Safe Products, Made Safely: Green Chemistry Tools for Business

Resources Guide

Great Lakes Green Chemistry Network

INSTITUTE FOR AGRICULTURE AND TRADE POLICY

ABOUT THIS RESOURCES GUIDE

The number of sustainability tools in the marketplace is growing daily, often making it more complicated for businesses interested in improving their sustainability footprint to find the technical assistance they need. This guide provides a simple template of questions to help users begin the process of identifying goals for sustainability and toxics reduction, determining needs for hazard assessment tools, and basic decision-making criteria for choosing which tool to use. It describes selected tools and resources to assist businesses in meeting their sustainability, toxics use reduction and supply chain management goals. Listing in this guide does not imply an assessment of the efficacy or value of a specific tool.

Many of the tools and resources presented in this guide use the Principles of Green Chemistry as the general foundation for their methodology and specific principles in their application. The guide is organized into five sections.

SECTION 1. CHOOSING THE RIGHT TOOL. Suggestions for questions to ask in choosing a tool.

SECTION 2. GUIDES FOR SUSTAINABLE BUSINESS PRACTICES AND GREEN CHEMISTRY. A compendium of free resources and guides for businesses wishing to implement green chemistry and sustainable practices, including resources provided by the Green Chemistry and Commerce Council (GC3), the BizNGO Network, and the state of California.

SECTION 3. SELECTED GREEN CHEMISTRY AND HAZARD ASSESSMENT TOOLS. A sampling of tools currently available for hazard and alternatives assessment, life-cycle analysis, third-party certification, and strategies for hazard reduction and elimination in specialized areas. It also includes a Matrix of Selected Green Chemistry and Hazard Assessment Tools.

SECTION 4. ORGANIZATIONAL AND AGENCY RESOURCES. A list of organizations and agencies to contact for technical assistance in the implementation of tools.

SECTION 5. THE SAFER CHEMISTRY CHALLENGE PROGRAM. A description of the National Pollution Prevention Roundtable's program to encourage and reward businesses in toxic use reduction efforts and how to sign up for the program.

SECTION 1. CHOOSING THE RIGHT TOOL

In response to consumer and ecological concerns, and a changing regulatory landscape, more companies are seeking ways to improve their ecological footprints. In this environment, implementing sustainable practices can provide a competitive advantage. Numerous tools based on the principles of green chemistry are now offered in response to growing business needs in this area. However, selecting the right tool to meet individual needs is challenging.

In this section we present some questions and criteria for companies to consider when deciding which tool will be most cost effective and appropriate to achieve identified goals.

Most of the information in this section is derived from the TURI Compendium of Methods and Tools for Chemical Hazard Assessment, published in 2011 by the Lowell Center for Sustainable Production. Written by a team of experts, led by Sally Edwards, this document is an excellent resource for companies interested in drilling down more deeply into the process of hazard assessment. It is available at www.sustainableproduction.org/publ.alternatives.php.

Types of tools

Just as various companies have different priorities in approaching sustainability, companies also start from different places in the supply chain in assessing and seeking alternatives for chemicals. Tools are available to help companies regardless of where they begin. Many of the tools are multifaceted, with significant overlap leading from one step to the next. The types of tools listed below are separated only for the purpose of giving a basic understanding and should not be seen as fixed or mutually exclusive.

- Tools designed to *identify and screen out hazardous chemicals* typically include chemical characterization and hazard assessment. Some examples include the GreenScreen™ for Safer Chemicals, 3E Green Product Analyzer, GreenWERCs and QCAT.

- Tools designed to *compare alternatives* typically include alternatives assessment and alternatives evaluation. Some examples include PHAROS, Design for the Environment (DfE) and the Toxic Use Reduction Institute tools.

- Tools designed to identify preferred chemicals and products or offer third-party certification include Clean-Gredients and Design for the Environment (DfE).

- Tools designed for *life-cycle analysis* such as SimaPro, GaBi, and Cradle to Cradle.

Asking the right questions

1. **What type of business are you in and where are you in the supply chain?**
   - Molecular design of new chemical or pharmaceutical products
   - Formulation
   - Fabrication
   - Materials manufacturing
   - Product manufacturing
   - Retail

2. **What do you want the tool to do for you?**
   - Identify chemicals in the supply chain
   - Assess the hazard of chemicals being used
   - Analyze the life cycle of the product
   - Track materials, chemical use, and outputs
   - Look for alternatives or substitutions for chemicals now in use
   - Evaluate available alternatives
   - Obtain certification for chosen alternative/substitution/product

   Examples of supply chain position and tool use:
   - Designers (architects, builders, product designers): choosing safer materials
   - Raw material/component supplier: provide information to downstream user, customer
   - Chemical formulator: reduce adverse environmental and health impacts of ingredients
   - Manufacturer/Assembler/Original Equipment Manufacturer (OEM): choose safer alternative materials/components for your product
   - Retailer, purchaser: screen products for potentially hazardous chemicals
   - Regulator: regulatory framework to drive demand for safer alternatives; find solutions to specific hazards

3. **Cost of the tool. Is it open access or proprietary?**

   Open Access
   - No cost to use tool
   - Associated fees may apply for consultants
   - Toxicology expertise often required
   - May include costs to certify users

   Examples: GreenScreen™ for Safer Chemicals; Design for the Environment (DfE)- US EPA; Suite of EPA tools.

   Proprietary
   - Subscription or fee for use
   - Access to databases
   - May include consultants
   - May provide reports

   Examples: SciVera Lens; Cradle-to-Cradle; Pharos.

4

4. **How are data handled and how transparent is the process?**

   a. How are data gaps addressed?

      ◆ Data gaps are ignored: no data, no harm

      ◆ Data gaps are ranked as zero weight

      ◆ Data certainty/uncertainty is ranked according to a predetermined score

      ◆ Chemicals with no data ranked as high hazard

      ◆ Lack of standardized data is supplemented by a review of the scientific literature for experimental data on chemicals of concern

   b. What are the decision rules? What are they based on and how transparent are they?

   c. What are the criteria for determining whether a chemical should be ranked as high, medium or low hazard?

      ◆ P (persistent) B (bioaccumulative) T (toxic) characteristics

      ◆ ecotoxicity

      ◆ carcinogenicity

      ◆ acute toxicity

      ◆ other health endpoints: endocrine disruption, neurotoxicity, reproductive or development toxicity, immune-toxicity

   d. How are data arrayed? (hazard, routes of exposure, risk, etc.)

   e. Who decides criteria and rules for decision-making?

      ◆ User

      ◆ Embedded in tool but adaptable

      ◆ Embedded in tool but set and unchangeable

   f. How transparent are the methods used to arrive at weighting, endpoints and other conclusions about hazard?

      RULE OF THUMB: "Methods that array a range of hazard information are the most transparent, but they generally require more research, data collection, and evaluation by the user."[1]

As a final caveat, it is highly recommended that companies ask questions and discuss what they are hoping to achieve with the tool designers and consultants before they sign on the bottom line. Tools vary widely in cost, methodology, degree of transparency and level of support provided for the tool. Hazard and alternatives assessment tools in particular can utilize very different strategies which may significantly impact their results.

---

1   A Compendium of Methods and Tools for Chemical Hazard Assessments (2011), Edwards, Sally, Lead Writer, Lowell Center for Sustainable Production, May, 2011, www.sustainableproduction.org/publ.alternatives.php.

SECTION 2. GUIDES FOR SUSTAINABLE BUSINESS PRACTICES AND GREEN CHEMISTRY

In this section we present a sampling of available resources for companies interested in improving chemical sustainability in their operations. While not all of these resources incorporate the principles of green chemistry explicitly, for example, the life-cycle assessment software tools, all are valuable in supporting the efforts of companies to apply the principles and increase the sustainability of their business practices. This is not a comprehensive list, but each source covers a broad range of resources.

1. **The Guide to Safer Chemicals**
   www.bizngo.org/guide.php

   A hands-on resource that charts pathways to safer chemicals in products and supply chains for brand name companies, product manufacturers, architects and designers, retailers, and health care organizations. It uses the four Biz-NGO Principles for Safer Chemicals to set performance benchmarks with specific actions and examples of business practices for each benchmark.

2. **Green Chemistry and Commerce Council**
   www.greenchemistryandcommerce.org

   A range of useful resources and guides, including:

   ❍ An Analysis of Corporate Restricted Substance Lists (RSLs) and Their Implications for Green Chemistry and Design for Environment

   ❍ Meeting Customers' Needs for Chemical Data: A Guidance Document for Suppliers: tools and examples in support of improved supply chain communication between suppliers and their customers

   ❍ Retailer Portal Database: tools organized by sector

3. **A Compendium of Methods and Tools for Chemical Hazard Assessments (2011), Lowell Center for Sustainable Production**
   www.sustainableproduction.org. Click on "Publications"-"Alternatives Assessment."

   An overview of the methods and tools being used by governments, private sector and nonprofit organizations, including strengths and limitations of tools. It includes a summary matrix of methodologies and tools.

4. **Growing the Green Economy Through Green Chemistry and Design for the Environment (DfE) (2009), Lowell Center for Sustainable Production**
   www.sustainableproduction.org. Click on "Publications"-"Chemicals Policy."

   Although described as a resource for "states and higher education," it contains useful information about green chemistry and Design for the Environment (DfE). It includes a chapter on tools and useful appendices with information on labeling programs.

5. **Developing Regulatory Alternatives Analysis Methodologies for the California Green Chemistry Initiative (2011), UCLA Sustainable Technology and Policy Program**
   www.stpp.ucla.edu/node/8

   Presents models and case studies of alternatives assessment methodologies and includes a long list of additional publications of interest.

6. **Hazard Assessment Tools and Methodologies, California Environmental Protection Agency Department of Toxic Substances Control**
   www.dtsc.ca.gov/PollutionPrevention/upload/WorkshopTables. pdf and green chemistry Resources - www.dtsc.ca.gov/PollutionPrevention/GreenChemistryResources/index.cfm

   A comprehensive guide including chemicals lists, exposure assessment tools and methods, and life-cycle tools, methods and databases.

7. **Design for the Environment Program Alternatives Assessment Criteria for Hazard Evaluation (2011), EPA**
   www.epa.gov/dfe

   The Design for the Environment (DfE) website includes a comprehensive list of publications and tools including a methodology for alternatives assessment at www.epa. gov/dfe/alternative_assessments.html.

   This alternatives assessment guide is a transparent tool for evaluating and differentiating among chemicals based on their human health and environmental hazards, based on criteria applied in DfE Alternatives Assessments.

SECTION 3. SELECTED GREEN CHEMISTRY AND HAZARD ASSESSMENT TOOLS

This section presents a sampling of tools available to assist companies in meeting sustainability and toxics use reduction goals. The 12 Principles of Green Chemistry, found at the end of this document, provide the underlying guidance for the development of the tool. Different tools incorporate the principles in different ways and because green chemistry is defined by its overriding commitment to continuous improvement, so too the tools are also predicated on that objective.

The information presented in this guide was based on information provided on an organization's website and/or the company's response to our questionnaire. There are a large number of tools on the market and while this list is not inclusive, it should nonetheless give a good idea of the type of tools available. Inclusion of specific tools in this guide does not in any way constitute an endorsement of any tool or product, nor an assessment of the value and efficacy of any tool or product.

1. 3E Green Product Analyzer

PURPOSE
Hazard assessment third; party certification.

DESCRIPTION
"The 3E Green Product Analyzer™ (GPA) provides the necessary data and information needed to support sustainability and safer and greener product standards for both raw material inputs in manufacturing and consumer end products. It provides detailed information on the chemical makeup of products—information that will enable sophisticated analysis, application and decision support, and ultimately better product sourcing and management. Because there is no single definition of sustainability, the system accommodates company-specific criteria, while still providing guidance to those who might still be identifying their parameters. The GPA enables product comparisons through calculation of ratings and material costs. It also allows comparison of products in the same use category (i.e., solvents) to support product selection and purchasing decisions. Finally, it assesses the toxic footprint of an organization to create a baseline and measure improvement."

BASED ON
Over 1,000 global regulatory lists. Analysis is used to generate a risk score based on the product's impact on people, the facility and the environment.

WHERE USED/WHO USES
Throughout the supply chain, including chemical formulators, manufacturers and retailers. Manufacturers use to assess toxic footprint of a product line. End users can compare products in the same category to support purchasing decisions. Currently 50 suppliers list their ingredients in CleanGredients and about 200 formulators subscribe to use the resource.

COST
Subscription rate per application. Pricing depends on number of products and use of the application.

CONTACT
Jenny Bingham, (619) 980-4205
jbingham@3ecompany.com

2. CleanGredients

PURPOSE
Design; third-party certification.

DESCRIPTION
"CleanGredients is an online database of cleaning ingredients—the online resource for green formulation®. CleanGredients aligns broad environmental and human health goals with the cleaning product industry's business objectives and will support formulation of products with human and environmental health benefits, whether to meet corporate internal objectives, regulations, voluntary product recognition programs, or national and international eco-labels. At present, CleanGredients includes listings for surfactants, solvents, fragrances, and chelating agents. Modules for additional ingredient classes are in development. Key attribute data and the ingredient formulations are reviewed by an approved third-party, and carried out under confidentiality, providing verification of claims for the key ingredient attributes for ingredients without compromising proprietary formulations."

BASED ON
U.S. EPA Design for the Environment (DfE) program.

WHERE USED/WHO USES
CleanGredients is designed to help formulators identify ingredients that have potential environmental and human health and safety benefits, and provide opportunity for manufacturers and producers of cleaning ingredients to showcase their ingredients with potential environmental and human health and safety benefits. Currently 50 suppliers and 200 formulators use the tool.

COST
Business-to-business tool with subscription rates.

CONTACT
James Ewell, james.ewell@greenblue.org

3. Cradle to Cradle

PURPOSE
Entire life cycle, including: design pollution prevention; hazard assessment; third-party certification; preferred materials; labeling.

DESCRIPTION
"The Cradle to Cradle Certified^{CM} Product Standard is a multi-attribute, continuous improvement methodology that provides a path to manufacturing healthy and sustainable products for our world. Because the standard rewards achievements in five categories and at five levels of certification, our certification represents the most comprehensive product certification available. The methodology was originally created by McDonough Braungart Design Chemistry, LLC (MBDC) in cooperation with EPEA Internationale Umweltforschung GmbH, and has been developed and practiced over the past 20 years. Since product certification began in 2005, more than 100 companies have adopted the methodology and over 400 certifications have been issued for Cradle to Cradle CertifiedCM products."

BASED ON
Its own banned list of 100 chemicals of concern.

WHERE USED/WHO USES
Used throughout the product life cycle. Companies using Cradle to Cradle include Steelcase, Herman Miller, Desso, Aveda and a government leader, the United States Postal Service.

COST
Subscription rate per application.

WEBSITE
www.c2ccertified.org

4. Design for the Environment (DfE) U.S. EPA

PURPOSE
Hazard assessment; alternatives assessment; third-party certification.

DESCRIPTION
"The U.S. EPA's Design for the Environment program helps consumers, businesses, and institutional buyers identify cleaning and other products that perform well, are cost effective and are safer for the environment."

BASED ON RSL OR CHEMICAL LIST
EU risk phases, International lists such as IARC.

WHERE USED/WHO USES
Cleaning industry ingredients and alternatives assessment for all industries e.g. manufacturer, Hewlett Packard and chemical supplier, DSM.

COST
None

CONTACT
Libby Sommer, (202) 564-1065
sommer.elizabeth@epa.gov

5. EMFACT

PURPOSE
Pollution prevention; alternatives assessment.

DESCRIPTION
"EMFACT™ is a software tool designed to be used within companies for systematically tracking materials and energy use; releases, discharges, and wastes; and associated costs in ways that can create value for their business. The tool can provide a comprehensive picture of resource use and its relation to production and planning that can help improve both business and environmental performance. NEWMOA and the Massachusetts Office of Technical Assistance (MA OTA) created EMFACT™ because the agencies recognized the need and opportunity for manufacturers to more effectively implement environmental management accounting as a key tool to aid in setting pollution prevention priorities, identifying value-added opportunities for sustainable production, and implementing materials and energy efficiency improvements."

BASED ON
Federal lists of toxics such as Toxics Release Inventory (TRI).

WHERE USED/WHO USES
Useful for formulators and manufacturers as an adjunct for compliance assurance, quality management, lean manufacturing, environmental management systems, productivity and resource efficiency improvements, and preventing accidents and losses.

COST
None

CONTACTS
Andy Bray, (617) 367-8558 x306
abray@newmoa.org

Terri Goldberg, (617) 367-8558 x302
tgoldberg@newmoa.org

6. GaBi

PURPOSE
To help Life Cycle Assessment (LCA) experts answer their questions about environmental impacts.

DESCRIPTION
GaBi is a suite of software that the company describes as "the next generation product sustainability solution with a powerful Life Cycle Assessment engine" that supports multiple applications for businesses including life-cycle assessment, eco-efficiency, eco-design, efficient value chains, and several others.

BASED ON
5,000 databases developed for GaBi by PE International

COST
Yes. Must contact for quote.

CONTACT
Peter Canepa, gabi_na@pe-international.com

WHERE USED/WHO USES

Over 1,500 companies, organizations and institutes from all branches of industry use PE every day to deliver high performance. Clients range from Fortune 500 global players to mid-sized companies, including Alcan, Allianz, Bayer, Daimler, Deutsche Post/DHL, Rockwool, Siemens, Toyota, ThyssenK-rupp and Volkswagen.

7. Good Guide, UL Transparency Platform

PURPOSE

Hazard assessment; life cycle assessment; third party certification.

DESCRIPTION

"A comprehensive decision-support platform that enables manufacturers and retailers to collect data up and down their supply chain and make smarter purchasing decisions about the sourcing of materials, ingredients, and products. Enables: analysis of product and vendor performance across supply chains; assessment of the material composition of products against regulatory and corporate standards on restricted chemical substances; monitoring product attributes or supplier performance relevant to corporate sustainability goals; screening of products or suppliers using customized criteria based on your company's unique sustainability policies."

BASED ON

This tool is based on the Good Guide which scores ingredients based on health hazard (no health concern; low level of health concern; medium level of health concern; or high level of health concern); whether a chemical is subject to regulation in the U.S, Canada, Japan or the European Union; and whether the product had been certified as safe and healthy by a credible third party. Health ratings are based on information from authoritative national and international scientific and regulatory agencies, including California Proposition 65, peer reviewed journals, the International Agency for Research on Cancer and the National Toxicology Program. In addition to ingredient safety, the platform also takes into consideration other sustainability criteria, such as transparency, packaging and environmental quality.

WHERE USED/WHO USES

Useful for manufacturers and retailers. Target is currently using.

COST

Not available. We assume the costs will depend on the needs of a particular business.

CONTACT

https://platform.goodguide.com , support@goodguide.com

8. GreenScreen for Safer Chemicals

PURPOSE

Hazard assessment; alternatives assessment.

DESCRIPTION

"The GreenScreen for Safer Chemicals (GreenScreen™) is a method for comparative Chemical Hazard Assessment (CHA) that can be used for identifying chemicals of high concern and safer alternatives. It is being used by industry, government and NGOs to support product design and development, materials procurement, and as part of alternatives assessment to meet regulatory requirements."

BASED ON

Pharos, Design for the Environment (DfE).

COST

None

CONTACT

Lauren Heine, lheine@lheinegroup.com

WHERE USED/WHO USES

It is being used by businesses like Hewlett-Packard, governments like Washington State, and NGOs such as the Healthy Building Network in their Pharos Project. The GreenScreen can also be used to support environmentally preferable product procurement tools including standards, scorecards and ecolabels.

9. GreenWERCS®

PURPOSE

Hazard assessment; alternatives assessment; third-party certification.

DESCRIPTION

"GreenWERCS® offers versatile software to assess product formulations based on industry and user-defined "green" criteria. GreenWERCS'® ingredient-based visual ranking system, gives manufacturers the ability to identify how product formulations impact human health and the environment. By using GreenWERCS® to identify and reduce chemically hazardous products, retailers and distributors can choose and sell goods that have a minimum impact on human and environmental health. GreenWERCS® also provides local, state and federal governments a simple and straightforward tool to assess the chemical make-up of everyday products. This transparency helps agencies to choose and promote greener products."

BASED ON

GreenScreen List Translator.

WHERE USED/WHO USES

Useful throughout the supply chain, including the following industries: toys, footwear/apparel, electronics, automotive and specialty chemicals. It is also useful for government agencies.

COST

Subscription cost.

WEBSITE

www.thewercs.com/products-and-services/greenwercs

10. Guidelines for Sustainable Bioplastics

PURPOSE

Improve the sustainability of plastics throughout the supply chain.

DESCRIPTION

"To provide a roadmap for the development and continuing improvement of biobased plastics throughout their life cycle, the Sustainable Biomaterials Collaborative led a collaborative effort to create The Guidelines for Sustainable Bioplastics (Version 1.0, released May 2009). The Guidelines reflect the current collective wisdom of a wide range of organizations that are addressing the potential benefits and challenges of biobased plastics and will be updated as the biobased plastics industry evolves. "Bioplastics" are defined as plastics which derive 100% of their carbon from agriculture, forests, or other renewable resources. "Sustainability" encompasses issues of environment, health, and social and economic justice, as well as material resources used throughout the entire life cycle of bioplastics: from feedstock production to management of the bioplastic product after its intended use."

BASED ON

GreenScreen, Pharos.

WHERE USED/WHO USES

The Guidelines are being used by farmers, manufactuirers, wholesalers, retailers, consumers and recyclers (such as Whole Foods, the Rynel Corp., and the Maine Bioplastics Council) to help guide their purchasing and promotion of biobased plastics. They are also the foundation for the development of the BioSpecs for Food Service Ware.

COST

None

WEBSITE

www.sustainablebiomaterials.org

11. Outdoor Industry Association Chemical Management

PURPOSE
Hazard assessment; alternatives assessment.

DESCRIPTION
"The Chemicals Management (CM) Framework is a groundbreaking roadmap for companies to benchmark, establish, build, maintain and improve chemicals management processes as part of an overall corporate management system. It provides a shared strategic guide for companies in the outdoor and fashion industries—and beyond—to better manage chemicals they use to create products. The CM Framework indicators will be integrated into the Higg Index—the apparel index tool that the OIA [Outdoor Industry Association] helped develop—in partnership with the Sustainable Apparel Coalition, to bolster the chemicals management portion of the Index. The CM Framework is organized into seven primary objectives that form the building blocks of a robust chemicals management strategy."

BASED ON
The Higg Index of Sustainability is based on standards developed by the Apparel, Footwear, International RSL Management (AFIRM) and the American Apparel and Footwear Association (AAFA).

WHERE USED/WHO USES
Management of chemicals in the supply chain for outdoor products and fashion industries. Used by retailers, brands, chemical suppliers, and other suppliers e.g., Patagonia, GoLite and Columbia Sportswear.

COST
None

WEBSITE
www.outdoorindustry.org/responsibility/chemicals

12. Pharos

PURPOSE
Hazard assessment; alternatives assessment.

DESCRIPTION
"The Pharos tool screens chemicals, polymers, and other substances against 29 hazard lists. Pharos incorporates a chemical and material library that identifies potential health hazards from both direct exposure to a substance and from the substances that may be used or created throughout the life cycle. Pharos screens materials against authoritative hazard listings to identify potential health hazards for those exposed to the material. Persistent bioaccumulative toxicants (PBTs) receive the highest priority for elimination followed by priority health effects: cancer, genetic mutation, reproductive or developmental harm and endocrine disruption. Pharos also identifies additional chemicals used, created and emitted throughout the material's life cycle and screens for potential health hazards to the workers and local communities near where the raw materials are mined or grown and then manufactured into products. Pharos uses CAS registry numbers to compare materials against selected Chemical Hazard and Restricted Substance and classifies materials through a color coding system to indicate the Pharos system's prioritization of concern based upon the type of hazard and the degree of scientific evidence (black, red, orange, yellow, blue or green.)

BASED ON
29 hazard lists.

WHERE USED/WHO USES
Manufacturers, formulators, building project teams (architects, contractors etc.) e.g., Google Real Estate.

COST
$17/month or $180/year.

WEBSITE
www.pharosproject.net

13. QCAT (Quick Chemical Assessment Tool)

PURPOSE
Hazard assessment

DESCRIPTION
"The Quick Chemical Assessment Tool (QCAT) is a simplified assessment tool used to evaluate hazards associated with alternatives to toxic chemicals. Ecology developed the QCAT to help small and medium businesses who are concerned about the alternative assessment process. It is not intended as a replacement for more thorough assessment methods like the GreenScreen™ but as an introduction to the hazard assessment process."

BASED ON
The QCAT is based upon the GreenScreen™ methodology, as well as several Restricted Substances Lists and databases.

WHERE USED/WHO USES
Screening tool for chemical formulators and manufacturers. Proposed use in the Safer Chemistry Challenge Program.

COST
None

CONTACTS
Alex Stone, (360) 407-6758
alex.stone@ecy.wa.gov

Ken Zarker, (360) 407-6724
ken.zarker@ecy.wa.gov

14. SciVera Lens™ CSA

PURPOSE
Design; hazard assessment; alternatives assessment; third-party certification.

DESCRIPTION
"SciVera offers an Expert Chemical Assessment service for companies interested in learning about the human and environmental health characteristics of individual chemicals. SciVera Expert Chemical Assessments are targeted, comprehensive toxicological assessments of industrial chemicals. Having access to a SciVera Expert Chemical Assessment delivers essential business information about the safety of a chemical for use in a company's processes and products, including rapid-response, cost-effective toxicological reports on chemicals that go beyond the detail provided in a MSDS. SciVera Lens™ CSA enables companies to validate the safety of their products by gaining access to valuable chemical ingredient toxicological hazard and risk assessment processes."

BASED ON
Tool to screen against existing restricted substances lists based on authoritative lists, available experimental data, modeled data and expert judgment, including weight of evidence decisions.

WHERE USED/WHO USES
Useful throughout the supply chain, including the following industries: toys, footwear/apparel, electronics, automotive and specialty chemicals.

COST
Annual subscription cost.

CONTACT
Dr. Pat Beattie, pbeattie@scivera.com

15. SimaPro

PURPOSE
Life-cycle assessment.

DESCRIPTION
Software solution that "allows you to model products and systems from a life-cycle perspective. Users build complex models in a systematic and transparent way using SimaPro's unique features such as parameters and Monte Carlo analysis. SimaPro comes fully integrated with the well-known ecoinvent database and is used for a variety of applications, like: Carbon footprint; product design and eco-design; Environmental Product Declarations (EPD); environmental impact of products or services; environmental reporting (GRI); and determine key performance indicators."

BASED ON
The International Organization for Standardization (ISO) guidelines for conducting an LCA.

WHERE USED/WHO USES
Throughout the supply chain. Users include Lucite International, Ecofiltro, Viva Healthcare, GEDnet and Wecycle.

COST
Yes. Varies by product or service.

WEBSITE
www.pre-sustainability.com/simapro-lca-software

16. Toxics Use Reduction Institute (TURI)

PURPOSE
Hazard assessment; alternatives assessment

DESCRIPTION
"The Toxics Use Reduction Institute (TURI) at the University of Massachusetts Lowell provides resources and tools to help make the Commonwealth a safer and more sustainable place to live and work. Established by the Massachusetts Toxics Use Reduction Act (TURA) of 1989, TURI collaborates with businesses, community organizations and government agencies to reduce the use of toxic chemicals, protect public health and the environment, and increase competitiveness of Massachusetts businesses."

BASED ON
Vast body of work and research.

WHERE USED/WHO USES
Useful throughout the supply chain.

COST
None

CONTACT
Pam Eliason, pamela@turi.org

17. UNEP LC Initiative

PURPOSE
To enable the global use of credible life-cycle knowledge for more sustainable societies.

DESCRIPTION
In 2002, the United Nations Environment Programme (UNEP) and the Society for Environmental Toxicology and Chemistry (SETAC) launched an International Life Cycle Partnership, known as the Life Cycle Initiative (LCI), to enable users around the world to put life-cycle thinking into effective practice. The Initiative responded to the call by Governments around the world for a Life-Cycle economy in the Malmö Declaration (2000). It contributes to the 10-Year Framework of Programmes to promote sustainable consumption and production patterns, as requested at the World Summit on Sustainable Developement (WSSD) in Joannesburg (2002). It aims to promote life-cycle thinking globally and to facilitate the exchange of knowledge of over 2,000 experts worldwide and four regional networks from different continents. The activities of the Life Cycle Initiative are divided into 5-year phases. Knowledge generation on approaches and methodologies is a core element of the work.

BASED ON
The integration of life-cycle management into enterprise operations is similar to that of the ISO 9000 and 14000 standards in that it favors a cyclical plan-do-check-act approach, and thereby provides a basis for continual improvement.

WHERE USED/WHO USES
Primarily based in Europe.

COST
None

WEBSITE
www.lifecycleinitiative.org

18. U.S. EPA various tools

PURPOSE
Hazard assessment; alternatives assessment; waste reduction

DESCRIPTION
"EPA's chemical assessment researchers are crafting software and methodologies for estimating the human health and environmental impact of chemicals. These flexible tools estimate the toxicity and physical properties of compounds based on their molecular structures. To identify potential risks early in the design stage, decision-makers can use the software to rapidly assess the hazard of chemicals, focusing on the area of chemical manufacturing design." Tools include:

- QSAR (quantitative structure activity relationships)
- TEST (toxicity estimation software tool)
- PARIS II (computer aided solvent design for pollution prevention)
- WAR (chemical process simulation for waste reduction)
- CAPE-OPEN (computer-aided process engineering)
- Life Cycle Assessment
- TRACI tool for the reduction and assessment of chemical and other environmental impacts

BUILT ON
Modeling tools.

WHERE USED/WHO USES
Useful throughout the supply chain

COST
None

WEBSITE
www.epa.gov/nrmrl/std/chemicals.html

19. USETox™

PURPOSE
The model and database include environmental fate, exposure, and effect parameters for human toxicity and freshwater ecotoxicity.

DESCRIPTION
USEtox™ is a model based on scientific consensus providing midpoint characterization factors for human and freshwater ecotoxicological impacts of chemicals in life-cycle impact assessment, developed under the United Nations Environment Program (UNEP) and the Society for Environmental Toxicology and Chemistry, (SETAC) Life Cycle Initiative. USEtox™ does not represent the latest scientific state of the art, but a scientific consensus defining best application practice as an interface between ever advancing science and a need for stability, parsimony, transparency and reliability.

BASED ON
Developed by the USETox Team.

WHERE USED/WHO USES
European Union, the United States—Environmental Protection Agency, and other organizations. USEtox™ is increasingly used in a wide range of national and international projects as well as in industrial life-cycle assessment studies.

COST
None

WEBSITE
www.usetox.org

Matrix of Selected Tools for Business									
Company/Tool	Design	Hazard	AA	3rd-party Eval	Life cycle	Other	Where in supply chain	Restricted substances lists and databases	Fee for use
1. 3E's Green Product Analyzer		X		X			Throughout	Access to > 1000 global regulatory lists	N
2. CleanGredients	X			X		Design Tools, preferred materials, labeling	Formulators of final products and the suppliers that sell primary ingredients to formulators.	DfE Safer Product Labeling Program	Y
3. Cradle-to-Cradle Certified Product Standard	X			X	X	Preferred materials	Manufacturers, formulators	List of 100 chemicals of concern	Y
4. DfE		X	X	X		Catalog of sustainable design principles	Ingredient list for cleaning and related, AA all Industry	EU Risk Phrases International lists	N
5. EMFACT			X				Manufacturers, formulators, all Industry sectors	Federal lists such as TRI	N
6. GaBi					X		Throughout	GaBi databases	Y
7. Good Guide, UL Transparency Platform		X		X			Manufacturers, retailers	Good Guide health ratings; international regulation	Y

Matrix of Selected Tools for Business									
Company/Tool	Design	Hazard	AA	3rd-party Eval	Life cycle	Other	Where in supply chain	Restricted substances lists and databases	Fee for use
8. GreenScreen™ for Safer Chemicals		X	X				All	Multiple	N
9. GreenWercs®		X	X			Management of Chemicals in Supply the Chain	Manufacturers, retailers, distributors	GreenScreen™ List Translator, several other hazard and RSLs.	Y
10. Guidelines for Sustainable Bioplastics, BioSpecs for Food Service Ware, BioSpecs for Compostable Biobased Food Service Ware					X	Goals and specifications for improving sustainability of bioplastics throughout their life cycle	Farmers, manufacturers, wholesalers, retailers, consumers, recyclers	Green-Screen™, Pharos	N
11. OIA Chemicals Management Framework		X	X				Retailers, brands, chem-ical suppliers, other suppliers related to outdoor industry	AAFA and AFIRM	N
12. Pharos		X	X				Manufacturers and formula-tors, building and design teams	GreenScreen™ List Translator, several other hazard and RSLs	Y
13. QCAT		X				Restricted substance screening and exposure/risk assess	Manufacturers	Sub-set of GreenScreen™	N
14. SciVera Lens	X	X	X	X			All steps in supply chain; currently used in toys, foot-wear/apparel, electronics, automotive, specialty chemicals	Any existing or internally developed RSL	Y
15. SimPro					X		Throughout	ISO guidelines	Y
16. TURI		X	X				Throughout	Vast body of research	N
17. UNEP LC Initiative					X		Throughout	N/A	N
18. U.S. EPA tools		X	X		X		Throughout	Modeling tools	N
19. USETox™					X		Throughout	Created by USETox	N

SECTION 4. ORGANIZATIONAL AND AGENCY RESOURCES

Assistance with tools and green chemistry resources

- BizNGO Network. www.BizNgo.org

- Clean Production Action. www.cleanproduction.org

- Great Lakes Green Chemistry Network. www.glgc.org

- Green Chemistry and Commerce Council (GC3). www.greenchemistryandcommerce.org

- Institute for Agriculture and Trade Policy. www.iatp.org

- Lowell Center for Sustainable Production. www.sustainableproduction.org

- Massachusetts Toxics Use Reduction Institute. www.turi.org

- Michigan Green Chemistry Clearinghouse. www.migreenchemistry.org

- Minnesota Green Chemistry Forum. www.greenchemistrymn.org

- U.S. EPA Green Chemistry. www.epa.gov/green-chemistry

- U.S EPA Sustainable Technology. www.epa.gov/nrmrl/std/decision_making.html

- U.S. EPA Design for the Environment. www.epa.gov/dfe

Pollution prevention technical assistance

- Illinois Environmental Protection Agency Pollution Prevention. www.epa.state.il.us/p2

- Indiana Department of Environmental Management Pollution Prevention. www.in.gov/idem/prevention

- Michigan Department of Environmental Quality Pollution Prevention Resources on Green Chemistry. www.michigan.gov/deq/0,4561,7-135-3585-115473--,00.html

- Minnesota Pollution Control Agency P2: Pollution Prevention. www.pca.state.mn.us/index.php/topics/preventing-waste-and-pollution/p2-pollution-prevention/index.html

- Minnesota Technical Assistance Project (MNTAP) http://www.mntap.umn.edu

- New York State Pollution Prevention Institute - Rochester Institute of Technology. www.nysp2i.rit.edu

- Ohio EPA Office of Compliance Assistance and Pollution Prevention. www.epa.state.oh.us/ocapp/ComplianceAssistanceandPollutionPrevention.aspx

- University of Wisconsin Extension, Solid and Hazardous Waste Education Center, University of Wisconsin, Stevens Point. www.shwec.uwm.edu

- U.S. EPA Pollution Prevention Technical Assistance www.epa.gov/p2/pubs/assist/index.htm

  - Region 5 (IL, MI, MN, IN, OH, WI) www.epa.gov/p2/pubs/assist/resourceguide05.htm

  - Region 3 (PA) http://www.epa.gov/p2/pubs/assist/resourceguide03.htm

  - Region 2 (NY) http://www.epa.gov/p2/pubs/assist/resourceguide02.htm

- Great Lakes Regional Pollution Prevention Roundtable/P2 Information Center. www.glrppr.org

- National Pollution Prevention Roundtable (NPPR). www.p2.org

SECTION 5. THE SAFER CHEMISTRY CHALLENGE PROGRAM

The *NPPR 2025 Safer Chemistry Challenge Program (SCCP)* is designed to motivate, challenge and reward facilities to reduce the use of chemicals, especially hazardous chemicals, through source reduction measures. These measures include the following approaches:

- Making changes in production processes and adopting new technologies

- Moving toward cleaner processes that avoid the use and generation of toxic chemicals

- Changing raw materials to include benign or low toxicity materials that degrade into innocuous substances in the environment

- Using tools and design options in support of green chemistry

- Selecting and using safe alternatives

As part of this program, companies are encouraged to partner with state and local technical assistance programs. Such programs can help identify ways to reduce waste and emissions and move toward safer substitute chemicals, which can result in reduced costs, improved productivity, and regulatory compliance.

Challenge Program benefits

By making changes and participating in the Challenge Program, companies can:

- Improve employee health and safety

- Minimize risk and liability

- Institute supply chain initiatives

- Improve company image with the community

- Reward investments in the design of increasingly safer chemicals and products

- Reduce cost of compliance and employee protection

- Realize that alternatives may have improved performance

- Improve profitability

Go to www.p2.org/challenge/to find:

- Steps to participating in the Challenge Program

- A list of state and federal chemicals of concern

- Recognition and reward opportunities

- Benefits of membership

- How to join

TWELVE PRINCIPLES OF GREEN CHEMISTRY

Green chemistry, also known as sustainable chemistry, is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture and use. The 12 Principles of Green Chemistry, originally published by Paul Anastas, Ph.D. and John Warner, Ph.D. in *Green Chemistry: Theory and Practice* (Oxford University Press: New York, 1998), provide a road map for chemists to implement green chemistry.

1. **PREVENTION.** It's better to prevent waste than to treat or clean up waste afterwards.

2. **ATOM ECONOMY.** Design synthetic methods to maximize the incorporation of all materials used in the process into the final product.

3. **LESS HAZARDOUS CHEMICAL SYNTHESES.** Design synthetic methods to use and generate substances that minimize toxicity to human health and the environment.

4. **DESIGNING SAFER CHEMICALS.** Design chemical products to affect their desired function while minimizing their toxicity.

5. **SAFER SOLVENTS AND AUXILIARIES.** Minimize the use of auxiliary substances wherever possible make them innocuous when used.

6. **DESIGN FOR ENERGY EFFICIENCY.** Minimize the energy requirements of chemical processes and conduct synthetic methods at ambient temperature and pressure if possible.

7. **USE OF RENEWABLE FEEDSTOCKS.** Use renewable raw material or feedstock rather whenever practicable.

8. **REDUCE DERIVATIVES.** Minimize or avoid unnecessary derivatization if possible, which requires additional reagents and generate waste.

9. **CATALYSIS.** Catalytic reagents are superior to stoichiometric reagents.

10. **DESIGN FOR DEGRADATION.** Design chemical products so they break down into innocuous products that do not persist in the environment.

11. **REAL-TIME ANALYSIS FOR POLLUTION PREVENTION.** Develop analytical methodologies needed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances.

12. **INHERENTLY SAFER CHEMISTRY FOR ACCIDENT PREVENTION.** Choose substances and the form of a substance used in a chemical process to minimize the potential for chemical accidents, including releases, explosions, and fires.

Source: www.epa.gov/sciencematters/june2011/principles.htm