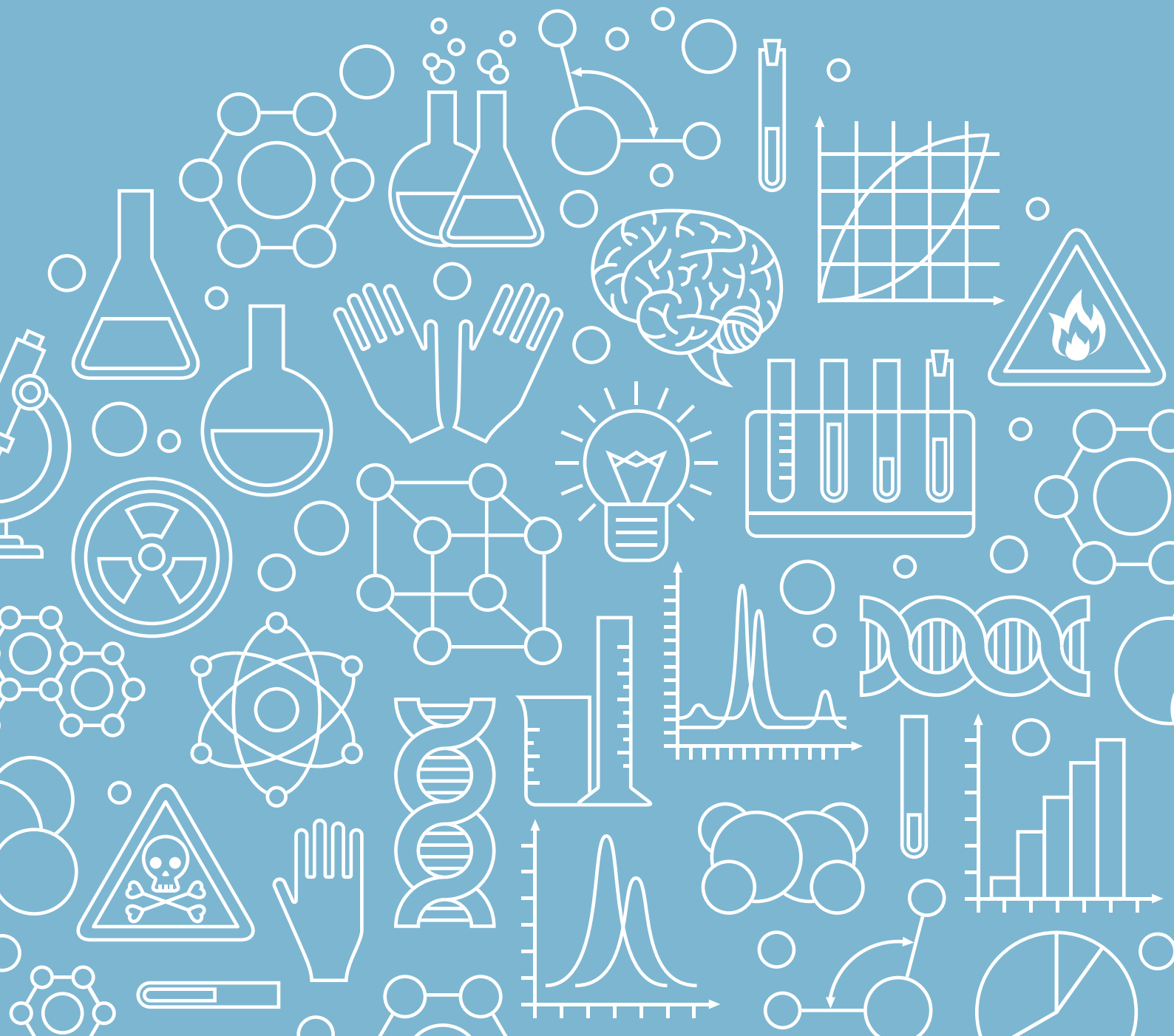
Institute for Sustainable Futures

Chemical management for consumer products

Industry landscape and recommendations for progress



ABOUT THE AUTHORS

The Institute for Sustainable Futures (ISF) is an interdisciplinary research and consulting organisation at the University of Technology Sydney setting global benchmarks since 1997 in helping governments, organisations, businesses and communities achieve change towards sustainable futures. We utilise a unique combination of skills and perspectives to offer long-term sustainable solutions that protect and enhance the environment, human well being and social equity.

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CITATION

Please cite as: Dubash, J., Wakefield-Rann, R., Prentice, E., Giurco, D., and Latimer, G. (2018): Chemical Management for Consumer Products – Industry landscape and recommendations for progress. Institute for Sustainable Futures, UTS.

ACKNOWLEDGEMENTS

The team that undertook this research was a partnership between ISF and Ascend Waste and Environment Pty Ltd.

The team thanks all the companies who agreed to participate in the research and who took part in an interview and/or provided data. We also thank the NGOs and academics who helped provide perspectives as input to the research.

DISCLAIMER

This research was commissioned by a sustainable investment company, which has been anonymised for the public version of this report. The content of this report has been prepared independently by the research team. The research team has used all due care and skill to ensure the material is accurate as at the date of publication and any opinions expressed therein are those of the authors. However, the use of the Research is at the user's own risk and ISF, the client and Ascend Waste and Environment Pty Ltd disclaim any responsibility to anyone relying upon the Research.

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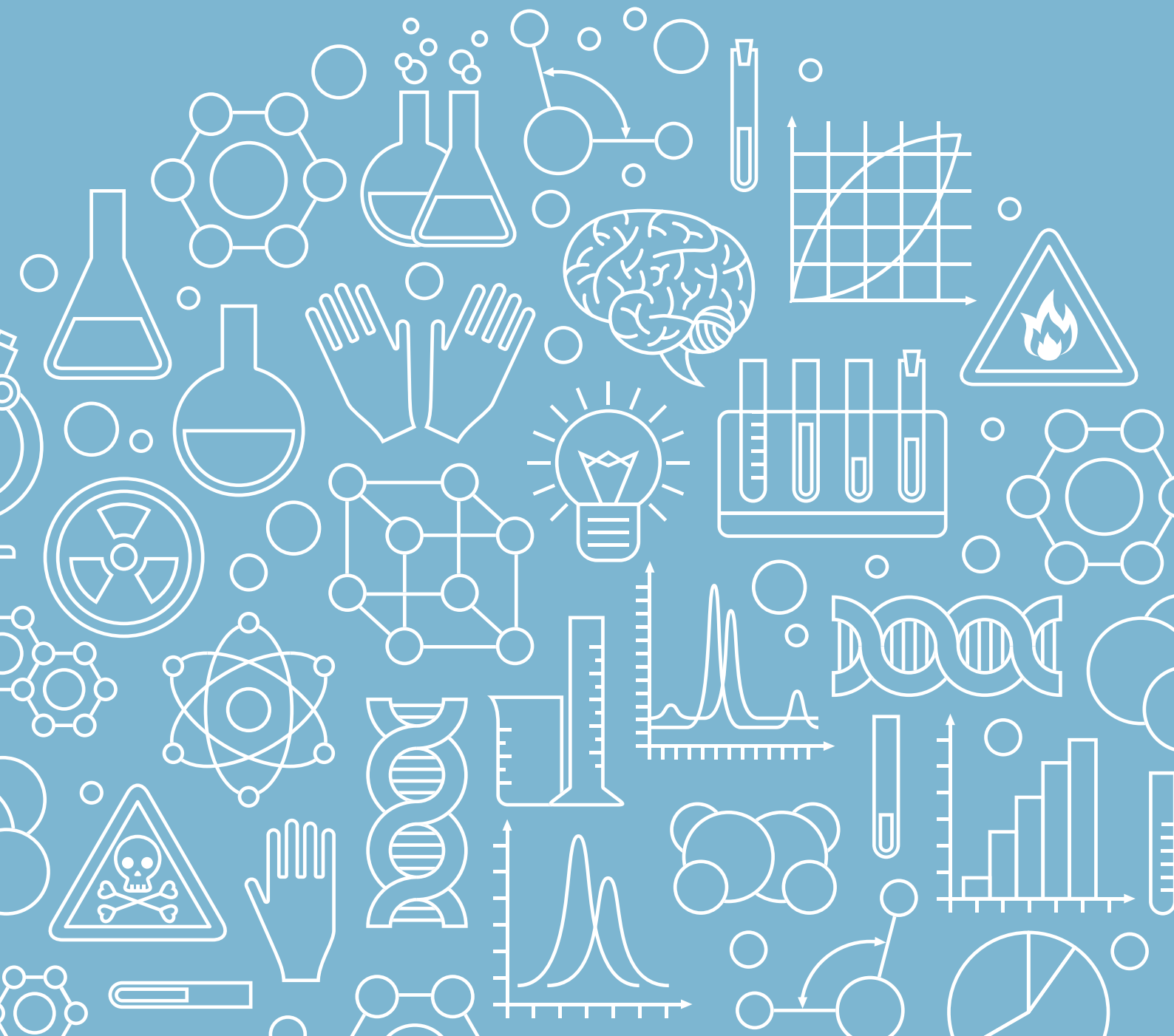


Executive Summary

This report seeks to understand best and worst practice in relation to product safety standards and the use and management of potentially hazardous chemicals in products, with a special focus on consumer products in established and emerging markets across the globe. The report explores what constitutes leading practice in product safety standards and collates the efforts of selected companies to remove or avoid potentially hazardous chemicals in their products. Whilst individual companies are not uniquely identified, collectively the work paints a picture of the state-of-play.

The research focused on the following product categories:

- Personal Care products (including cosmetics, oral care, hair care, sunscreens, soaps and skin creams)
- Home Care products (laundry, cleaning and air fresheners)
- Pesticides and Insecticides (for home use only)
- Paints (for home use)
- Adhesives and Sealants (for home use)
- Ingredients manufactured for these sectors.

The data collection process is illustrated to the right.

Executive Summary continued

The research began by gathering publicly available information about the 21 companies reviewed in this report, and proceeded with gathering publicly available information about these companies. ISF also contacted the companies to complete a 'baseline survey' in relation to their current practices on the use and management of hazardous chemicals in their products, and a phone interview or written response to more detailed questions. This information was supplemented with interviews with six NGOs and academics active in the field of product responsibility and/or the consumer products sector.

In order to keep the included companies anonymous, we have identified each with the initial 'C', and assigned them a number from 1 to 21.

RESULTS SUMMARY

Figure 1: Overall results summary

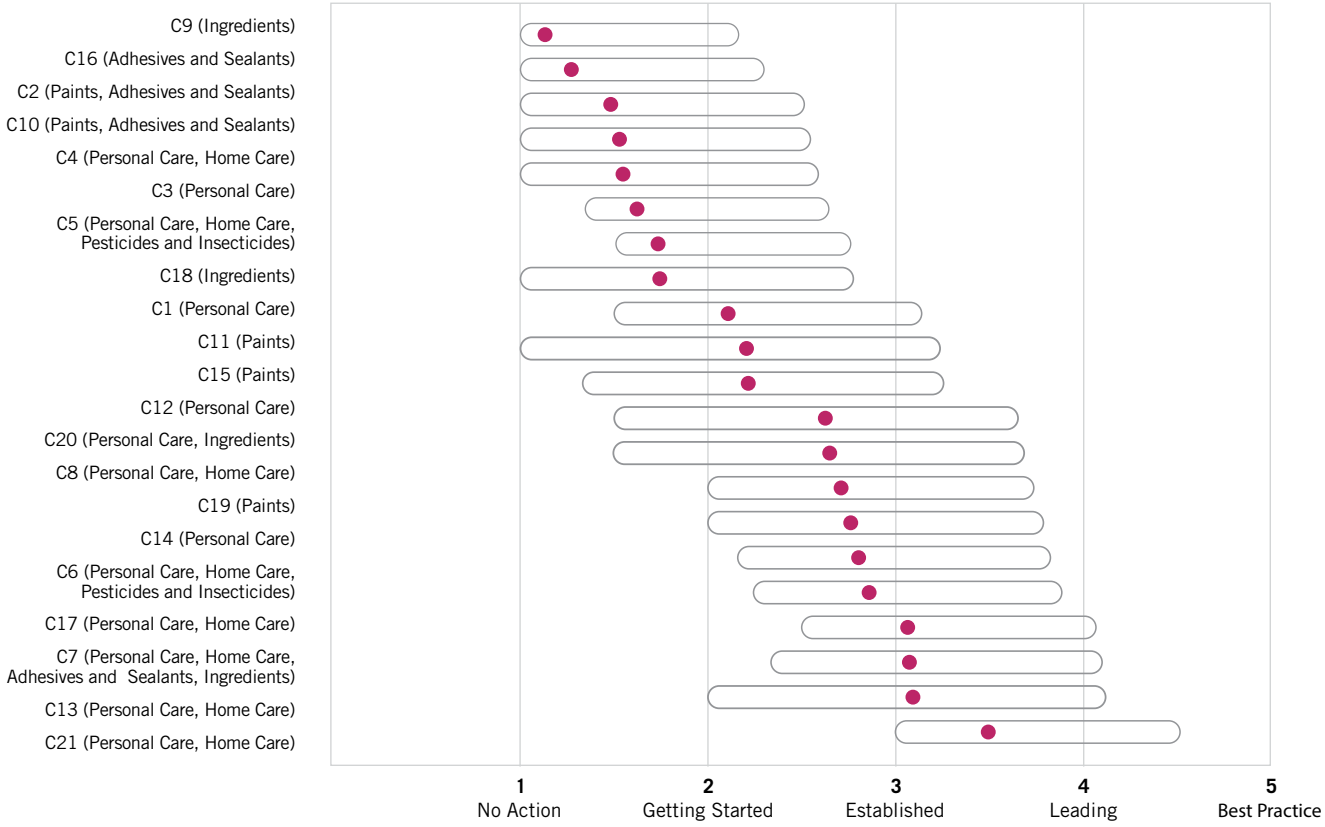


Figure 1 ranks the companies in order from least to highest average score calculated across the criteria categories, with the circles representing the average and 'lozenges' representing the range of scores achieved across all criteria. All company performance evaluations were at or below 'Established' level. Nine companies were evaluated as 'Getting Started' level with another eight companies evaluated as 'No Action'. This indicates that there is much progress to be made in moving towards safe, sustainable and responsible management of chemicals in consumer products across these companies.

RESEARCH HIGHLIGHTS

Hazardous ingredient responsibility and its relationship to company sustainability were not well considered by the majority of companies

In interview and written company responses, there was little acknowledgement of the significance of proactive and precautionary chemical management policies for long-term human and environmental health. Rather, company responses tended to frame 'sustainability' in terms of water and energy usage and waste generation. As one NGO interviewed stated "companies do not consider product ingredients and altering them at the core of achieving true sustainability […] if product ingredients are changed, only then can overall company sustainability be improved".

IMPLICATIONS: Greater corporate focus is required to integrate responsible ingredient sourcing and hazardous chemicals management with the precautionary principle and overall sustainability goals to achieve genuine long-term sustainability, in terms of environmental, human health and business outcomes.

Disclosure of product ingredients is generally poor

Seven of the 21 companies received a 'Good' rating for ingredient disclosure. Evaluating companies on their product responsibility efforts was challenging given the lack of substantial and explicit information in public documents, and companies' efforts to protect 'trade secrets'. It was often a challenge for investor relations teams to identify appropriate staff within the company to respond to our queries.

IMPLICATIONS: Consumers are increasingly demanding transparency and the power to decide what ingredients they consume. Given inadequate chemical testing and the continued inclusion of concerning chemicals in consumer products, there is an urgent need for product ingredient disclosure across product sectors to be improved.

Some sectors fared worse than others

The best overall scores in company evaluations for responsible chemical management in consumer products were for the Personal Care and Home Care sectors. The Paints sector came in second, followed by generally poor performance across the Adhesives and Sealants and Ingredients Manufacturing sectors. The Pesticides and Insecticides sector had only two representative companies and could not be comprehensively evaluated. Despite the higher toxicity of products in the Pesticides and Insecticides and the Adhesives and Sealants categories, and the requirement for manufacturers to provide Material Safety Data Sheets (MSDS), these health and safety documents generally focus on handling issues and immediate first aid concerns rather than information about ingredient toxicity and bio-accumulative impacts in the long-term.

Particular ingredients of concern featured prominently

Microbeads, triclosan, parabens, generically termed 'fragrance' or 'parfum', DMDM hydantoin and phthalates were some of the main ingredients of concern among the Personal Care and Home Care segments. Volatile organic compounds (toluene, ethylbenzene) and lead were the main concerns in the Paints and Adhesives and Sealants segments.

Executive Summary continued

IMPLICATIONS: All of these ingredients are of moderate to high concern on the Environmental Working Group's 'Skin Deep' Database and ChemSec's SIN List, and are recommended for elimination. The continued use of these chemicals is likely to result in increased regulatory and/or reputational risks. Products containing these ingredients should be reformulated or redesigned to exclude these ingredients of concern, and other chemicals within the six chemical classes of particular concern to avoid 'regrettable substitution' issues (see Section 2.3.3)

No difference between developed and developing countries was evident in terms of proactive chemical management practices

Indian companies showed leadership in responsible chemicals management by either self-imposing EU REACH product responsibility/safety norms or were guided by the Bureau of Indian Standards, despite weak domestic regulations and policies. In particular, Indian paint companies led the pack by removing lead and/or reducing Volatile Organic Compounds (VOC) in their paint products. One company based in Brazil, mentioned that though their own domestic regulation was not stringent, the neighbouring market of Chile had very strict product regulation with respect to particular chemicals, which influenced their product reformulations to continue supplying this market.

Few companies were able to provide evidence of appropriate risk assessments of products, including life cycle assessments

While some companies have clear commitments to life cycle assessment of their products, others provided little to no evidence that any risk assessment is being undertaken on a regular basis, or at least as part of the product development process. Lee Bell from IPEN also noted, in an interview, the inadequacy of traditional risk assessment methods, as they cannot account for complex use scenarios in which different chemical combinations result in different forms of harm over time. Given that a number of companies have faced public scrutiny in relation to consumer products in recent years, it is unclear why life cycle assessments are not integrated into regular risk assessment accounting for multiple use scenarios, and reporting to ensure safety, environmental, reputational and financial risk is appropriately managed.

IMPLICATIONS: The continued use of chemicals that have not undergone rigorous testing for multiple use scenarios and long term human health and environmental impacts poses a significant risk to companies. Many of the companies assessed would consequently benefit from implementing a thorough risk assessment process, including potential long term impacts and a detailed Life Cycle Assessment.

What does best practice look like?

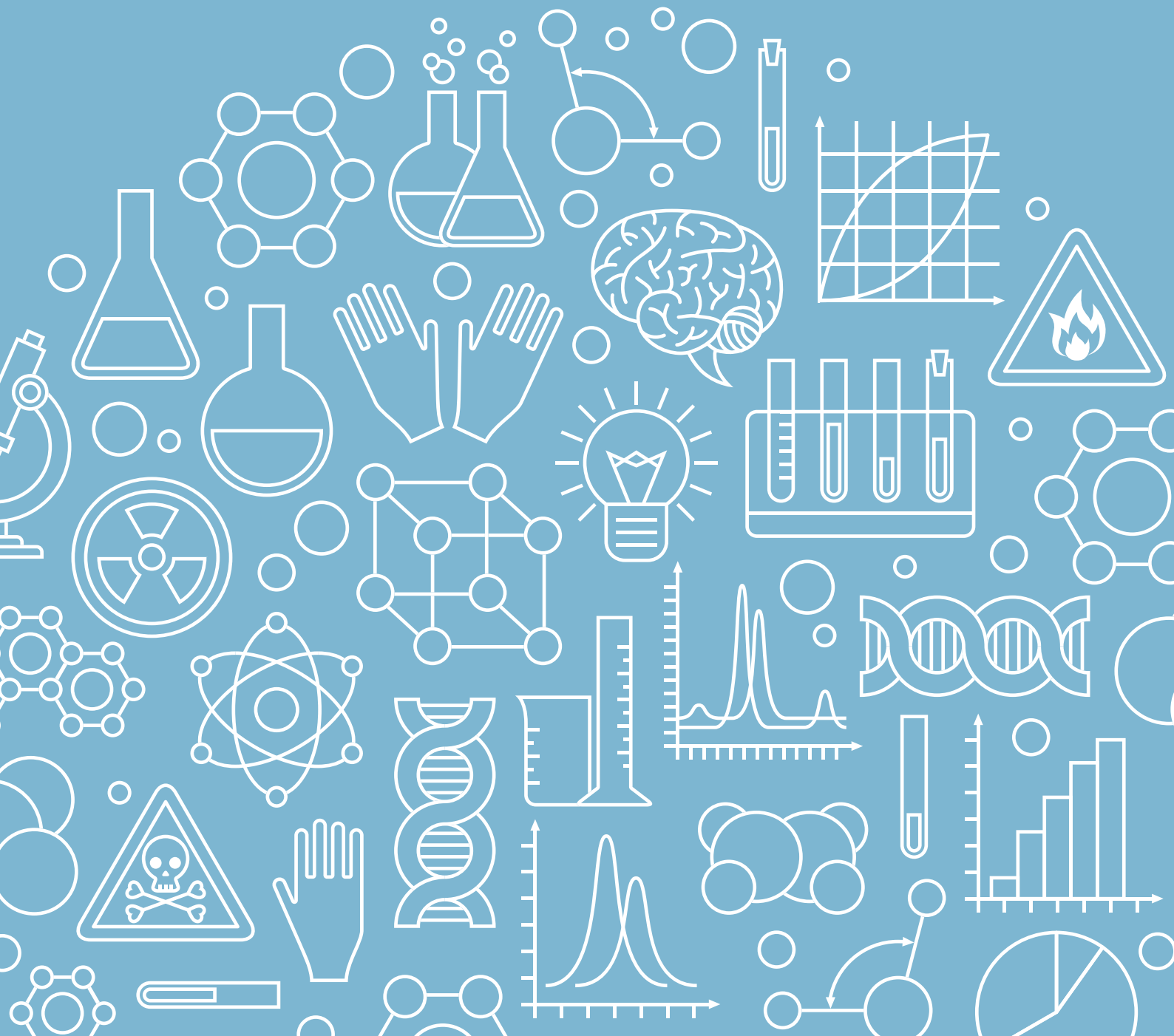
From the interviews, written responses and public documents reviewed, ISF has developed the following recommendations for companies that want to lead in the product responsibility/ chemical management space:

1	**Adopt a precautionary approach to chemical management** across the product development process and supply chain monitoring for ALL products - not just for the select few products branded as 'eco' or 'green'.
2	**Question the necessity of using potentially hazardous chemicals** when designing both products and their packaging.
3	**Adopt a precautionary principle when redesigning or reformulating products** that currently contain potentially hazardous chemicals.
4	**Fully and explicitly disclose all ingredients** on product labels, avoiding generic terms.
5	**Engage with stakeholders more widely**, including multipartite consultations and international roundtables, with governments, NGOs, academics, waste and recycling managers, product users and industry product designers.
6	**Engage with other companies** with proactive chemical management and corporate strategies. For example, IKEA, Apple, Boots, Skanska and H&M are members of ChemSec's Business Group.

Abbreviations

AICS	Australian Inventory of Chemical Substances
BCRC	Basel Convention Regional Centre for the Asia and Pacific Region in China
BIS	Bureau of Indian Standards
Cefic	The European Chemical Industry Council
ChemSec	International Chemical Secretariat
EDC	Endocrine Disrupting Chemicals
EMS	Environmental Management System
EWG	Environmental Working Group
IFRA	International Fragrance Association
IPEN	International Persistent Organic Pollutants Elimination Network
JIS	Japan Industrial Standard
K-REACH	Korean Safety and Labelling Standards for Chemical Consumer Products
LCA	Life Cycle Assessment
MSDS	Material Safety Data Sheet
NPI	National Pollutant Inventory
POP	Persistent Organic Pollutant
REACH	Europe's Registration, Evaluation, Authorisation and Restriction of Chemicals policy
RSL	Restricted Substance List
SDS	Safety Data Sheet
SIN List	ChemSec's Substitute It Now! List
TIS	Together for Sustainability Initiative
VOC	Volatile Organic Compound

The report



1. Introduction

1.1 Research

This report seeks to understand best and worst practice in product chemical safety standards for companies in the consumer products sector in developed and developing countries. This research report seeks to:

1	Identify which companies amongst those evaluated have gone furthest to proactively remove potentially hazardous chemicals from their products and which are doing just enough to keep up with regulation;
2	Provide a comprehensive evaluation of which companies are at greatest reputational, financial and regulatory risk from rising consumer awareness around toxic ingredients and tightening state regulatory standards;
3	Identify for each company in the study (21 companies) key actions that senior management should undertake over the short-term (less than 3 years) and long-term, to further de-risk their businesses.

This research focuses on the following consumer product categories, with some specific analysis conducted on ingredients in products within the category.

Table 1: Product categories and specific products analysed

Sector	Specific products analysed
Personal Care	Sunscreens, body lotions, moisturisers, make-up and cosmetics, body wash, hand wash, soaps, perfumes, deodorants, talcum powders, baby care products, hair dyes, shampoos, conditioners, hair sprays and other hair styling products, skin and hair bleaches, hair removal products, toothpastes and tooth powders.
Home Care	Laundry powders and detergents, dishwashing detergents, tablets and powders, home cleaning products, air fresheners and deodorising sprays.
Pesticides and Insecticides	Insect repellent sprays and lotions (for body), indoor pest control sprays, coils, electric and non-electric kits, outdoor insect control sprays, powders or pellets.
Paints	Interior paints, exterior paints, undercoatings and primers for consumer use.
Adhesives and Sealants	Enamels, epoxies, stains and finishes for wood and metals, waterproofing solutions, tile adhesives and grouts, craft and hobby adhesives, adhesive tapes for consumer use.
Ingredients	Fragrances used in the manufacture of Personal Care and Home Care products.

These product categories were selected to focus the scope of the research on the analysis of products that have the most direct impact on human health and indoor environments through contact with skin, hair, eyes, or through ingestion. There are other consumer product categories such as food and food packaging, furniture and household goods, which also contain chemicals of concern, however, analysis of these product categories are outside the scope of this project and are recommended for review in subsequent research projects.

1.2 What are chemicals of concern?

The number of chemicals registered for use in consumer products around the world exceeds 80,000, and approximately 2,000 new chemicals enter the market each year, the majority of which have never been tested.[1] This means that there is insufficient research on many of the chemicals in consumer products.

Traditionally, chemical regulation around the world has placed the burden of proof of harm on consumers and scientists. Within this regulatory framework, a chemical is considered safe until it is proven otherwise. Even in instances where research is funded to conduct testing, conventional toxicological risk assessments – based on testing single chemicals on animals in a laboratory setting – are only able to capture short-term harm with consistent physiological effects. They are not able to account for long-term impacts, such as cancer and hormonal disruption, or the impacts of chemicals in complex everyday use-scenarios where people or ecosystems are exposed to multiple chemicals at the same time.

However, the regulatory landscape is shifting to make producers of chemicals and consumer products more responsible. ISF has explored this regulatory shift in more detail in Section 2 of this Report.

Until now, there have been few incentives for companies to implement a rigorous, proactive chemical management plan. However, as regulations become stricter and consumers become more aware of chemical risks posed by consumer products, it will be necessary for companies to engage with emerging science and adopt a more precautionary approach to chemical safety.

To outline some of the effects associated with certain chemical ingredients, we have developed a guide below to describe some of the most commonly encountered chemicals, included in many of the products listed in Table 1. Table 2 provides an overview of some of the most controversial chemicals that have gained political and consumer attention around the world. There are many more chemicals of concern not listed here, however, those listed have been identified as posing the greatest potential reputational risk.

Endocrine disrupting chemicals (EDCs) interfere with the normal functioning of the hormonal system. They have been linked to impaired development of reproductive, immune and neurological systems, certain cancers, obesity and diabetes.[2]

Chemicals that accumulate in living organisms, so that their concentrations in body tissues continue to increase, are called **bioaccumulative.**[3]

Carcinogenic refers to substances that have the potential to cause cancer.

1 Ha, S., Seidle, T., & Lim, K. M. (2016). Act on the Registration and Evaluation of Chemicals (K-REACH) and replacement, reduction or refinement best practices. Environmental health and toxicology, 31.

2 US EPA Website. "What are Concerns Regarding Endocrine Disruptors?", https://www.epa.gov/endocrine-disruption/what-endocrine-disruption

3 Safer Chemicals, Healthy Families Website. http://saferchemicals.org/get-the-facts/chemicals-of-concern/persistent-bioaccumulative-and-toxic-chemicals-pbts/

1. Introduction continued

Considering the inadequacy of current chemical testing requirements, scientists are increasingly advocating for the restricted use of entire **chemical classes**. Table 2 provides a list of six chemical classes that have been recommended for exclusion from consumer products.[4] These six classes contain chemicals known to cause harm to humans and the environment, and closely related chemicals that have not yet been tested but are suspected to be harmful. Restricting a class of chemicals avoids a specific chemical of concern being substituted by one which is functionally similar but inadequately tested.

AS AN INVESTOR, asking questions about **which chemical classes** are present in products would be a helpful step in understanding a company's ingredient disclosure policies and product development process.

Table 2: Chemicals of concern

Volatile Organic Compounds (toluene, ethylbenzene, xylene)	Respiratory irritant, central nervous system effects **Present in:** Paints, Home Care products, Personal Care products, Adhesives and Sealants, Pesticides and Insecticides
Triclocarban/ Triclosan	Endocrine disruption, environmental toxicant, bioaccumulative **Present in:** Personal Care products, Home Care products
Formaldehyde	Carcinogenic, organ system toxicant, allergen, environmental toxicant **Present in:** Personal Care products, Paints
Fragrance	Immune system toxicant, environmental toxicant **Present in:** Personal Care products, Home Care products
Lead	Brain and central nervous system developmental effects **Present in:** Paints
Nanoparticles	Unknown effects, extremely reactive/catalytic **Present in:** Personal Care products, Paints
Titanium dioxide	Brain and central nervous system effects, carcinogenic **Present in:** Personal Care products, Paints
Polybrominated Diphenyl Ethers (PBDE)	Flame retardant has links to tumours, neurodevelopmental toxicity and thyroid hormone imbalance, endocrine disruption **Present in:** Paints
Per- and poly-fluoroalkyl substances (PFASs)	Possibly carcinogenic, bioaccumulative environmental toxicant, endocrine disruption, neurotoxicity **Present in:** Personal Care products, Home Care products, Adhesives and Sealants
Pthalates	Endocrine disruption, bioaccumulative environmental toxicant **Present in:** Personal Care products, Adhesives and Sealants

4 The Six Classes Approach to Reducing Chemical Harm. Green Science Policy Institute, http://www.sixclasses.org [accessed 22nd December 2017]

Figure 2: Chemical classes of concern[5]

5 As adapted from the Green Science Policy Institute 'SixClasses.Org' Website, http://www.sixclasses.org/ [accessed 22nd December 2017]

2. Understanding the regulatory and political context

A number of challenges have prevented adequate regulation to protect humans and the environment from hazardous chemicals in both developed and developing countries. A brief list of chemicals management regulations, policies, standards and agreements is shown in the table below.

Table 3: Regulatory overview

Country/ Region	Regulation/policy/ agreement/standard	Description
Global	United Nations Environment Programme Chemicals in Products (CiP) Programme	CiP aims to reduce risks from hazardous chemicals in products through 3 key objectives: • To know and exchange information on chemicals in products, associated hazards and sound management practices within supply chains; • To disclose information of relevance to stakeholders outside the supply chain to enable informed decision-making and actions about chemicals in consumer products; • To ensure that, through due diligence, information is accurate, current and accessible.
	Globally Harmonised System of classifying and labelling chemicals (GHS)	1. Provides harmonized criteria for classifying substances and mixtures according to their health, environmental and physical hazards, and; 2. Provides harmonised hazard communication elements, including requirements for labelling and safety data sheets.
Multilateral	Stockholm Convention	Objective: to prohibit and/or eliminate the production and use, as well as the import and export, of intentionally produced POPs. (Persistent Organic Pollutants (POPs): chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and have harmful impacts on human health or on the environment.)
	Rotterdam Convention	Objective: create legally binding obligations for the international trade of hazardous chemicals, and the environmentally sound use of those hazardous chemicals. It primarily covers pesticides and industrial chemicals.
	Basel Convention	Objective: promote the reduction of hazardous waste generation, the sound management of hazardous wastes, the restriction of transboundary movements of hazardous wastes, and regulatory systems in cases where transboundary movements are permissible.

Country/ Region	Regulation/policy/ agreement/standard	Description
Europe	REACH	• The European Union's REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) program is recognised as the most comprehensive regional regulatory framework[6]. • REACH operates based on four processes: the registration, evaluation, authorisation and restriction of chemicals. • It shifts the responsibility from public authorities to industry for assessing risks and providing appropriate safety information for chemical use. • 524 chemicals to date are restricted under REACH are listed in Annex XVII. A further 204 chemicals are listed as 'substances of very high concern'.
United States of America	EPA Toxic Substances Control Act (TSCA) Chemical Substance Inventory	• Inventory of existing chemical substances in the USA. • If a chemical is not on the inventory, it is considered a 'new chemical substance' and must be reviewed under the EPA's TSCA New Chemicals Review Program, which acts as a gatekeeper that can identify conditions, up to and including a ban on production, to be placed on the use of a new chemical before it is entered into commerce. • https://www.epa.gov/tsca-inventory.
Australia	NICNAS Australian Inventory of Chemical Substances (AICS)	• Assesses the risks of industrial chemicals and provides information to promote their safe use. • Focuses on chemicals used in inks, plastics, adhesives, paints, glues, solvents, cosmetics, soaps and many other products. • https://www.nicnas.gov.au/chemical-inventory-AICS.
	Hazardous Chemical Information System (HCIS)	• HCIS is an internet advisory service providing information on chemicals that have been classified in accordance with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) by an authoritative source, such as the European Chemicals Agency (ECHA) or the National Industrial Chemicals Notification and Assessment Scheme (NICNAS). • Not an exhaustive hazardous chemicals database. • http://hcis.safeworkaustralia.gov.au/#Classification.
	The National Pollutant Inventory (NPI)	• Contains data on 93 substances that have been identified as important due to their possible effect on human health and the environment. • Provides monitoring data for environmental pollutants originating from mines, power stations and factories, and from other sources such as households and transport. • http://www.npi.gov.au • http://www.npi.gov.au/resource/technical-advisory-panel-report

6 Understanding REACH: European Chemicals Agency. https://echa.europa.eu/regulations/reach/understanding-reach [Accessed 26 March 2018]

2. Understanding the regulatory and political context continued

Country/ Region	Regulation/policy/ agreement/standard	Description
Japan	Japan Industrial Standard (JIS)	• Chemical classification, labelling and safety data sheet (SDS) regulations are addressed by the Japan Industrial Standard (JIS) • Implemented a single standard in January 2017, to which all companies must comply. • The 1974 law on household products containing harmful substances (2009 revision) established permissible limits of harmful substances in household products. The list of harmful substances can be found at Japan's Chemical Risk Information Platform (CHRIP).
South Korea	K-REACH	• K-REACH Safety and Labelling Standards for Chemical Consumer Products • From April 2015 – safety and labelling standards for eight types of products including: cleaning agents, synthetic detergents, bleaching agents, fabric softeners, coatings, adhesives (including glues), fragrances, and deodorants. • From 1 July 2013, businesses must comply with GHS standards with regards to mixtures classification and labelling.
India	National Chemical Policy	Been in draft form since 2012, further refined in 2014. Gained support from industry and some government agencies but still awaiting approval.[7]

The European Union's chemical regulation framework REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) is shifting the burden of proof to industries, requiring them to demonstrate that the chemicals they produce do not cause harm.

The final deadline for companies to **register the old and new chemicals they want to use in products for REACH is May 2018**.

Other countries, such as China and Korea[1], are following in this model, meaning that regulation around the world will increasingly **require more stringent chemical testing to be carried out by companies**. Although REACH represents a step in the right direction, concern has been raised that chemical restrictions and bans will be weakened by member states and industries that rely on a strong chemical industry.

7 India updates draft national chemical policy: ChemicalWatch Global Risk & Regulation News. https://chemicalwatch.com/18318/india-updates-draft-national-chemical-policy [Accessed 22 December 2017]

2.1 Issues: developed economies

2.1.1 INCONSISTENT LEGAL FRAMEWORKS

In many developed economies, such as Australia, the United States, Canada, and until recently the European Union, chemicals used in consumer products have been regulated under different domestic laws, creating inconsistent and piecemeal protections. For example, in the United States, the 1976 Toxic Substances Control Act (TSCA) was implemented to protect humans and the environment from harm from toxic chemicals, however it does not include drugs, cosmetics or pesticides, which are covered by different laws. This has meant that protections are inconsistent and challenging to assess.

2.1.2 LACK OF CHEMICAL SAFETY TESTING

In addition to insufficiently tested chemicals that enter the global market each year, many chemicals that were in use prior to legislation being enacted were 'grandfathered' and have not undergone any testing. In Australia 40,000 chemicals were 'grandfathered' into the Australian Inventory of Chemical Substances[8], while 62,000 were included in TSCA in the United States[9]. In addition, the long-term effects of new chemicals, such as cancer and hormonal disruption, are not taken into account in required safety testing.

2.1.3 TRADE SECRETS

Many domestic chemical regulatory frameworks, including Australia and the United States, allow companies to not disclose all of the chemical ingredients in their products to protect 'trade secrets'. Although these chemicals are still subject to national testing requirements, consumers are not able to access and make informed decisions about chemicals in products. A controversial example is 'fragrance', an umbrella term which includes substances found to be allergenic and potentially toxic to organ systems.

2.2 Issues: developing economies

Lack of regulation and enforcement: in addition to the issues described above, many developing economies across Asia, Africa and Latin America do not have sufficient basic regulatory frameworks and chemical registration schemes. In addition, where regulation does exist, the state often does not have the capacity to enforce restrictions and bans.

8 National Toxics Network, (2014) Review of the National Industrial Chemicals and Notification and Assessment Scheme (NICNAS) http://www.ntn.org.au/wp/wp-content/uploads/2014/09/NTN-SubmissiondraftRIS2014.pdf

9 Ebnesajjad , S. (2016) TOSCA is an Opera, TSCA can be a Drama, in Chemical Manufacturing Excellence, https://chemical-materials.elsevier.com/chemical-manufacturing-excellence/tosca-is-an-opera-tsca-can-be-a-drama/

2. Understanding the regulatory and political context continued

2.3 Key topics of concern and controversy

2.3.1 AGGREGATE EXPOSURES AND 'COCKTAIL EFFECTS'

Due to the ubiquity of chemicals in consumer products, people are often exposed to many substances, multiple times a day. This is important because many chemicals have different effects based on the amount, duration and frequency of exposures, and what other chemicals they are combined with. The transformation of chemical behaviour because of combination with other chemicals has been termed the 'cocktail effect'. It is consequently insufficient to assess safety based on a single chemical in a specific setting removed from the influence of other chemicals and environmental factors.

IMPLICATIONS FOR COMPANIES: risk can be decreased by assessing the effects of aggregate exposures and probable combinations of chemicals, to determine how the amount of a particular chemical in a product that is applied multiple times a day, or with other products, can be modified accordingly.

2.3.2 LOW-DOSE EFFECTS

Traditional approaches to regulatory toxicology follow the axiom that 'the danger is in the dose'. Tests to determine the toxicity of a substance assume that substances will always be more toxic at higher doses, and less toxic at lower doses. Consequently, allowable dose limits are established for many substances that are toxic at high doses. However, emerging research has found that some chemicals are more harmful at low doses. For example, some EDCs fool the body at low doses into thinking they are hormones, thus allowing them to disrupt the function of the hormonal system. At higher doses, these same chemicals are recognised by the body as foreign, and don't have the same impact.

IMPLICATIONS FOR COMPANIES: substances that are currently allowed at low doses may be banned or require disclosure on labels in the future. It is consequently advised that substances found or suspected to have 'low dose' effects are excluded from consumer products.

2.3.3 REGRETTABLE SUBSTITUTION

Chemicals that are discovered to be harmful to humans or the environment are often replaced by chemicals that have been inadequately researched, and are later discovered to be harmful in similar or different ways. This problem has been termed 'regrettable substitution' and is pervasive in the consumer product industries. One reason regrettable substitution is such a problem is because each chemical in a product serves a particular purpose. Companies are therefore likely to seek out a replacement chemical that is structurally and functionally similar to the problematic chemical so they do not need to radically alter their product formulation.

Two approaches to avoid regrettable substitution are provided below. In many cases, these options should be used in conjunction with one another.

Option 1: Product Redesign

Where a harmful chemical must be replaced, a 'best practice' approach does not involve substituting it with another chemical that is under-researched, but thinking about how the product could be redesigned to avoid the use of harmful chemicals.

IMPLICATIONS FOR COMPANIES: 'regrettable substitution' can be avoided by rethinking how a product's functions could be delivered through a different product design, or even a new product/service system.

Option 2: The Six Classes Approach

Certain classes of chemicals have been consistently found to have harmful human and environmental impacts. Although, not all chemicals in each of these classes have been tested to date, they are closely related and behave in similar ways to chemicals known to be harmful. Scientists are increasingly advocating that the 'precautionary principle' be applied in relation to these classes of chemicals, and that they should be excluded from consumer products completely. See Figure 2.

IMPLICATIONS FOR COMPANIES: the exclusion of these six chemical classes from consumer products is a crucial strategy for avoiding 'regrettable substitution'. This will also prevent the need for constant reformulation of products, and will help safeguard against a loss of community trust in the company.

3. Evaluation Framework

The evaluation framework involved four broad areas of performance review, as described in the boxed paragraphs below. Scores and ratings from each area of the evaluation were then aggregated together to form an overall snapshot of each company, with an overall performance score relating to products and processes (Table 4 and Table 5) as well as a rating for chemicals of concern (Table 6), rating for ingredient disclosure (Table 7) and a high-level rating for regulatory, reputational and financial risk (Table 8). Drawing from these four broad areas of evaluation, ISF developed individual recommendations for de-risking for each company.

1a **Each company's efforts to eliminate or reduce chemicals of concern in its products were evaluated across company product ranges and business processes.**

Given the inadequacy of current regulatory frameworks for assessing and restricting hazardous chemicals in consumer products, ISF have developed a more comprehensive approach to assessing potential human and environmental chemical hazards based on additional criteria for each of the 21 companies (Table 4). The evaluation criteria outlined in Table 4 below were developed based on latest scientific findings in addition to existing research into aspects of proactive chemical management strategies that have been effectively employed by consumer product manufacturers.[10] This gave an indication of what was possible, the challenges faced by companies, and key elements of best practice models.

Table 4: Product responsibility performance evaluation criteria

Criteria	Components
Business operations	
Corporate strategy	Explicit commitment in company strategic plans and policies to exclude chemicals from products that are hazardous to humans and the environment
	Employs a company-specific or industry Restricted Substances List to determine chemical exclusions for products
	Regularly evaluates and reports on progress towards chemical management targets, including chemical phase outs
	Demonstrates commitment to responsible chemical management across all business areas, subsidiary companies and global regions of operation
Product development processes	Procedures are in place to evaluate the potential human and environmental impacts of chemicals considered for use in all new products
	Product design processes involve an evaluation of potential impacts of chemicals on humans and the environment across the entire lifecycle of products, including implications for recycling and disposal
Supply chain management	Hazardous chemicals are restricted in the production process, or managed and disposed of responsibly at all stages of the supply chain
	Company requires suppliers to comply with proactive chemical management processes, and evaluates their compliance

10 Scruggs, C.E., Buren, H.J.V. (2016), "Why Leading Consumer Product Companies Develop Proactive Chemical Management Strategies", *Business & Society,* Vol.55 (5), pp. 635-675.

Criteria	Components
Leadership	Works with government, industry and scientists to develop and progress voluntary standards and tools to reform the industry and supply chain
	Internally runs or supports Green Chemistry initiatives
Consultation	Regular benchmarking for chemical safety of products is performed against competitors
	Has an established process for consulting in-house experts or third parties for assistance with hazardous chemical management
	Has an effective mechanism to engage with customer feedback around chemical concerns and restrictions
Product attributes	
Safe materials	All relevant user scenarios and risks are considered when assessing the potential for a chemical to cause harm in a product
	Products do not contain chemicals that are known or suspected to be harmful to consumers
	Processes are in place to re-evaluate product formulas when chemical safety concerns are raised
Communication	Company discloses all product ingredients on labels or its website
	Certification has been obtained from a third party requiring all product ingredients to be publicly available
	Procurement policy requires suppliers to disclose information about the production and use of potentially hazardous chemicals
	Provides training and other resources to suppliers about hazardous chemical management
Promotion of broader chemical avoidance	Rethinks product design and production rather than substituting individual chemicals when hazardous chemicals are identified in products
	Develops products that remediate chemicals or promote low chemical exposure in the broader environment.

1b **Product responsibility efforts were scored based on evidence provided in public documents, surveys, written responses and interviews.**

Companies' efforts in product safety and responsibility were assigned scores for each of the evaluation criteria in Table 4. The scoring system shown in Table 5, was modelled on the *Sustainable Packaging Report*[11] completed by ISF, which provides a simple way for readers to understand why companies scored high or low in particular actions. Criteria scores (e.g. 'Corporate Strategy') were calculated by a structured process of selecting the highest score from the three information channels (public documents, survey/written response and/or interview) for each criteria component (shown in Table 4). The overall company scores were then calculated by averaging the scores across each criterion and assigning an overall level of performance (Table 5).

11 Kelly, S., Lewis, H., Atherton, A., Downes, J., & Wyndham, J., Giurco, D. (2016): Packaging Sustainability in Consumer Companies in Emerging Markets: Final Report. Institute for Sustainable Futures, UTS.

3. Evaluation Framework continued

Table 5: Product responsibility evaluation scoring table

Expected performance at each level for selected companies		
Score	**Levels of performance**	**Characteristics**
0	**No response**	No publicly available information
		Researchers unable to interview a company representative and/or no or insufficient information provided by the company
1	**No action**	The company is not aware of the issues or they are not seen as important
2	**Getting started**	Some awareness and action
		Informal commitments
		Ad-hoc activities
3	**Established**	Product responsibility commitments embedded in corporate strategy and processes
		Responsibility allocated across the company
		Targets and metrics adopted
		Suppliers being engaged
4	**Leading**	Ambitious targets and metrics adopted
		Public accountability
		Company goes beyond compliance
		Consumer engagement strategy being implemented
		Good progress achieved for product responsibility and/or outstanding innovation
5	**Chemicals management/ product responsibility best practice**	An ambitious product responsibility strategy guides all business activities including procurement
		Product responsibility is considered at every stage of product development - design, procurement, manufacture, distribution, etc.
		Product responsibility is a source of business innovation and competitive advantage
		Targets have been achieved
		Continuous improvement strategy in place, not only for the company, but to use corporate leadership position to transform the sector's practice in collaboration with governments, and civil society

2 **Each company's use of chemicals of concern was evaluated.**

Using online tools such as the EWG Skin Deep® cosmetics database and ChemSec's SINList, as well as the broader scientific literature, ISF evaluated each company's use of chemicals of concern. Ratings derived from these sources were finalised by cross-checking ingredients using the thresholds outlined in Table 6.

Table 6: Chemicals of Concern Ratings and Descriptions

Chemicals of Concern Rating	Description
HIGH	Majority of chemicals listed under company name or company products on EWG Skin Deep Database/ChemSec SIN List or other third-party databases are listed as of High Concern.
MEDIUM	Majority of chemicals listed under company name or company products on EWG Skin Deep Database/ChemSec SIN List or other third-party databases are listed as of Moderate/Medium Concern.
LOW	Majority of chemicals listed under company name or company products on EWG Skin Deep Database/ChemSec SIN List or other third-party databases are listed as of Low Concern.

3. Evaluation Framework continued

3 **Each company's ingredient disclosure was evaluated.**

Through interviews with NGOs and academics active in the product responsibility/safety and consumer products sector regarding chemicals, ISF determined that the level of disclosure a company provides with regard to product ingredients was a significant indicator of product responsibility efforts. In order to evaluate each company based on a best practice model, ISF developed a rating based on the Environmental Working Group's grading system for product/ingredient ingredient disclosure in its Guide to Healthy Cleaning (Table 7).

Table 7: Levels of Ingredient Disclosure Ratings and Descriptions

Ingredient Disclosure Rating	Description
POOR	Product ingredients are listed with very little detail or no details on products or online and/or are hard to find. Chemicals are referred to generically and ingredient lists are not complete.
INSUFFICIENT	Product ingredients are listed with some detail on products or online. Some chemicals are referred to generically or not listed if used in small amounts.
GOOD	Product ingredients are listed in detail on products or online. All chemical names are referred to individually, even if used in very small compositions.

4 **Each company's regulatory, reputational and financial risk was determined.**

Using the product responsibility performance evaluation, chemicals of concern rating and ingredient disclosure ratings described above, the overall regulatory, reputational and financial risks for each of the selected companies were determined using the risk reference matrix in Table 8. The reasoning and process for assigning risk is detailed in the boxed paragraph below.

The **determinant for regulatory and reputational risks** was the **number of chemicals and severity of concern about these chemicals within a company's products**. These particular chemicals have been identified in scientific studies indicating a potential for human or environmental harm. This approach is intended to mitigate against the risk of companies continuing to use chemicals that scientific research has indicated are highly likely to be hazardous. The **determinant for financial risk** is the **percentage of product sales that would be affected** within the company by regulatory or reputational issues, with financial performance and segment sales proportions determined from annual and financial reports available online.

Table 8: Regulatory, Reputational and Financial risk references

Risk type	Determinant	Risk level		
		Low	Medium	High
Regulatory	**No. of ingredients of concern/ level of concern**	Little disruption on sales	Some disruption on sales	Major disruption to sales
		No-low legal threats	Some legal threats/ minor fines/penalties	Shutdowns/ major penalties/fines
Reputational	**No. of ingredients of concern/ level of concern**	No-minor loss of customer trust	Some loss of customer trust	Major effect on customer trust, may be unrecoverable
		No-little media coverage	Some media coverage (mostly locally)	Major media coverage (locally/internationally)
Financial	**Size of product categories of concern**	<5% of sales	5-15% of sales	>15% of sales

More extensive evaluations of company risks could not be provided at this time due to the poor availability of data across the selected companies.

5 **Product responsibility performance, ingredient safety, ingredient disclosure levels and risk profiles for each company were used to determine up to 3 main de-risking areas, probing questions and suggested improvements for the short-term (less than 3 years) and long-term (more than 3 years).**

The outputs from the four evaluation areas were used to develop recommendations for de-risking for each company, highlighting areas of concern and potential actions to be taken in the short and longer term to reduce regulatory, reputational and financial risk relating to hazardous chemical management.

4. Results Summary

4.1 Overall score results, by company

Figure 3: Overall score results, by company

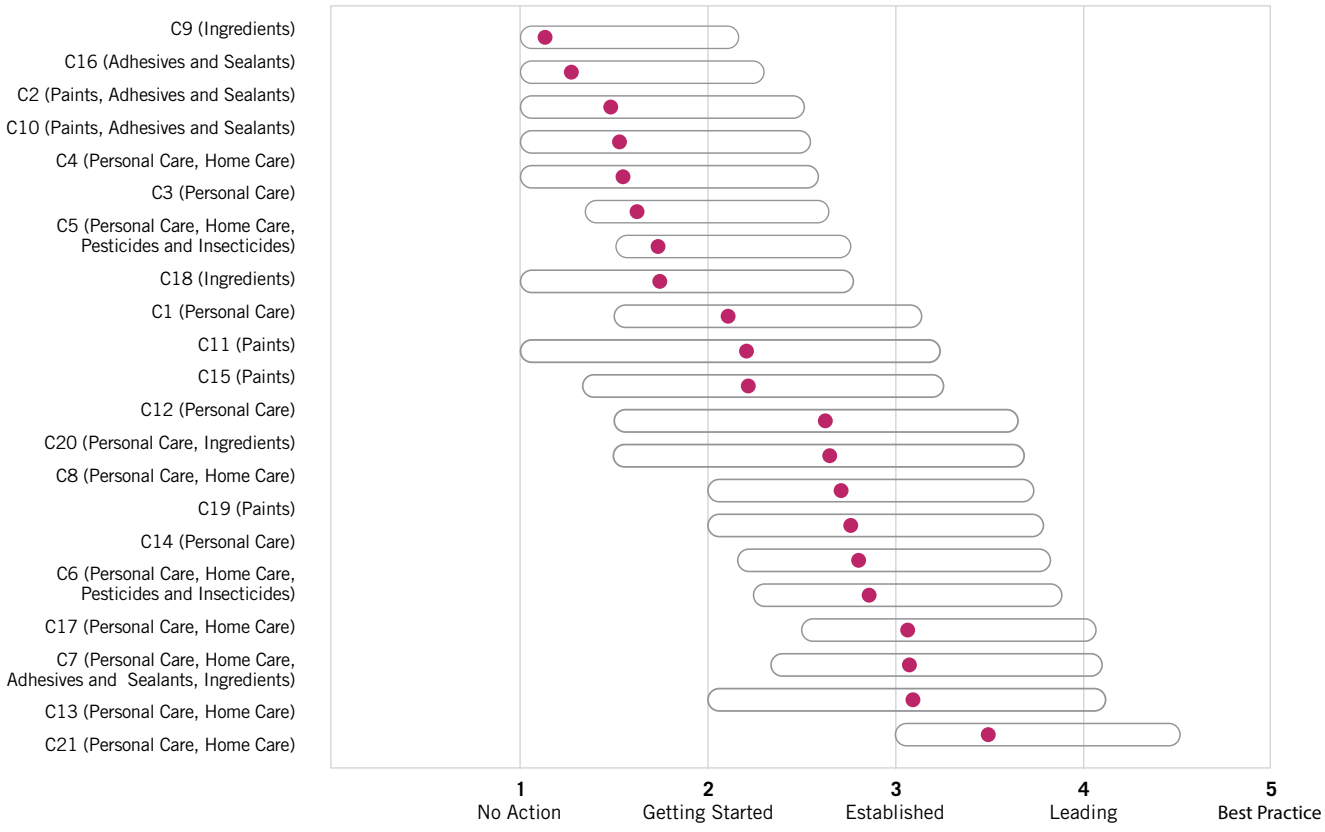


Figure 3 ranks the companies in order from least to highest average score calculated across the criteria categories, with the circles representing the average and 'lozenges' representing the range of scores achieved across all criteria. All company performance evaluations were at or below 'Established' level. Nine companies were evaluated as 'Getting Started' level with another eight companies evaluated as 'No Action'. This indicates that there is much progress to be made in moving towards safe, sustainable and responsible management of chemicals in consumer products across these companies.

4.2 Overall score results, by assessment criteria

Figure 4: Overall score results, by assessment criteria

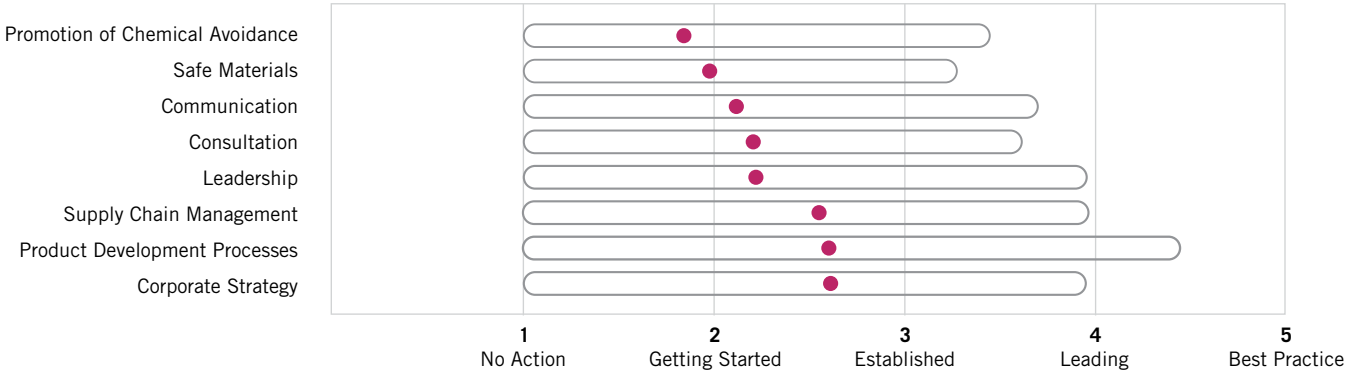


Figure 4 ranks the companies in order from least to highest average score calculated across the criteria categories, with the circles representing the average and 'lozenges' representing the range of scores achieved across all companies. While many companies referenced consumer safety, environment and sustainability in their corporate strategies and marketing material, it was difficult to locate documents that provided evidence of their processes in these areas. Despite statements of commitment to safety, 'Safe Materials' ranked second last, suggesting that many companies continue to manufacture products with ingredients of concern. The evaluations also suggested little evidence of concerted effort to improve sector/industry standards, with 'Promotion of Chemical Avoidance' receiving the lowest average score out of the eight criteria categories.

4. Results Summary continued

4.3 Ingredient disclosure and 'chemicals of concern' grades by company

Table 9: Ingredient disclosure and chemicals of concern

Company	Overall Score	Ingredient disclosure	Chemicals of concern
C6 (Personal Care, Home Care, Pesticides and Insecticides)	2.8	GOOD	MEDIUM
C12 (Personal Care)	2.7	GOOD	HIGH
C13 (Personal Care, Home Care)	3.0	GOOD	MEDIUM
C14 (Personal Care)	2.8	GOOD	MEDIUM
C19 (Paints)	2.8	GOOD	HIGH
C20 (Personal Care, Ingredients)	2.6	GOOD	LOW*
C21 (Personal Care, Home Care)	3.5	GOOD	MEDIUM
C1 (Personal Care)	2.1	INSUFFICIENT	LOW
C2 (Paints, Adhesives and Sealants)	1.5	INSUFFICIENT	HIGH
C3 (Personal Care)	1.6	INSUFFICIENT	HIGH
C4 (Personal Care, Home Care)	1.6	INSUFFICIENT	HIGH
C5 (Personal Care, Home Care, Pesticides and Insecticides)	1.7	INSUFFICIENT	HIGH
C7 (Personal Care, Home Care, Adhesives and Sealants, Ingredients)	3.0	INSUFFICIENT	HIGH
C8 (Personal Care, Home Care)	2.7	INSUFFICIENT	HIGH
C9 (Ingredients)	1.1	INSUFFICIENT	HIGH
C10 (Paints, Adhesives and Sealants)	1.5	INSUFFICIENT	HIGH
C11 (Paints)	2.2	INSUFFICIENT	HIGH
C17 (Personal Care, Home Care)	3.0	INSUFFICIENT	MEDIUM
C15 (Paints)	2.2	POOR	HIGH
C16 (Adhesives and Sealants)	1.2	POOR	HIGH
C18 (Ingredients)	1.7	POOR	HIGH

* C20 (Personal Care, Ingredients)'s 'Low' grade for chemicals of concern should be treated with caution: it was difficult to evaluate due to the company's range of sectors and lack of distinction between these in public documents.

The companies are ranked above according to ingredient disclosure level, as we have found this is the most immediate area for improvement. Ingredient disclosure on product ingredients and provision of specific chemical names was largely insufficient across the board, with only seven companies being awarded a 'Good' rating for ingredient disclosure. Indian and Japanese companies fared worst in this area, which may be an indication of the lack of detailed labelling laws in these countries. Several companies currently satisfy labelling laws and regulatory policies through use of generic ingredient terms such as 'fragrance', 'parfum', 'colourants' and 'preservatives' without the need for specification of chemical names. This is not considered best practice.

Ingredient disclosure levels, however, are not complete indicators of a company's product responsibility efforts, as shown in Table 9, with several top product responsibility performance scorers having insufficient or poor ingredient disclosure levels.

However, ingredient disclosure performance did appear to be loosely tied with the incidence of concerning ingredients: of the companies who demonstrated 'Good' disclosure, the majority had less concerning ingredients, with the exception of C19 (Paints) and C12 (Personal Care). C20 (Personal Care, Ingredients)'s 'Low' grade for chemicals of concern should be treated with caution: it was difficult to evaluate due to the company's range of sectors and lack of distinction between these in public documents.

4.4 Personal Care sector

Table 10: Personal Care results summary

Company	Overall Score
C21 (Personal Care, Home Care)	3.5
C17 (Personal Care, Home Care)	3.0
C13 (Personal Care, Home Care)	3.0
C7 (Personal Care, Home Care, Adhesives and Sealants, Ingredients)	3.0
C6 (Personal Care, Home Care, Pesticides and Insecticides)	2.8
C14 (Personal Care)	2.8
C12 (Personal Care)	2.7
C8 (Personal Care, Home Care)	2.7
C20 (Personal Care, Ingredients)	2.6
C1 (Personal Care)	2.1
C5 (Personal Care, Home Care, Pesticides and Insecticides)	1.7
C3 (Personal Care)	1.6
C4 (Personal Care, Home Care)	1.6

4. Results Summary continued

4.5 Home Care sector

Table 11: Home Care results summary

Company	Overall Score
C21 (Personal Care, Home Care)	3.5
C17 (Personal Care, Home Care)	3.0
C13 (Personal Care, Home Care)	3.0
C7 (Personal Care, Home Care, Adhesives and Sealants, Ingredients)	3.0
C6 (Personal Care, Home Care, Pesticides and Insecticides)	2.8
C8 (Personal Care, Home Care)	2.7
C5 (Personal Care, Home Care, Pesticides and Insecticides)	1.7
C4 (Personal Care, Home Care)	1.6

Results were similar for the Personal Care and Home Care sectors as several companies produced products in both categories.

4.6 Paints sector

Table 12: Paints results summary

Company	Overall Score
C19 (Paints)	2.8
C15 (Paints)	2.2
C11 (Paints)	2.2
C10 (Paints, Adhesives and Sealants)	1.5
C2 (Paints, Adhesives and Sealants)	1.5

Top scorer amongst the paint companies was C19 (Paints), followed by C15 (Paints) and C11 (Paints). Despite having removed lead and reduced VOCs in their paints, C10 (Paints, Adhesives and Sealants) and C2 (Paints, Adhesives and Sealants) received lower scores due to lower performance in other evaluation criteria.

4.7 Pesticides & Insecticides sector

C6 (Personal Care, Home Care, Pesticides and Insecticides) and C5 (Personal Care, Home Care, Pesticides and Insecticides) were the only companies with products in this sector. These companies received overall scores of 2.8 and 1.7 respectively, indicating that both have a lot of room to improve in order to become leaders in chemical management within this sector.

4.8 Adhesives and Sealants

Table 13: Adhesives and Sealants results summary

Company	Overall Score
C7 (Personal Care, Home Care, Adhesives and Sealants, Ingredients)	3.0
C10 (Paints, Adhesives and Sealants)	1.5
C2 (Paints, Adhesives and Sealants)	1.5
C16 (Adhesives and Sealants)	1.2

C2 (Paints, Adhesives and Sealants) owns the distributor rights for C7 (Personal Care, Home Care, Adhesives and Sealants, Ingredients) adhesives and sealants in India, however, our evaluations revealed a substantial difference in their overall score which suggests management practices may differ between these companies. Domestic Indian competitor in this sector – C16 (Adhesives and Sealants) – has much space to improve its product ingredient disclosure and alignment of its overall corporate strategy with respect to chemical management.

4.9 Ingredients manufacturing

Table 14: Ingredients manufacturing results summary

Company	Overall Score
C7 (Personal Care, Home Care, Adhesives and Sealants, Ingredients)	3.0
C20 (Personal Care, Ingredients)	2.6
C18 (Ingredients)	1.7
C9 (Ingredients)	1.1

Of the 21 selected companies, two produce fragrances that are used in the Home Care and Personal Care sectors and flavours used in food products, while three other companies (C7 (Personal Care, Home Care, Adhesives and Sealants, Ingredients), C20 (Personal Care, Ingredients) and C18 (Ingredients)) manufacture ingredients as well as Personal/Home Care products. Although the manufacturing of fragrances and flavours is largely directed by industry associations such as the International Fragrance Association[13] with their own responsible chemical management policies, ingredient disclosure in this sector is very poor. Evaluation of company efforts was therefore limited due to the lack of public information. Out of the above companies, only C7 (Personal Care, Home Care, Adhesives and Sealants, Ingredients) responded after repeated requests for interviews.

12 International Fragrance Association: http://www.ifraorg.org/ [Accessed 22 December 2017]

5. Recommendations

5.1 Improvement opportunities

1 The **most significant area of improvement for companies** is in providing **clear and complete information** about the ingredients contained within their products. Ingredients listed should not be generic and should include names of chemicals even in very low concentrations in the product.

ISF recommends that all companies review their listings of product ingredients on packaging and in the public realm (company website, company brochures, social media, and other websites/databases) and ensure that these lists are:

- Clear – listing all ingredients in a product
- Complete – does not include generic names and includes all ingredients with very low concentrations.

The following online databases would assist companies to evaluate their product formulations and ingredients as well as potential regulatory risks (especially for USA and Europe):

- Environmental Working Group's Skin Deep Cosmetics Database https://www.ewg.org/skindeep/#.WjeZgVEjE2w
- ChemSec's 'Substitute It Now!' (SIN) List http://chemsec.org/business-tool/sin-list/ and SINMILARITY Tool http://sinimilarity.chemsec.org/
- The International Living Future Institute's Declare Label and RED List https://living-future.org/declare/declare-about/red-list/
- The US National Library of Medicine's Haz-Map database https://hazmap.nlm.nih.gov/
- The Personal Care Products Council Cosmetics Info database (industry-sponsored) http://www.cosmeticsinfo.org/About-us

Many companies cited the use of ISO 14001 Environmental Management Systems to guide their chemical management practices. However, ISO 14001 EMS are generally 'plant-based' and refer to specific company facilities where products are manufactured. The ISO 20400:2017 in Sustainable Procurement[13] would be a good place to start in integrating sustainability early in the supply chain, under the condition that long-term impacts of chemicals on humans and the environment are included in product formulation assessment criteria.

ISF also recommends companies investigate and pursue, where suitable, third-party certification of labelling on their product packaging. Labelling certification would consider ingredient sourcing, manufacturing and lifecycle impacts to ensure responsible chemical management across the supply chain.[14]

Finally, in order to align with best practice, ISF recommends companies employ the precautionary principle by proactively avoiding the use of the Six Chemical Classes of Concern (Figure 2) in the development and manufacture of their products.

13 ISO 20400:2017 Sustainable Procurement — Guidance. https://www.iso.org/standard/63026.html [Accessed 26 March 2018]

14 Global Eco-Labelling Network Website. https://globalecolabelling.net/eco/eco-friendly-products-by-category/ [accessed 18th December 2017]

2 Reach out to industry associations and leading NGOs to understand the **potential for best practice**.

Given that none of the companies evaluated could be classified as 'best practice', ISF recommends that companies reach out to industry associations, academic organisations and NGOs, particularly at the international level, to identify potential steps to improve their chemicals management practices. Suggestions include:

- The International Chemical Secretariat (ChemSec) – ChemSec's Business Group of companies may also provide useful links[15]
- The International Persistent Organic Pollutants Elimination Network (IPEN) and their various local counterparts
- The Green Science Policy Institute
- Local and global university research groups with expertise in responsible management of chemicals in consumer products.

3 Develop a balanced approach to providing **customer feedback mechanisms** and **proactive consumer awareness raising activities.**

Several companies interviewed or reviewed indicated either a lack of consumer awareness or widespread misinformation among consumers, which led to unwarranted reputational risks. When some company websites were reviewed, there was difficulty in accessing the consumer complaints/queries form or contact details, though most companies indicated that they provide easy access for consumer feedback. Very few companies took a balanced and proactive approach to improving consumer awareness in particular product sectors about particular chemical ingredients. Companies should not only manage the consumer reactions to products, but also need to make efforts to engage with the broader industry (from raw materials suppliers to product designers to waste management/recycling providers), knowledgeable professionals, non-governmental organisations and government bodies to ensure misinformation is promptly managed without the need for (often expensive) piecemeal 'band-aid' responses from individual companies.

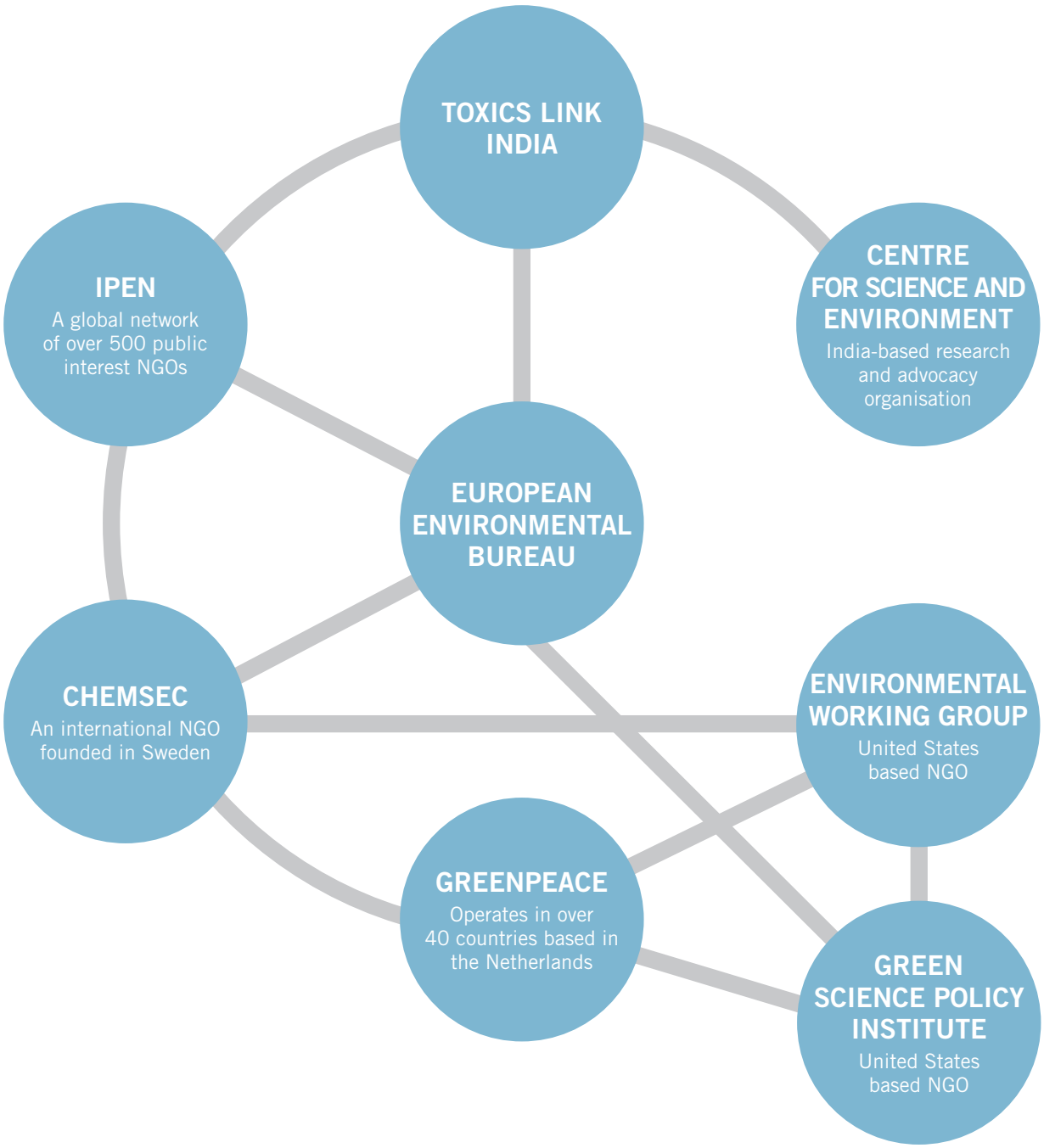
15 ChemSec Website. "ChemSec Business Group Participants", http://chemsec.org/business-and-investors/chemsec-business-group/members/ [accessed 22nd December 2017]

5. Recommendations continued

5.2 Build enabling networks

Through ISF's evaluations of the companies, the research team identified several existing links between stakeholders and have illustrated these links below.

Figure 5: Connections between NGOs



5.3 Future research areas

The scope of this research project was limited to the five product categories included to ensure robust evaluations could be carried out in the time period allocated. However, several companies selected also produce products in the areas of Food and Nutrition, Furniture, and Building Products, all of which contain chemicals of concern and will encounter significant regulatory risks in the near future. ISF recommends separate studies are conducted to investigate chemicals of concern in company-manufactured products with regard to:

- Food and food-contact materials
- Furniture, bedding and carpets
- Household electronic and electrical appliances
- Toys and other products for children and babies.

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