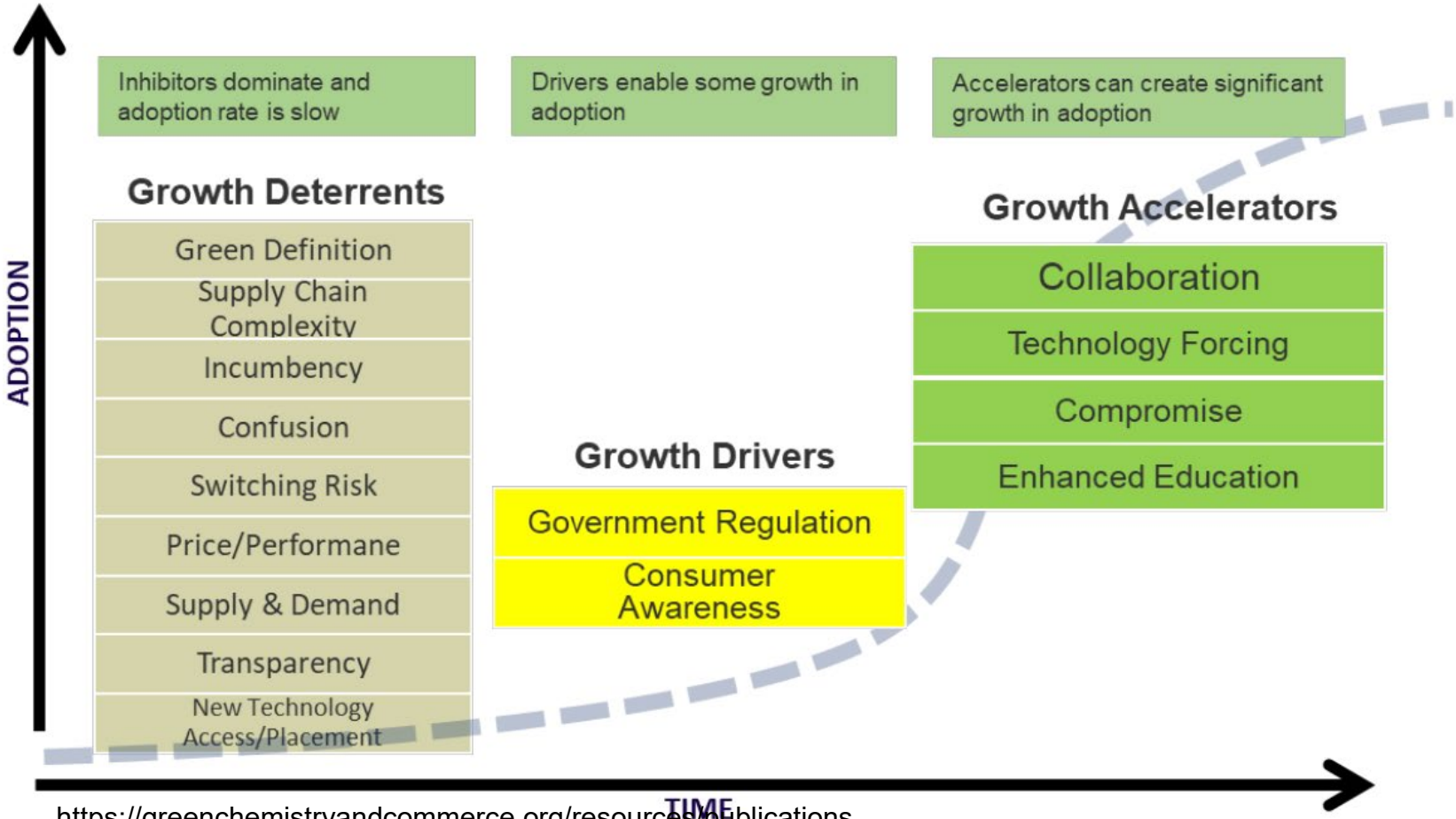
Key sectors that exemplify the growth in sustainable chemistry

- Personal care products
- Household cleaning products
- Footwear and apparel

Vision for a transition to sustainable chemicals

Accelerated growth of green and sustainable chemicals is needed.

There are challenges to scale that must be addressed and accelerators that must be leveraged



*Through the lens of the GC3

https://greenchemistryandcommerce.org/resources/publications

Transition will take many forms

Joel A. Tickner, Ken Geiser & Stephanie Baima (2022) Transitioning the Chemical Industry: Elements of a Roadmap Toward Sustainable Chemicals and Materials, Environment: Science and Policy for Sustainable Development, 64:2, 22-36, DOI: 10.1080/00139157.2022.2021793

Conclusions

Accelerating the scaling sustainable chemistry requires increasing investment

- To transition the bulk of the chemical industry and the downstream users
- To leverage government support for R&D, piloting, and capital investment

Growing the supply of green and sustainable chemistry is necessary, possible, and an investment opportunity

Thank you!