Comparison of existing approaches to assess chemical footprints along values chains

Discussion document for the Open-Ended Working Group (OEWG) of the Global Framework on Chemicals (GFC)[1]

Context

The Vision of the Global Framework on Chemicals is "a planet free of harm from chemicals and waste for a safe, healthy and sustainable future", with a scope that covers the life cycle of chemicals, including products and waste. **Chemical footprint approaches** help achieve this vision by offering an indication of potential risks / burdens on human health and ecosystem health associated with chemicals or chemicals contained in an industrial process or a material or product throughout its life cycle. They provide useful information that supports better decisions in government policies, business strategies, and supply chain management.

Specifically, chemical footprint approaches help identifying which chemicals pose the highest risks, where interventions are needed, and which actions can deliver meaningful improvements in terms of human and environmental risk or impact reduction. They can be applied in policy development, corporate/business strategy, supply chain management, performance reporting, and environmental management. By making impacts from chemical use more transparent and measurable, these approaches provide a strong foundation for informed and effective decision-making in support of the GFC's objectives.

The Open-Ended Working Group (OEWG) of the Global Framework on Chemicals (GFC) brings together governments, industry, and other stakeholders to strengthen the global management of chemicals and waste. A key focus of this process is **Target D6**, which aims to help sectors identify priority chemicals and reduce their impacts across the value chain. This target supports the broader objectives and targets of the GFC, including improving chemicals management throughout their life cycle (Target A3) and enhancing data generation, sharing, and the use of harmonized tools (Targets B3 and B4).

Initial progress in understanding of chemical footprint approaches

The Inter Organization Programme for the Sound Management of Chemicals (IOMC) held a multi-stakeholder workshop in Paris from 24 to 26 February 2025 on "Economic and Industry Sector Engagement and Action to Implement the Global Framework on Chemicals". As a result of that workshop, the following activities were proposed around the topic of chemical footprint approaches:

- compile and undertake a comparison of existing approaches to measure the chemical footprint along values chains;
- develop guidance to provide options to measure various aspects of the chemical footprint and support industry disclosure;
- explore opportunities to align a chemical footprint approach e.g. through development of a common standard.

There are currently different approaches and tools to chemical footprinting developed and applied by various organizations; this provides a diverse range of methods and perspectives that answer different relevant questions in the context of the GFC targets. To support discussions within the OEWG, this document provides an overview of selected chemical footprint tools, assessed in terms of their object of analysis, typical use cases, methodological approach, metrics used and their position in the cause-effect chain, and whether the tool is voluntary or tied to regulatory frameworks. A key distinction in terms of methodological approach relates to **Hazard-based approaches** (addressing individual aspects via intrinsic properties of chemicals only) and **Risk- or Impact-based approaches** (considering intrinsic chemical properties and using such data as input to model environmental processes, exposure pathways, and toxicity-related effects, and ultimately combine resulting factors for environmental fate, exposure and effect (impact) or comparing estimated exposure with effect-based references (risk)).

Discussions in the OEWG are meant to clarify the differences between these approaches and identify opportunities for greater alignment and synergies to support the safe and sustainable management of chemicals.

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Chemical Footprint Matrix

	Chemical Footprint Project	Cradle-to-Cradle Material Health	Cradle-to-Cradle Certified	USEtox	WBCSD's PSA	EPDs (Environmental Product Declarations)	PRTR
Object of analysis (chemical, product, company, sector)	Company, Sector, Product, Manufacturing, Packaging	Products across sectors, which are broadly defined and include chemicals, formulations, materials, product components and finished products	Product, manufacturing and corporate sustainability	Chemical substances (emitted along product and technology life cycles and/or used in consumer goods)	Company's individual products and overall portfolio sustainability from cradle to grave	Product or service from a company	National-level data of chemical use/ emissions across sectors
Stakeholders addressed	Manufacturers, Product Designers, Asset managers (Investors), Banking sector, Policymakers, Civil society (including NGOs), consumers, purchasers, retailers, employees and workers and Brands	Primarily product manufacturers and the value chain, and programs specifying or rewarding certified products such as gov agencies, green building standards, retailers with sustainable shopping platforms	Product designers, manufacturers, and brands across sectors, as well as stakeholders at left	LCA practitioners, industry experts, policymakers, product designers, academic researchers	Company decision makers (portfolio management, R&D, business leaders), value chain partners (e.g. customers), regulators/ecolabel, industry groups, and external stakeholders (incl. NGOs)	Industries, supplier, consumers	
Use case / answers provided	Measure, disclose, and improve management of chemicals, particularly focusing on reducing the use of Chemicals of High Concern (CoHCs). CoHCs are identified based on hazard criteria (human health and environment endpoints) and chemical groups (for example, PFAS). Hazard endpoints include CMRs, EDCs, and PBT. It provides a standardized framework for benchmarking, certification, strategic planning, continuous improvement, goal setting, and impact reduction in chemical management	Material health, i.e., human health and ecotoxicity, including both hazard and exposure/risk	Multi-attribute product sustainability framework, including Material Health (definition at left)	Human toxicity and ecotoxicity impact characterization of products and technologies, in the context of LCA studies; sustainability assessments; Chemical impact assessment, chemical substitution and alternatives assessment; screening of exposure and risk from chemicals, and prioritization	Sustainable portfolio strategy and innovation (e.g. Investing in new business model, green technologies and/or products, exit plan) Business sustainability performance management (e.g improving, reformulating, substituting) Risks mitigation (e.g operation action plan to respond to specific identified risks) Disclosure and transparency, including encouraging setting targets (e.g. elimination of non sustainable products)	Communication purpose, Comparative LCA, support green building certifications	
Metric's description (including its position in the impact pathway chemical use-emission-exposure-effect)	CFP identifies economic and social activities (e.g., manufacturing, product development) that drive chemical use and then measures the total count and **mass of Chemicals of High Concern (CoHCs) used**, representing the drivers to pressure exerted on the environment and health.	Impact (via combining information on chemical mass emitted, with information on impact potential, such as ecotoxicity characterization factors)	Impact (via combining information on chemical mass emitted, with information on impact potential, such as ecotoxicity characterization factors)	Impact potential: on 1) human health via toxicity and 2) ecosystem quality via ecotoxicity Impact potential, also called "comparative toxic unit (CTU)" expresses toxicity-related impact on humans or ecosystems per unit mass emitted or per unit mass in a consumer product application (i.e. impact/kg).	Measure a product sustainability performance in a specific application according to 8 criteria called "Signal Categories" (SC)[2] with the aim of taking strategic and operational business decisions and actions on the product (see use case) It considers both pressure (mass/volume and	Impact (combinations of impact potentials -as from USEtox – with emissions along the life cycle of the product the EPD refers to)	Mass of chemical use or chemicals emitted

[2] The 8 signals include chemical hazard and exposure associated with a product (SC1), Anticipated regulatory developments and global conventions (SC2), environmental and social performance (SC5). The assessment draws on existing done **Cradle to Grave**, **no netting is permitted**.

	CFP by measuring chemical use of CoHCs enables entities to measure use and set goals and measure progress in reducing use, thereby having the impacts of reducing emissions of and exposure to CoHCs across their life cycle.			State potential: Changes in mass or concentrations in the environment, and human and/or ecological exposure per unit mass emitted or in a product application **Needs to be combined with information on pressure** (mass of chemical emissions) to arrive at actual State and Impact levels (i.e. pressure x impact potential = Impact)	revenues) and impact information Specifically for chemicals hazard and exposure, it requires drawing 2 level priority lists, according to harmonized criteria, considering toxicology and ecotoxicology to assess product performance according to its use		
Methodological Approach (e.g. qualitative, quantitative, risk, hazard-based).	Chemical Footprint metric: Quantitative, Hazard-Based Inventory (based on chronic and acute human health and environmental criteria) Chemical Footprint Project Survey: Qualitative and Quantitative set of KPIs including corporate chemical policy, chemical inventory, safer alternatives, t	Hazard and risk-based quantitative Uses tiered achievement levels (Bronze, Silver, Gold, Platinum)	Multi-attribute, multi-criteria approach combining qualitative and quantitative assessment; hazard and risk-based. Considers fate, exposure, effect potency Uses tiered achievement levels (Bronze, Silver, Gold, Platinum)	Quantitative, Risk/Impact-based modeling; combining fate potential; exposure potential; effect potency	A risk-based approach, Quantitative and qualitative, using a signal-based framework grounded in LCA For chemicals specifically, it drives hazard consideration first, then combined with exposure from cradle to grave (ie impact).	Quantitative. Based on the product category rules and verification process.	
Key Assumptions	Aggregating Diverse Hazards	Transparency in chemical contents of products Framework and tools to design products for net-positive impact: safe for human health and environment	Transparency in chemical contents of products in Material Health category Framework to design products for net-positive impact: safe, circular, responsibly made	Steady-state and dynamic solution, generic environments (e.g. global, continental) and population characteristics (e.g. food consumption rate)	Group products by harmonized sustainability profiles, considering the product, application, region where this is used, cradle-to-cradle life cycle view	Following the LCA standard and data quality requirements	
Voluntary / recommended or required in regulation	Voluntary in process of being integrated as set of standards in a government	Voluntary	Voluntary	Voluntary; used in the context of LCA studies, EU's Environmental Footprint method and several EPD systems, and alternatives assessment	Voluntary	Voluntary Disclosure of Construction Products Environmental data derived from LCA indicators becoming mandatory in Europe through the revised Construction products regulation CPR enforcement. EPDs Based on EN15804. / environmental data are already required to calculate buildings environmental impact in several EU Member states regulation as transposition of EPBD. For other products, same applies with PEF and coming ESPR regulation requirements for disclosing products environmental impacts.	

Kinds of questions that these methods could inform: looking at GFC targets

Text of relevant GFC targets	What could Chem Footp approaches contribute?
D6: By 2030, sustainable chemical and waste management strategies have been developed and implemented for major economic and industry sectors that identify priority chemicals of concern and standards and measures, such as the chemical footprint approach, to reduce their impact and, where feasible, their input along the value chain.	• Identification of chemicals of concern • Qualitative assessment of impact, and where relevant quantitative • Quantification of impacts from chemicals of concern along the value chain • Quantification of inputs of chemicals of concern along the value chain
A3: By 2030, companies implement measures identified to prevent or, where prevention is not feasible, minimize adverse effects from chemicals throughout their life cycle	• Quantification of adverse effects from chemicals throughout their life cycle
A7: By 2035, stakeholders have taken effective measures to phase out highly hazardous pesticides in agriculture where the risks have not been managed and where safer and affordable alternatives are available, and to promote transition to and make available those alternatives.	• Determination of highly hazardous pesticides • Assessment of safer and affordable alternatives (*to prevent regrettable substitutions*)
D1: By 2030, companies consistently invest in and achieve innovations towards advancing sustainable chemistry and resource efficiency throughout the life cycle of chemicals.	• Assessment of sustainable innovations throughout the life cycle of chemicals (*to prevent regrettable substitutions*)
D2: By 2035, Governments implement policies that encourage production using safer alternatives and sustainable approaches throughout the life cycle, including best available techniques, green procurement and circular economy approaches.	• Assessment of sustainable and safer alternatives throughout the life cycle of chemicals (*to prevent regrettable substitutions*)
D3: By 2030, the private sector, including the finance sector, incorporates strategies and policies to implement the sound management of chemicals and waste in its finance approaches and business models and applies internationally recognized or equivalent reporting standards.	• Strategic approach to embed quantification of inputs and/or impacts linked to chemicals of concern • Basis to develop internationally recognized or equivalent reporting standards
D4: By 2030, relevant stakeholders give priority to sustainable solutions and safer alternatives to harmful substances in products and mixtures, including in consumer products, in their research and innovation programmes.	• Assessment of sustainable and safer alternatives throughout the life cycle of chemicals (*to prevent regrettable substitutions*) • Approach to monitor the use of CoC

Next steps: call to action

The sessions in the OEWG are meant to encourage further action by all stakeholders around the use of chemical footprints to aid implementation of the Global Framework on Chemicals. Possible further actions to be agreed towards the International Conference in 2026 (not exhaustive, meant only to inspire discussions during OEWG) include:

- Further refinement of the assessment of chemical footprint approaches; consideration of additional approaches not included yet in this document.
- Preparation of guidance on how to apply the different approaches for GFC targets.
- Encourage industry to commit to using chemical footprint approaches in the context of the sector implementation programmes, and report their progress, challenges, and opportunities during meetings of a chemical footprint approaches work stream ahead of the 2026 International Conference.
- Consider possible milestones / tasks towards initiating work for an international standard on chemical footprint at the International Conference in 2026.
- Others TBC.