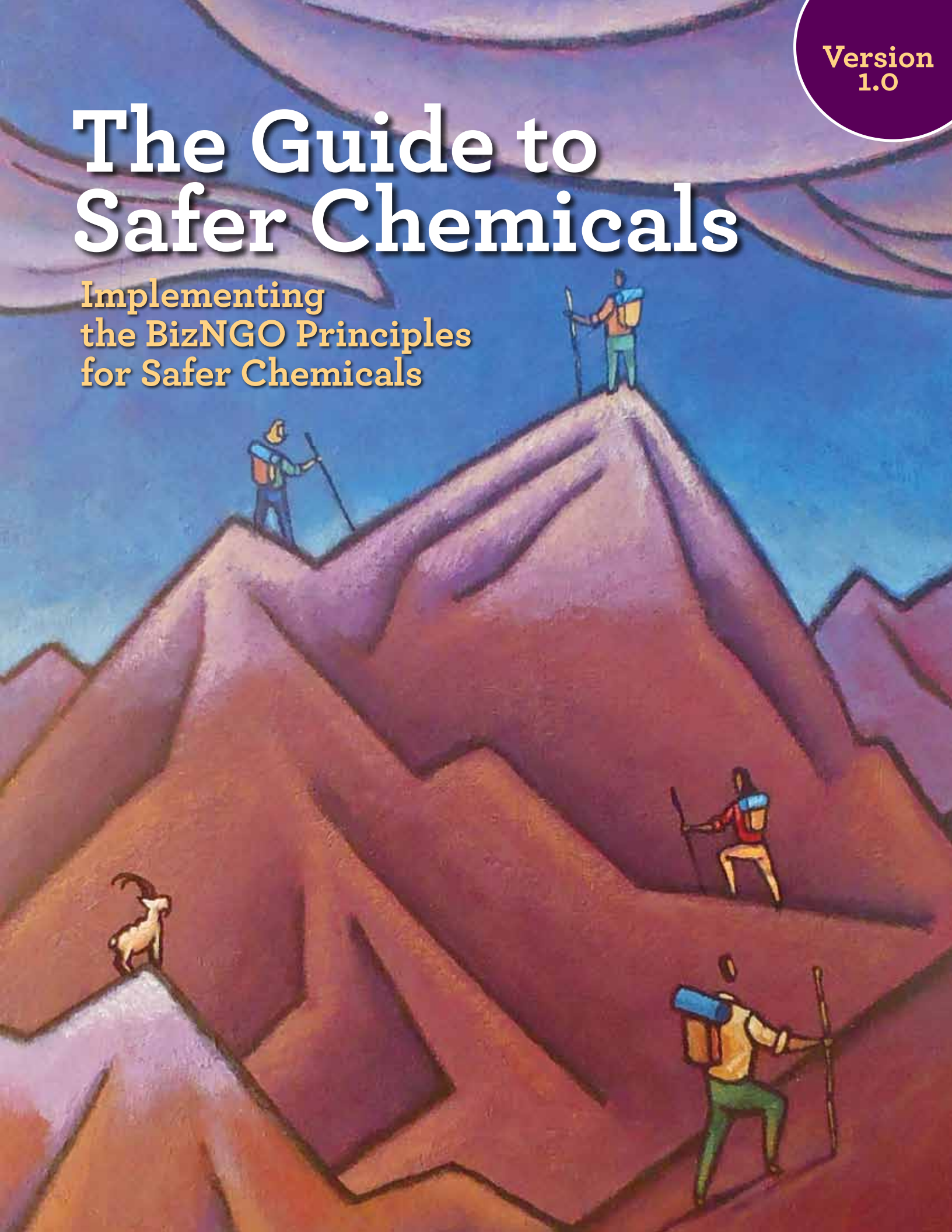
Version 1.0

The Guide to Safer Chemicals

Implementing the BizNGO Principles for Safer Chemicals



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BizNGO
FOR SAFER CHEMICALS AND SUSTAINABLE MATERIALS

BizNGO is a collaboration of leaders from businesses, environmental organizations, government agencies, and universities. Our mission is to promote the creation and adoption of safer chemicals and sustainable materials in a way that supports market transitions to a healthy economy, healthy environment, and healthy people. Established in 2006, BizNGO is a project of Clean Production Action.

CLEAN PRODUCTION ACTION

Clean Production Action's mission is to design and deliver strategic solutions for green chemicals, sustainable materials, and environmentally preferable products. Critical to our success is working closely with existing networks across the globe, developing new partnerships, learning about emerging technological trends and associated environmental health problems, and developing and communicating essential solutions. Clean Production Action is a project of the Tides Center.

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BizNGO Principles for Safer Chemicals

Demand for products made from greener chemicals is growing rapidly. Consumers, investors and governments want chemicals that have low to no toxicity and degrade into innocuous substances in the environment.[1] Leading businesses are seeking to capture these emerging market opportunities by redesigning their products and catalyzing change in their supply chains.

To advance an economy where the production and use of chemicals are healthy for humans, as well as for our global environment and its non-human inhabitants, responsible companies and their supply chains should adopt and implement the following four principles for safer chemicals:

1. ***Know and disclose product chemistry.*** Manufacturers will identify the substances associated with and used in a product across its lifecycle and will increase as appropriate the transparency of the chemical constituents in their products, including the public disclosure of chemicals of high concern.[2] Buyers will request product chemistry data from their suppliers.

2. ***Assess and avoid hazards.*** Manufacturers will determine the hazard characteristics of chemical constituents and formulations in their products, use chemicals with inherently low hazard potential, prioritize chemicals of high concern for elimination, minimize exposure when hazards cannot be prevented, and redesign products and processes to avoid the use and/or generation of hazardous chemicals. Buyers will work with their suppliers to achieve this principle.

3. ***Commit to continuous improvement.*** Establish corporate governance structures, policies, and practices that create a framework for the regular review of product and process chemistry, and that promote the use of chemicals, processes, and products with inherently lower hazard potential.

4. ***Support public policies and industry standards*** that:
   - advance the implementation of the above three principles;
   - ensure that comprehensive hazard data are available for chemicals on the market;
   - take action to eliminate or reduce known hazards; and
   - promote a greener economy, including support for green chemistry research and education.

These principles are key features of an effective strategy for promoting, developing and using chemicals that are environmentally preferable across their entire lifecycle.

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1 These are two of the 12 Principles of Green Chemistry defined by Paul Anastas and John Warner in *Green Chemistry: Theory and Practice*, 1999 (Oxford University Press: New York).

2 "Chemicals of high concern" include substances that have the following properties: 1) persistent, bioaccumulative and toxic (PBT); 2) very persistent and very bioaccumulative (vPvB); 3) very persistent and toxic (vPT); 4) very bioaccumulative and toxic (vBT); 5) carcinogenic; 6) mutagenic; 7) reproductive or developmental toxicant; 8) endocrine disruptor; or 9) neurotoxicant. "Toxic" (T) includes both human toxicity and ecotoxicity.

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Acknowledgments

The Guide to Safer Chemicals v.1.0 is a product of BizNGO. A project of Clean Production Action, BizNGO is a collaboration of downstream users—businesses, non-governmental organizations (NGOs), universities, and government agencies—working to promote the creation and adoption of safer chemicals and sustainable materials in a way that supports market transitions to a healthy economy, healthy environment, and healthy people. *The Guide* is the result of three plus years of discussions, pilots, and draft versions among BizNGO participants of how to implement the BizNGO Principles for Safer Chemicals.

The Guide will be an evolving resource of current and best practices of how organizations can implement safer alternatives to chemicals of high concern to human health or the environment. This is our first attempt at detailing the actions organizations are taking on the paths to the BizNGO Principles for Safer Chemicals. We recognize that many gaps exist in our reporting and that the benchmarks are imperfect and will need refinement.

We look forward to filling in the many cutting edge actions organizations are taking on the path to safer chemicals and learning from your feedback and experiences. *The Guide* will evolve and will be updated as organizations work with BizNGO in using it and populating it with an ever growing list of activities. We welcome your input.

We are deeply indebted to the many individuals who shared their insights, critical thinking, and technical expertise in developing *The Guide* (note that organizational affiliation is for identification purposes only and does not imply endorsement of The Principles or *The Guide*):

- Alan Rae, TPF Enterprises
- Albert Tsang, Dell
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- Barbara Kyle, Electronics TakeBack Coalition
- Brian Martin, Seagate
- Brian Penttila, Pacific Northwest Pollution Prevention Research Center
- Cassidy Randall, Women's Voices for the Earth
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- Colin Price, Oregon Environmental Council
- Dave Rappaport *(during his tenure with Seventh Generation)*
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- Greg Scott, Mountain Equipment Cooperative
- Helen Holder, HP
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- Jennifer Waddell, Novation
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- Ronald Hart, former Chief Scientist and Executive Director of the US FDA's National Center for Toxicology Research
- Roger McFadden, Staples
- Sue Chiang, Center for Environmental Health
- Ted Smith, International Campaign for Responsible Technology
- Tom Lent, Healthy Building Network

We are especially indebted to the organizations that piloted *The Guide*, including Dignity Health, Kaiser Permanente, Construction Specialties, Seventh Generation, Perkins+Will, and Staples.

Yet despite all the help received, we no doubt made a few misstatements and misinterpretations along the way and welcome your help in correcting them.

On behalf of all the leaders in BizNGO, your humblest chroniclers of current and best practices,

— *Mark Rossi, Cheri Peele, and Beverley Thorpe*

Executive Summary

The BizNGO Guide to Safer Chemicals—call it *"The Guide"* for short—is a unique resource for downstream users of chemicals. It is a hands-on guide 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.

Chemicals are at the core of our materials, products, and manufacturing systems, and as such should be at the core of our sustainability programs. Yet many a downstream business, those organizations that use chemicals by virtue of the products they purchase, has avoided starting this journey thinking that the path to greener and safer chemicals is too clouded in complexity and uncertainty. *The Guide* is our response to these uncertainties and is intended for both novices and experts.

The Purpose of *The Guide to Safer Chemicals*

The Guide:

- marks pathways to safer chemicals in products and supply chains.
- sets relative benchmarks for each of the four BizNGO Principles for Safer Chemicals.
- specifies actions for each benchmark.
- presents examples of business practices for each benchmark.
- illustrates how downstream users are getting started and advancing on their paths to safer chemicals.

Users of *The Guide* will learn how to:

- measure internal performance, identify areas of improvement, and track progress to safer chemicals.
- benchmark performance in comparison to other organizations.
- communicate to the public their organization's performance in moving to safer chemicals based on an independent metric.

The question of how to implement the Principles for Safer Chemicals is the inspiration for *The Guide*. As many a potential traveler has said to us: "We agree with the spirit of the BizNGO Principles. But what does it mean to implement them?" The writing of *The Guide* is our initial (v.1.0) answer to that question.

***The Guide* uses a hiking metaphor of four benchmarks—Trailhead, Base Camp, High Camp, and Summit—for the journey to implementing the BizNGO Principles for Safer Chemicals. The benchmarks are relative indicators of performance, not absolutes.**

The Foundation of *The Guide*: the BizNGO Principles for Safer Chemicals

Our journey towards *The Guide* started in 2008 with the release of the BizNGO Principles for Safer Chemicals—a set of aspirational goals for advancing the development and use of inherently safer chemicals in products and production processes. The BizNGO Principles are:

1. Know and disclose product chemistry.
2. Assess and avoid hazards.
3. Commit to continuous improvement.
4. Support public policies and industry standards that advance the above three principles.

The Benchmarks

The Guide uses a hiking metaphor of four benchmarks—Trailhead, Base Camp, High Camp, and Summit—for the journey to implementing the BizNGO Principles for Safer Chemicals. The benchmarks are relative indicators of performance, not absolutes. They are indicators of a progression from relatively easier actions at Trailhead to progressively more challenging and comprehensive actions at High Camp and Summit.

The benchmarks require an increasing scope and depth of knowledge about chemicals and their impacts to move from Trailhead to Summit. For example, in Principle #1a-Know Product

Chemistry—Trailhead is know some chemicals of high concern, Base Camp is know all chemicals of high concern, High Camp is know all chemicals in all products, and Summit is know all chemicals in supply chains and sources of feedstocks. The Figure "From Trailhead to Summit" summarizes how all the benchmarks scale from Trailhead to Summit.

The questions purchasers need to ask suppliers are what are your systems for: knowing chemicals in products; identifying chemicals of high concern; evaluating alternatives; and selecting safer alternatives.

Getting to Trailhead: Stepping Beyond Compliance

Trailhead is where downstream users start on the path beyond compliance to safer chemicals. As shown in the Figure, From Trailhead to Summit, the journey for implementing Principles #1 and #2 starts with a few chemicals of high concern in products or processes.

Chemicals of high concern are so prevalent in our global economy that the vast majority of products have chemicals of high concern in them. Finding chemicals of high concern in products is not the challenge for downstream users. The challenge is determining which ones to target first. A company can identify and target chemicals of high concern through a variety of pathways. Environmental organizations, government agencies, institutional consumers, and other companies are all good sources for identifying emerging and existing chemicals of high concern. Examples of chemicals of high concern addressed by downstream users include polyvinyl chloride (PVC), phthalates, brominated flame retardants, Bisphenol A (BPA), formaldehyde, and perfluorinated compounds.

Organizationally, companies may start at Principle #3 by establishing an organizational policy or guideline. In some companies it is easier to work below the radar screen of upper management and take action against a few chemicals of high concern, demonstrate success, then gain organizational support for what was already achieved, and gain approval for an organizational policy. In other companies, high level policies are the first step in driving action across the organization.

Getting to Base Camp and High Camp: Creating Systems for Change

Replicable and scalable systems are essential to moving beyond a handful of chemicals of high concern.

An example of a linked set of systems is:

1. ***Know chemical ingredients in products.*** Examples include using the Health Product Declaration form and Seagate's system for collecting and managing data in products.
2. ***Identify chemicals of high concern.*** Examples include using ChemSec's SIN List and GreenScreen Benchmark 1 Chemicals (as determined using the List Translator).
3. ***Employ a framework for evaluating alternatives.*** Examples include using HP's Integrated Alternatives Assessment Framework and BizNGO's Chemical Alternatives Assessment Protocol.
4. ***Assess hazards of alternatives.*** Examples include using the GreenScreen for Safer Chemicals and Cradle to Cradle Certified.

The questions purchasers at the far end of the supply chain need to ask suppliers are, what are your systems for:

- knowing chemicals in products,
- identifying chemicals of high concern,
- evaluating alternatives, and
- selecting safer alternatives.

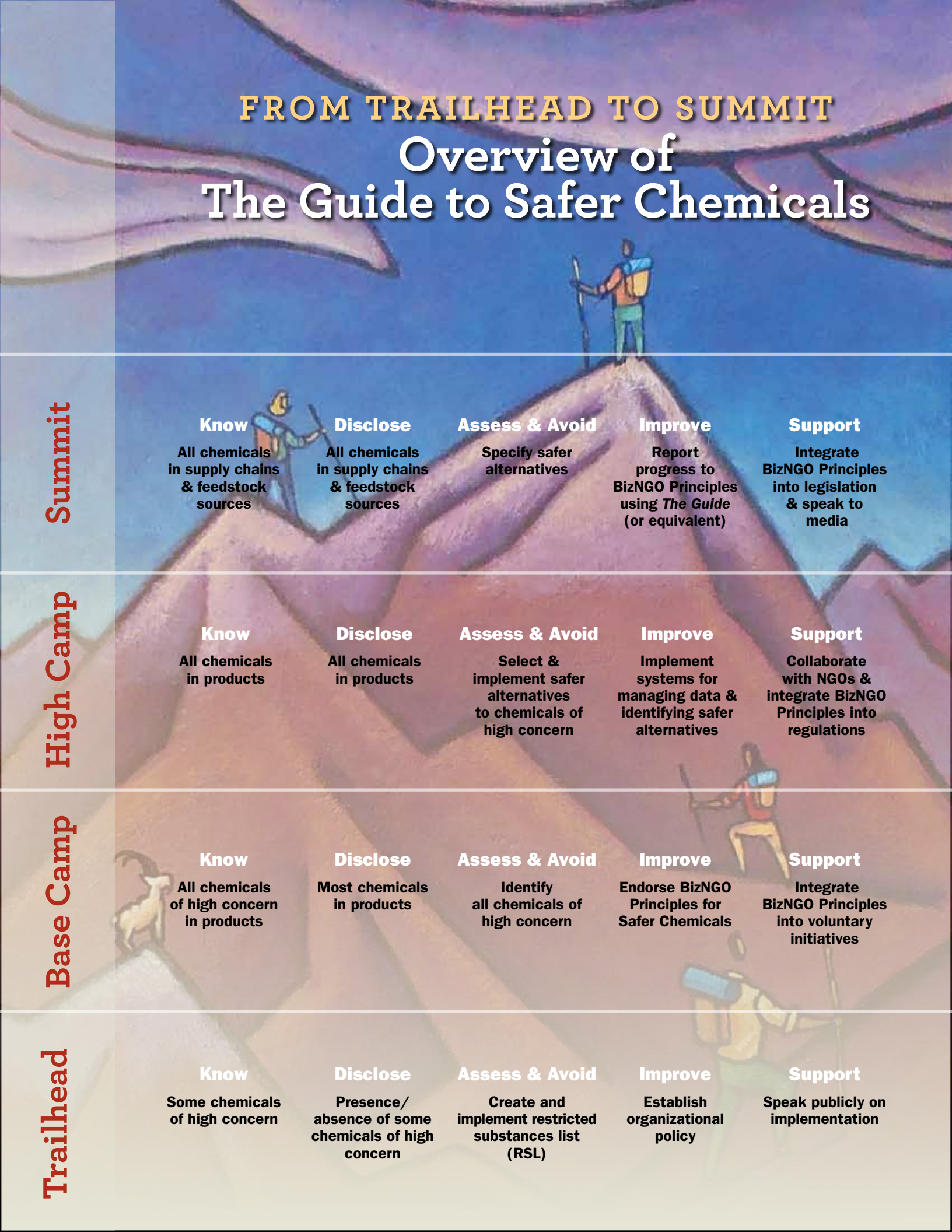
A short version of these questions would be how do you score on the BizNGO benchmarks.

Getting to the Summits: Setting the Compass to Inherently Safer Alternatives

Travelers to the Summits of *The Guide* have set their sights on specifying inherently safer chemicals, materials, and feedstocks across all of their products and supply chains. In looking across companies that are able to come close or reach the Summit for some principles, they share three common elements of success, namely they have the capacity, will, and systems in place to ensure long term adoption and implementation.

Capacity matters. Effectively managing chemicals in products and across supply chains requires technical capacity or staff. Organizations at or near the Summit have access to:

- deep knowledge and understanding of chemicals in products and supply chains, as well as the sources of feedstocks.
- technical capacity and systems for managing data, evaluating alternatives, and selecting and implementing safer alternatives.



FROM TRAILHEAD TO SUMMIT

Overview of The Guide to Safer Chemicals

Summit

Know	Disclose	Assess & Avoid	Improve	Support
All chemicals in supply chains & feedstock sources	All chemicals in supply chains & feedstock sources	Specify safer alternatives	Report progress to BizNGO Principles using *The Guide* (or equivalent)	Integrate BizNGO Principles into legislation & speak to media

High Camp

Know	Disclose	Assess & Avoid	Improve	Support
All chemicals in products	All chemicals in products	Select & implement safer alternatives to chemicals of high concern	Implement systems for managing data & identifying safer alternatives	Collaborate with NGOs & integrate BizNGO Principles into regulations

Base Camp

Know	Disclose	Assess & Avoid	Improve	Support
All chemicals of high concern in products	Most chemicals in products	Identify all chemicals of high concern	Endorse BizNGO Principles for Safer Chemicals	Integrate BizNGO Principles into voluntary initiatives

Trailhead

Know	Disclose	Assess & Avoid	Improve	Support
Some chemicals of high concern	Presence/ absence of some chemicals of high concern	Create and implement restricted substances list (RSL)	Establish organizational policy	Speak publicly on implementation

Will is essential. An effective chemicals management program requires organizational motivation and drive to move beyond legal compliance and maintain that trajectory over time. This comes in many forms, including: organizational mission, internal champions, and organizational policy or guidelines. Some of the most successful organizations on the path to safer chemicals have an internal mission to promote safer chemicals and values consistent with addressing chemicals of concern to human health or the environment.

A clear driver within many leading organizations is the presence of internal champions. Champions have a personal passion for the issue and possess technical or organizing skills that enable them to demonstrate the value of safer chemicals implementation. Internal champions gain organizational support for this work and share many of the characteristics of "tempered radicals:" individuals who are "fundamentally different from, and possibly at odds with, the dominant culture of their organization"; yet "have been toughened by challenges, angered by what they see as injustices or ineffectiveness, and inclined to seek moderation in their interactions with members closer to the centre of organizational values and orientations."[1]

Systems are fundamental. Successful implementation over the long term requires the development and implementation of systems. Systematic procedures are needed to collect and evaluate chemicals and their alternatives, validate data, select and implement safer alternatives, and specify green chemistry solutions. These procedures can be internal, outsourced, or a combination of the two. Leaders in safer chemicals implementation develop procedures that can be implemented over the long term and that are organizationally integrated as part of long term planning.

Systems are fundamental. Successful implementation over the long term requires the development and implementation of systems. Systematic procedures are needed to collect and evaluate chemicals and their alternatives, validate data, select and implement safer alternatives, and specify green chemistry solutions.

The Guide is a Living Resource: Tell Us of Your Journey

Significant insights we learned over the course of writing *The Guide* are:

1. ***Stepping beyond Trailhead requires systems.*** Organizations moving beyond Trailhead have systems in place for managing data, identifying chemicals of high concern, communicating with suppliers, and evaluating and selecting alternatives.
2. ***Having an agreed upon list of chemicals of high concern will accelerate the rapid screening of chemicals.*** The ChemSec SIN List and GreenScreen Benchmark 1 chemicals are readily available solutions. And the GreenScreen List Translator is the quickest route to rapidly identifying GreenScreen Benchmark 1 chemicals (although we must note the conflict of interest of the authors, one of whom is a co-author of the GreenScreen).
3. ***Leveraging the primacy of hazard facilitates priority setting, communicating with suppliers, and selecting inherently safer alternatives.*** The BizNGO Chemical Alternatives Assessment Protocol and the GreenScreen for Safer Chemicals are both well-suited for supporting hazard-based decision making (although note again the conflict of interest of the authors).
4. ***Raising the collective voice of downstream users is critical for growing the broader global movement to safer alternatives to* chemicals of *high concern to human health or the environment.*** Ultimately corporate leaders in safer chemicals will only succeed if their efforts are mainstreamed globally. This will require the insertion of know, disclose, and assess and avoid hazards into public policies, industry standards, ecolabels, certifications, and voluntary sustainability initiatives.

The Guide is a living resource and will evolve over time as we learn more about the challenges and opportunities that organizations face in implementing these benchmarks. If you are a downstream user of chemicals and want to join us on the journey to safer chemicals, please contact us at *TheGuide@bizngo.org*. We look forward to hearing your feedback and experiences.

1 *D.E. Meyerson and M.A. Scully, 1995, "Tempered Radicalism and the Politics of Ambivalence and Change," Organization Science, v.6n.5.*

Introduction

Ray Anderson, a visionary and practitioner of business innovation and environmental stewardship, spoke eloquently of the journey to Mount Sustainability. We designed *The Guide* to be a hands-on resource for all who want to make the journey to the summits of safer chemicals. It charts pathways to safer chemicals in products and supply chains for brand name companies, product manufacturers, architects and designers, retailers, and health care organizations. *The Guide* sets relative benchmarks for each of the four BizNGO Principles for Safer Chemicals, specifies actions for each benchmark, presents examples of business practices for each benchmark, and illustrates how downstream users are getting started and advancing on their paths to safer chemicals.

The Guide emerged from BizNGO's Principles for Safer Chemicals and sets performance benchmarks for each principle by specifying actions and examples to help users get started and advance along the paths to safer chemicals. The four principles are:

1. Know and disclose product chemistry.
2. Assess and avoid hazards.
3. Commit to continuous improvement.
4. Support public policies and industry standards that advance the above three principles.

These four principles emerged from the pioneers in safer chemicals implementation. In looking at best practices across business sectors we saw a common set of actions. Company leaders were identifying chemicals in products and production processes as well as their feedstock sources, assessing the hazards of those chemicals, avoiding chemicals of greatest concern by substituting safer alternatives, disclosing their findings to the public, and advocating for greater adoption of safer chemicals.[1]

The Guide emerged from BizNGO's Principles for Safer Chemicals and sets performance benchmarks for each principle by specifying actions and examples to help users get started and advance along the paths to safer chemicals.

BizNGO[2] then developed the Principles for Safer Chemicals[3] for "downstream users" of chemicals—those organizations that use chemicals by virtue of the products they purchase. In short, a downstream user is any organization that does not manufacture chemicals. Downstream users include: formulators, manufacturers, assemblers, original equipment manufacturers, brands, specifiers (for example, architects), retailers, health care organizations, and ultimately individuals.

Implementing the BizNGO Principles for Safer Chemicals

The question of how to implement the Principles for Safer Chemicals is the inspiration for *The Guide*. As many a potential traveler has said to us: "We agree with the spirit of the BizNGO Principles. But what does it mean to implement them?" The writing of *The Guide* is our initial (v.1.0) answer to that question.

The starting point for *The Guide* is beyond legal compliance. We do not provide details on how to implement programs for compliance with current laws and regulations. We assume organizations are legally compliant and set *The Guide* benchmarks for beyond compliance.

While no organization currently achieves all four Principles, any organization that addresses the use of chemicals in products and production processes beyond compliance is on a path to implementing the BizNGO Principles. Organizations move beyond legal compliance for many reasons. They do so to address consumer demands, to ensure product development stays far ahead of regulations, to grow current markets and capture new markets, and to guide innovation. These

organizations understand the importance of knowing the chemicals in their products. They also proactively outreach to environmental and public health advocates for insights and knowledge, and they demonstrate greater transparency to the public and their employees. They understand the need to change public policies and industry standards to support market moves to safer chemicals, and they create greater value for their brand by using safer chemicals in the products they make and sell.

Traditionally downstream users, especially brands and retailers, have not considered chemicals management as part of their responsibility. But this dynamic is rapidly changing. Downstream users are increasingly being held accountable for the chemical ingredients in their products and the environmental and human health impacts of chemicals in entire supply chains.

Few manufacturers, brands, or retailers are aware of all the chemicals in their products and their supply chains. That may be because chemicals have been popularly associated with "chemical intensive products"—mostly liquid or powder products like paints, cleaning products, detergents, and pesticides. Yet chemicals are very much a part of "hard" products—what the Europeans call "articles"—such as computers, cell phones, chairs, carpets, and clothing. The fact that chemicals are the foundation of every product presents significant management challenges for the vast majority of downstream users who do not know the chemicals in their products or supply chains, do not understand the hazards of those chemicals, or do not know the availability of safer alternatives. But ignorance is no longer tenable and in fact presents a very real business risk. Increasingly downstream users are the ones whose reputation is at risk when toxic chemicals are found in their products and in their stores. *The Guide* will help downstream users avoid this business risk and advance safer chemicals in our economy.

The Benchmarks in *The Guide*

The benchmarks are relative indicators of performance, not absolutes. They are indicators of a progression from relatively easier actions to progressively more challenging and comprehensive actions. Over the course of developing *The Guide*, BizNGO participants discussed many approaches to benchmarking the BizNGO Principles including developing a scoring system. BizNGO may revisit the comparative benefits of a scoring idea in the future, but for today, we offer the benchmarks as relative indicators of performance.

THE BENCHMARKS ADDRESS THE WHOLE LIFE CYCLE OF CHEMICALS ASSOCIATED WITH A PRODUCT. Downstream users of chemicals are downstream because chemicals come to them in a product. The product

FIGURE I-1

Key Stages in the Life Cycle of a Chemical

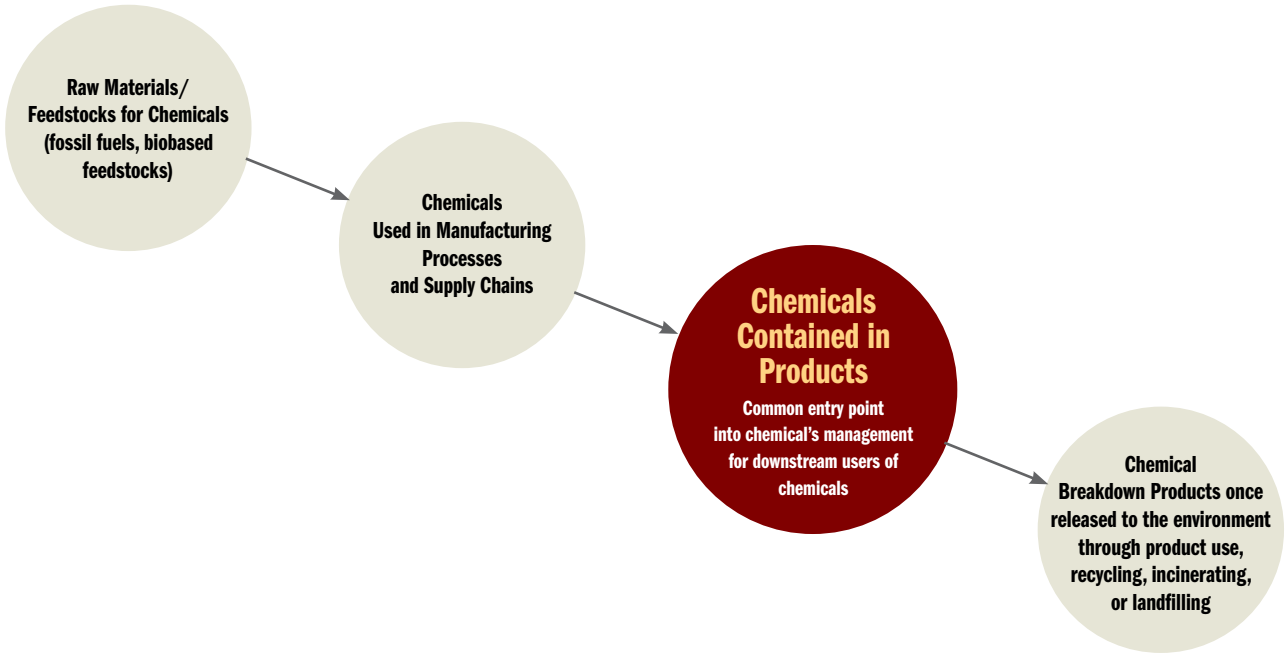


TABLE I-1

Relation of Chemicals along Life Cycle to Benchmarks in *The Guide*

Chemicals along the Life Cycle	BizNGO Guide Benchmarks			
	Trailhead	Base Camp	High Camp	Summit
Chemicals in Products	Chemicals of High Concern: Some	Chemicals of High Concern: All	Chemicals: All chemicals intentionally added to product and residuals of high concern	
Chemicals in Processes and Supply Chains	Chemicals of High Concern: Some		Chemicals of High Concern: All	Chemicals: All chemicals used in maufacturing processes
Feedstocks: The raw materials for a chemical, material, or product				Sources of feedstocks and chemicals used in extraction/growing

comes in many forms depending on where an organization sits in the supply chain. Some downstream users receive products directly from chemical manufacturers while others receive the chemical already embedded in an article. A common issue is that they do not know all the chemical ingredients in that product—be they a manufacturer that receives a chemical formulation or a retailer or health care organization that buys a final product for sale or use. As Figure I-1 illustrates, downstream users are positioned near the end of the lifecycle of chemicals. Upstream to them in the supply chain are a vast array of chemicals used in the various stages of manufacturing processes. This spans the trajectory of what feedstocks were used to actually produce the chemicals (for example, fossil fuels like natural gas or crude oil, or a biobased feedstock like sugar cane) to what chemicals are used in the factories that manufacture the product. Chemical ingredients in a product continue to have impacts not only at the consumption stage but also downstream through the breakdown products that result from the release of these chemicals into the environment through use, recycling, incinerating, or landfilling.

The benchmarks increase in complexity and difficulty as they move upwards from Trailhead, actions commonly taken by organizations first moving beyond compliance, to Summit, actions taken by only a few.

THE BENCHMARKS REQUIRE INCREASING KNOWLEDGE ABOUT A CHEMICAL'S LIFE CYCLE TO MOVE FROM TRAILHEAD TO SUMMIT.

For each of the four Principles, *The Guide* specifies a set of benchmarks based on a hiking analogy. Each principle is benchmarked against clear criteria attributed to Trailhead, Base Camp, High Camp, and Summit. The benchmarks increase in complexity and difficulty as they move upwards from Trailhead, actions commonly taken by organizations first moving beyond compliance, to Summit, actions taken by only a few. Additionally the complexity increases as companies move from a few chemicals of high concern at Trailhead to all chemicals at the Summit.

In *The Guide*, Principle #1 "Know and Disclose Product Chemistry" is divided into two section: Principle #1a, "Know Chemicals across the Life Cycle of Products" and #1b, "Disclose Chemicals across the Life Cycle of Products." Each of the other three principles then has its own set of unique benchmarks for a total of five sections in *The Guide*.

Trailhead in Principles #1a, #1b, and #2 start with chemicals contained in products and for each higher level benchmark the scope of chemicals increases to include manufacturing chemicals and the feedstock sources of chemicals. Table I-1 summarizes where chemicals at each life cycle stage intersect with each benchmark.

Note that Principles #1 and #2 are product specific while Principles #3

TABLE I-2

Principles and their Application to Downstream Users

Principle	Downstream Users to whom The Principles Apply					
	Formulator	Manufacturer	OEM/Brand	Retailer	Specifier	Health Care Organization
#1a Know	●	●	●	●	●	●
#1b Disclose	●	●	●			
#2 Assess & Avoid	●	●	●	●	●	●
#3 Continuous Improvement	●	●	●	●	●	●
#4 Policies & Standards	●	●	●	●	●	●

and #4 apply to the entire organization. A question that emerged within BizNGO for the first two principles was, should we distinguish among the percent of products within an organization that meet the actions specified for each benchmark. For example, companies may start down the path of knowing all chemicals in products with new product launches. Thus for a few products the company knows all the chemicals in the product, but for over 90% of the products, the company does not know all the chemicals in the product. Should it get credit under Action 1a.5—requires suppliers to report all chemicals in products? Within BizNGO we decided not to develop detailed levels of compliance with the benchmarks because they are indicators of activity not standards.

"Chemicals in product" refer to the chemical constituents that encompass the mass of the product, both intentionally added and "residuals of high concern."[4] "Chemicals in process" or synonymously, "chemicals in supply chain" refer to the chemicals used to manufacture a material, a product, or another chemical. "Feedstocks" are the raw materials used to manufacture a chemical, material, or product. Examples of feedstocks include crude oil, natural gas, sheep (for wool), and cotton. Downstream users face increasing challenges to secure chemical knowledge the further up the supply chain they go.

THE BENCHMARKS REQUIRE AN INCREASING SCOPE AND DEPTH OF KNOWLEDGE ABOUT CHEMICAL IMPACTS TO MOVE FROM TRAILHEAD TO SUMMIT.

In *The Guide* we distinguish how each benchmark requires a different depth of knowledge about a chemical's lifecycle stage (products/processes/feedstocks) and the properties and scope of chemicals information. The scope of knowledge required about chemicals increases from "some chemicals of high concern" to "all chemicals of high concern" to "all chemicals."

A "chemical of high concern" is one that meets internationally recognized high hazard properties, namely it is: 1) persistent, bioaccumulative and toxic (PBT); 2) very persistent and very bioaccumulative (vPvB); 3) very persistent and toxic (vPT); 4) very bioaccumulative and toxic (vBT); 5) carcinogenic; 6) mutagenic; 7) reproductive or developmental toxicant; 8) endocrine disruptor; or 9) neurotoxicant. "Toxic" (T) includes both human toxicity and ecotoxicity. "All chemicals of high concern" are all chemicals that qualify as GreenScreen Benchmark 1. There are close to 2,000 chemicals that meet the GreenScreen Benchmark 1 criteria.

"Some chemicals of high concern" refer to various lists of chemicals of high concern, including a company-specific restricted substance list (RSL) that includes some but not all known chemicals of high concern. RSLs range in scope from just a handful of chemicals to hundreds of chemicals (for example, ChemSec's SIN List).

"All chemicals" denotes all chemical constituents in a product, process, or feedstock, and includes all intentionally added chemicals and residuals of high concern.

In general each Principle applies to each downstream user as highlighted in Table I-2. However, Principle #1b "disclose chemicals in products," which requires the downstream user to provide information to the public,

is not directly applicable to some downstream users (such as retailers, specifiers, and health care organizations) when it is product specific information. For example, health care organizations cannot be expected to provide chemical information in every product in a hospital to every patient. Health care organizations as well as architects and retailers can prefer suppliers that provide information directly to the public through product labels or online. In comparison, Principle #1a "know chemicals in products," applies to all downstream users as part of business to business information exchange (B2B).

The Uses and Structure of *The Guide*

The Guide is for brand name companies, retailers, and other downstream users of chemicals that are implementing, or plan to implement, a program to advance safer chemicals in their products and supply chains. Users of *The Guide* will learn how to:

- measure internal performance, identify areas of improvement, and track progress to safer chemicals.
- benchmark performance in comparison to other organizations.
- communicate to the public their organization's performance in moving to safer chemicals based on an independent metric.

The first five sections of *The Guide* address each of the BizNGO Principles in detail, with Principle #1 divided into two sections as noted above. Each Principle is explained by its: Ideal, Intent, Context, Benchmarks, and Vignettes. The "ideal" is the visionary goal. The "intent" is the purpose of the Principle or what it strives to achieve. The "context" is the practical reality in which the Principle sits. The "benchmarks"—Trailhead, Base Camp, High Camp, and Summit—are relative guide points on the path to each Principle. The benchmarks are relative rather than absolute because they are indicative of key actions, but their relevance will vary depending on organization and sector. The "vignettes" are short, detailed examples of best practices for each Principle.

The Guide closes with a summary section on steps downstream users are taking to advance safer chemicals in products and supply chains.

Introduction Endnotes

1 T. Greiner, et al, 2006, *Healthy Business Strategies,* Clean Production Action, *http://www.cleanproduction.org/library/CPA-HealthyBusiness-1.pdf* (accessed November 18, 2012).

2 BizNGO is a collaboration of downstream users of chemicals who promote the creation and adoption of safer chemicals and sustainable materials in a way that supports market transitions to a healthy economy, healthy environment, and healthy people, *www.bizngo.org* (accessed November 20, 2012).

3 "The Principles for Safer Chemicals" were originally titled "The Guiding Principles for Chemicals Policy."

4 A "residual of high concern" is a chemical that is incidental to manufacturing. Residuals are not part of the intended chemical product, but are present because of factors such as the nature of the synthesis and engineering pathways used to produce the chemical. Residuals include: unintended by-products of chemical reactions that occur in product formulation and chemical synthesis, impurities in an ingredient that may arise from starting materials, incompletely reacted components and degradation products. A residual is a "residual of high concern" if it qualifies as a Green Screen benchmark "red" (or benchmark 1) chemical.

PRINCIPLE #1A

Know Chemicals across the Life Cycle of Products

In Principle #1 of the BizNGO Principles for Safer Chemicals—Know and Disclose Product Chemistry—"know" refers to the sharing of chemical information from business-to-business and "disclose" refers to the reporting of chemical information to the public. "Knowing" the life cycle chemistry of a product includes knowing the: 1) feedstocks: sources of and chemicals used in extraction and processing; 2) chemicals in processes: chemicals used across the supply chain in manufacturing processes; 3) chemicals in product: chemicals contained in the product; and 4) by-products that can form during the degradation[1] of the chemical at any point in its life cycle, including end of life management.

Ideal for Knowing Chemicals

The ideal situation is that manufacturers or suppliers know all the feedstocks used to manufacture the chemicals contained in their product, all the chemicals used in the manufacturing processes of suppliers, all the chemicals in all their products, and all the breakdown chemicals that are of concern to human health or the environment. In tandem, buyers of products will request this data from their suppliers. See box for Principle #1 as stated in the Principles for Safer Chemicals.

Intent for Knowing Chemicals

Knowing the chemicals in products, manufacturing processeses and feedstocks is foundational to advancing safer chemicals in products and supply chains. After all, how can an organization know the chemicals of high concern in its products or supply chains if it does not know all the chemicals in its products or supply chains? The intent of knowing feedstocks, chemicals in manufacturing processes, chemicals in products and chemical breakdown products is that this knowledge is at the foundation of action to safer chemicals. However, knowing all the above is a massive undertaking and therefore can only be achieved in steps. BizNGO Principle #1a in application does not mean companies must know every single aspect of the chemistry of a product across every stage of the product's life cycle. But the application of Principle #1a does mean that companies commit to continuously improving their understanding of the whole chain of chemicals associated with their operations, from feedstocks to manufacturing processes and chemicals contained in products.

PRINCIPLE #1:

Know and Disclose Product Chemistry

Manufacturers will identify the substances associated with and used in a product across its lifecycle and will increase the transparency of the chemical constituents in their products, including the public disclosure of chemicals of high concern. Buyers of products will request product chemistry data from their suppliers.

Context for Knowing Chemicals

Best practices today vary across downstream users of chemicals. Some organizations, especially formulators[2] of products, such as cleaning products, know all or at least the vast majority of the chemicals in their products because they specify those ingredients. For some functions in a formulated product, such as a fragrance, formulators may not know the ingredients because they specify a scent they want and suppliers create that scent but do not reveal the chemical ingredients. At the product or "article" level,[3] knowledge of chemicals in products is growing. Leading examples include Seagate and Google in the electronics/information technology (IT) sector; Construction Specialties, Shaw, Interface, and others in the building product sector; and the automotive sector through its Interna-

Knowing the chemicals in products, manufacturing processes, and feedstocks is foundational to advancing safer chemicals in products and supply chains.

tional Material Data System. Purchasers of products, such as in the health care sector, do not know the chemicals in their products but increasingly expect and request manufacturers to know the chemicals in their products and the chemicals in the manufacturing processes of their suppliers.

Barriers abound to collecting data on chemical ingredients in products and processes, including:

- confidential business information claims,
- complex supply chains where manufacturers have little technical knowledge and technical capacity,
- lack of systems for easily sharing data along the supply chain,
- volume of data that must be managed for those far down the supply chain, especially for original equipment manufacturers (OEMs), brands, retailers, and health care organizations, and
- no listing of chemicals of high concern at low levels among chemical ingredients.

Downstream users are often frustrated by confidential business information claims that block access to information on chemicals in products and processes. Frequently downstream users only know what may not be in their products, such as "BPA-free" or "PVC-free." Chemical ingredient transparency in products is an essential element in implementing a comprehensive chemical management program for downstream users. While this is especially true of chemicals of high concern to human health or the environment, downstream users ultimately need to know the identity of all chemical ingredients in products. Thus increased transparency is needed for all products up and down the supply chain.

Another challenge to sharing data on chemicals is being clear on what "knowing" chemicals in products means. With the increasing sophistication of measurement equipment, chemical concentrations can be measured at very minute levels, including at parts per billion or parts per trillion levels. In general, BizNGO takes the perspective that companies should know all intentionally added chemicals in the product (or at the level of 100 parts per million or 0.01% by weight of the product) and levels of residuals of high concern[4]—such as 1,4-dioxane—determined on a case-by-case basis.

Chemical ingredient transparency in products is an essential element in implementing a comprehensive chemical management program for downstream users.

An outcome of implementing a program to know chemicals in products and processes is that knowledge of chemicals in products will increase up and down the supply chain. Knowing the source of chemical constituents may help downstream users to predict potential contaminants. For example, chlorine produced in a chlor-alkali plant using a mercury cell process will contain trace amounts of mercury.

Benchmarks to Knowing Chemicals in Products, Processes, and Feedstocks

Figure 1a–1 depicts four benchmarks beyond compliance to knowing chemicals in products, processes, and feedstocks, with additional actions related to the auditing and validation of data. The trajectory of the benchmarks (beyond meeting regulatory requirements at Baseline) progresses from knowing a little about chemicals of high concern in products or processes at Trailhead to knowing all chemicals in products at High Camp and then continuing up to the Summit where companies know all chemicals in processes and feedstocks. Based on these criteria, Seagate, which is highlighted on page 18 in the Vignette section, is at High Camp.

The Principle #1a benchmarks apply to all downstream users, from formulators to manufacturers to specifiers to purchasers. The language in the benchmarks is not perfectly aligned to every sector. Architects, for example, are specifiers of products. They can "request" information from suppliers, but cannot require it. For simplicity purposes, we use the verb "require" but recognize that for specifiers it is "request."

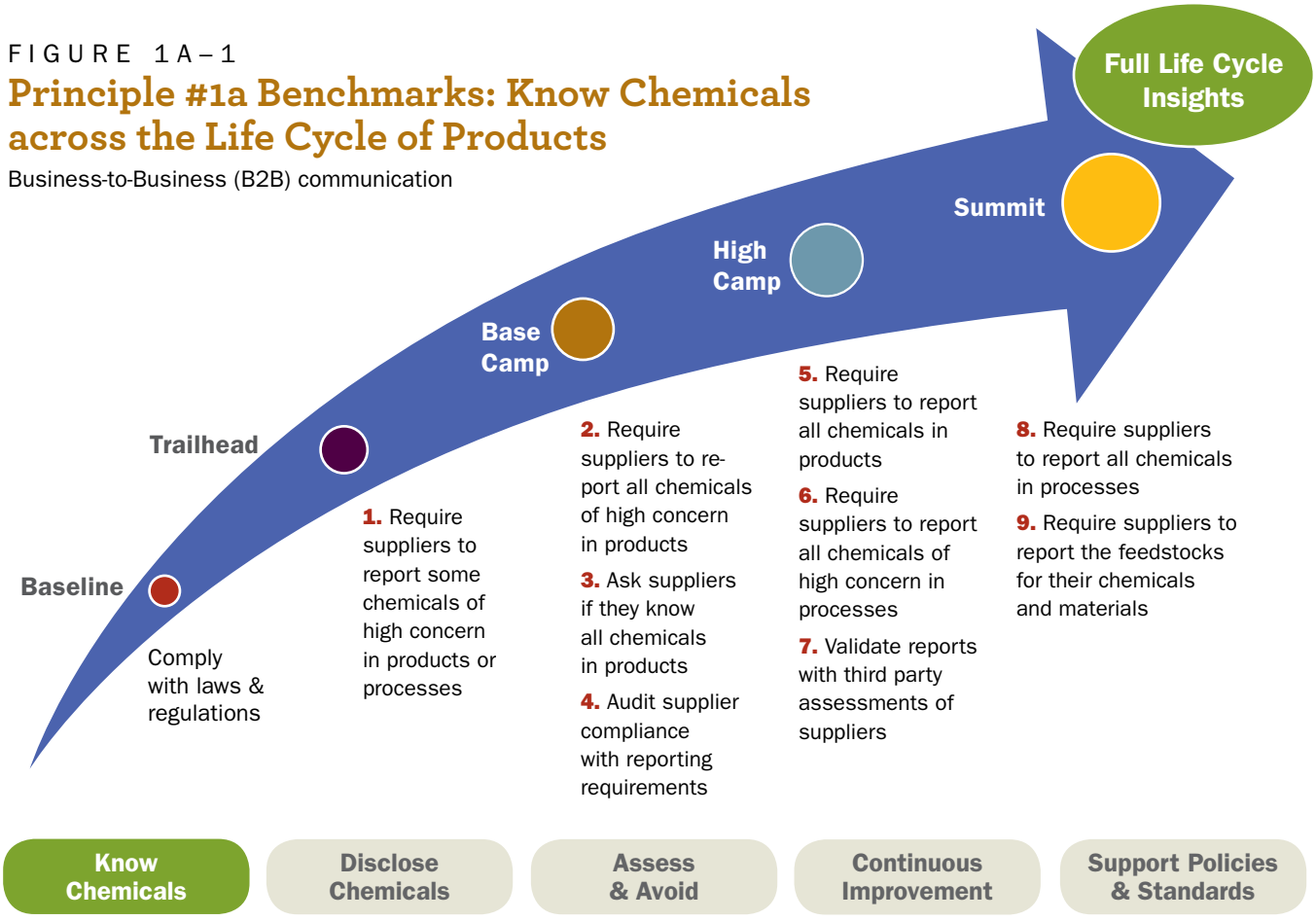
BizNGO is agnostic as to how organizations acquire data and the benchmarks do not specify how organizations should manage data. Companies may collect data themselves or they may rely on third parties to collect, manage, and/or assess the data. Seagate, for example, collects and manages the data itself whereas automotive companies rely on a third party system, the International Material Data System or IMDS.

Purchasers far down the supply chain, like health care organizations, have multiple options. They can ask or require that suppliers provide the data upon request, provide the data to third parties, or require intermediaries like group purchasing organizations to manage the data for them.

FIGURE 1A–1

Principle #1a Benchmarks: Know Chemicals across the Life Cycle of Products

Business-to-Business (B2B) communication



Baseline

Baseline denotes compliance with all laws and regulations, such as knowing whether your electronic product is compliant with the European Union Restriction of Hazardous Substances (RoHS) Directive.

Trailhead

1a.1—*Action:* Require suppliers to report whether a product contains, or a process uses, a specified list of chemicals of high concern—such as those on a company restricted substances list (RSL).

NOTE: RSLs typically start from regulatory compliance and expand beyond to include chemicals likely to be regulated as well as those of concern to customers. RSLs vary in scope, ranging from a few chemicals to a few hundred, such as those on ChemSec's Substitute It Now (SIN) List or the list of chemicals maintained as part of California's Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986. Here is a short list of examples of beyond compliance RSLs.

EXAMPLES

BUILDING SECTOR

The architectural firm Perkins+Will uses three lists of chemicals of high concern to guide its material and product specifications: Precautionary List, Asthma List, and Flame Retardants List. The Precautionary List includes over 25 substances "commonly found in the built environment that have been classified by regulatory entities as being harmful to the health of humans and/or the environment." The Asthma List "identifies asthmagens—substances that induce the chronic condition of asthma—commonly found in the built environment. This list is a compilation of substances that have identified human health impacts in the manufacturing, installation, and removal processes, as well as in the existing built environment." The Flame Retardants List "catalogs flame retardants found in the built environment. A comprehensive list providing in-depth knowledge of flame retardants, this tool is primarily informational and educational, and helps users understand not only where

FIGURE 1A–1

Principle #1a Benchmarks: Know Chemicals across Life Cycle

Trailhead (CONTINUED)

flame retardants are found in the built environment, but also if identified toxicity levels have a potential impact on human health."

The Living Building Challenge is a building certification program developed by the International Living Future Institute. Their Red List includes 14 chemicals or classes of chemicals, including halogenated flame retardants, polyvinyl chloride (PVC) plastic, formaldehyde, and phthalates.[5]

Google maintains a red list of chemicals not to be used in its building. It includes chemicals on the U.S. Environmental Protection Agency's (EPA) chemicals action plans list and the Living Building Challenge's Red List noted above.

HEALTH CARE

Practice Greenhealth's Standardized Environmental Questions for Medical Products includes eight questions on chemicals in products. The questions are for Group Purchasing Organizations (GPOs) to use in identifying more environmentally preferable products. GPOs using the PGH's Standardized Questions include Novation and Premier.

To meet the Healthier Hospitals Initiative (HHI)—Safer Chemicals Challenge hospitals will need to know whether medical devices contain polyvinyl chloride (PVC) and di-2-ethylhexyl phthalate (DEHP); and if furniture contains halogenated flame retardants, formaldehyde, perfluorinated compounds, and PVC. HHI is a national campaign to implement environmental health and sustainability initiatives in the health care sector.

ELECTRONICS

Hewlett Packard (HP) has set goals to phase out a handful of chemicals beyond regulatory compliance including: brominated flame retardants, PVC, DEHP, dibutyl phthalate (DBP), and butyl benzyl phthalate (BBP) in newly introduced personal computing products. It reports on meeting these goals in the Global Citizenship section of its website

Developed by the Consumer Electronics Association (CEA), the Joint industry Guide represents industry-wide consensus on the relevant materials and substances that shall be disclosed by suppliers when those materials and substances are present in packaging that is used to transport and protect electrotechnical products.

APPAREL

The Apparel & Footwear International RSL Management Group (AFIRM Group) maintains a list of potentially harmful substances relevant to the apparel and footwear sectors. The list is for voluntary use and may be adopted in part or full by companies in the sector. It is not an industry standard.

Levi Strauss & Co.'s RSL identifies the chemicals it will not allow in its products or manufacturing processes due to "their potential impact on consumers, workers, and the environment." The RSL is a mix of chemicals for which Levi Strauss & Co. is legally required to comply with as well as chemicals that are beyond regulatory compliance.

THIRD PARTY DATABASES ON RESTRICTED AND DECLARABLE SUBSTANCES

Electronics sector: BOMcheck.net is a proprietary database used by a range of OEMs (including Philips) and their suppliers. BOMcheck enables suppliers to generate and maintain substance declarations in a central location that manufacturers can easily access. Suppliers report on the BOMcheck List of Restricted and Declarable Substances, which is a mix of regulated and likely to be regulated chemicals as well as chemicals of high concern to OEMs.

Automotive sector: the International Material Data System (IMDS) provides a common method for identifying materials, substances, and attributes of products in the automotive supply chain. It is an online database that allows suppliers to enter information on product content, recyclability, and reuse. It includes, the Global Automotive Declarable Substance List (GADSL), which is a single common list for reporting substances that are regulated, projected to be regulated, or scientifically demonstrated to be of "significant risk to human health and/or to the environment."

RSL RESOURCE

In addition to the RSL resources referenced above another useful resource is the Green Chemistry and Commerce Council report, "An Analysis of Corporate Restricted Substance Lists (RSLs) and Their Implications for Green Chemistry and Design for Environment" (2008).

Base Camp

1a.2—*Action:* Require suppliers to report all chemicals of high concern in their products.

NOTE: In this action suppliers report all chemicals that meet a broad, yet common metric for a chemical of high concern—such as meeting the criteria for GreenScreen Benchmark 1 chemicals. A quick list of GreenScreen Benchmark 1 chemicals can be generated using the GreenScreen List Translator. This action is more ambitious than Action 1a.1 because it generates a significantly larger list of chemicals of high concern (approximately 2,000 chemicals) and moves suppliers beyond a list based approach to an approach based on comprehensive hazard criteria and screening of chemicals.

EXAMPLE

The BioSpecs for Food Service Ware (v1.0) is a tiered set of criteria—bronze, silver, and gold—for environmentally preferable compostable biobased food service ware. To achieve the gold level products cannot contain any intentionally added chemicals of high concern. Buyers will therefore need to ask their suppliers if the materials contain any chemicals of high concern. Developed by the Sustainable Biomaterials Collaborative, the no chemicals of high concern criterion relied on a precursor to the GreenScreen List Translator—the Clean Production Action/Healthy Building Network "Red List of Chemicals."[6]

1a.3—*Action:* Ask suppliers if they know all the chemicals intentionally added to their product plus all residuals of high concern that are present in the product

NOTE: This means "asking" suppliers if they have the data—it is not a requirement that suppliers provide the data. The purpose of this Action is to signal to suppliers the expectation that they should know all the chemicals in products.

EXAMPLE

Practice Greenhealth's Standardized Environmental Questions for Medical Products includes among its "environmental attributes for future consideration" the question: Does your company know "all the intentionally added chemicals and materials in this product."

1a.4—*Action:* Audit supplier compliance with reporting requirements.

NOTE: Common actions for auditing compliance include: 1) trusting that information provided by the supplier is accurate; 2) "auditing" by reviewing all forms and ensuring all boxes are filled in correctly; 3) requiring that suppliers test products in approved labs and provide the results of that testing; 4) randomly testing products to ensure they are in compliance; and 5) hiring a third party to verify information provided by the supplier. Supply chain auditing is a common function for businesses and is increasingly applied to any environmental and social sustainability claim made by a supplier.

High Camp

1a.5—*Action:* Require suppliers to report all intentionally added chemicals in products and residuals of high concern.

NOTE: The baseline level of reporting should be 100 ppm for intentionally added chemicals, with lower thresholds specified for residuals of high concern. A commonly used option is to hire third parties to collect, manage, validate, and/or assess the data.

EXAMPLES

Seagate: See "Knowing Chemicals" Vignette #2, page 18.

Google requires suppliers of building products to provide it with "comprehensive product ingredient information from every point in the supply chain."

Third party compiles data on chemicals in product from suppliers and holds this information confidential:

- Cradle to Cradle Certified: For products to receive the "Basic" level[7] of certification in Cradle to Cradle Certified, all chemicals in the product must be identified down to 100 ppm (0.01%) by weight. Companies whose products are Cradle to Cradle Certified usually do not know all the chemicals in their products. Instead MBDC, a consulting firm that certifies products, collects the chemical ingredient data from suppliers,

FIGURE 1A–1

Principle #1a Benchmarks: Know Chemicals across Life Cycle

High Camp (CONTINUED)

holds the data confidential, and evaluates and ranks the chemicals according to its own hazard and exposure criteria.

- GreenWercs (a product of The Wercs): Companies who manufacture formulated products for retail sale (for example, cleaning products, automotive products, cosmetics, and personal-care products) submit complete chemical ingredient data for each product to The Wercs. The Wercs then assesses the chemical ingredient data based upon a scoring system discussed in Principle #2. Retailers can then access a product score but do not know the chemicals in the product.

A step towards knowing chemicals in manufacturing processes for OEMs and brands is to collect generic data on chemicals likely to be in products. For example, HP has generated for internal use chemical content models for major product classes.

1a.6—*Action:* Require suppliers to report all chemicals of high concern in manufacturing processes.

EXAMPLES

Bluesign certifies textile manufacturers, chemical suppliers, and other production sites in the textile supply chain to its standard which addresses resource productivity, consumer safety, air emissions, water emissions, and occupational health and safety. Bluesign uses risk assessment to set usage bans for some chemicals (for example, benzidine) and limit values for other chemicals. The extent to which Bluesign collects information (beyond material safety data sheets—MSDSs) on every chemical ingredient in a formulated product, such as a dye, is unclear. At a minimum, Bluesign uses MSDSs to identify chemicals of high concern in manufacturing. Suppliers who meet the Bluesign standard then report this to brands.

Seventh Generation is developing a comprehensive program, as described in Action 1a.9 below, for identifying chemicals of concern from feedstocks to manufacturing processes to final product.

1a.7—*Action:* Third party validation of claims of suppliers on chemicals in products or in processes.

NOTE: End users are increasingly validating chemical ingredients in their products (through third party testing) and to a lesser extent in the manufacturing processes of their suppliers.

EXAMPLES

Levi Strauss & Co. requires its suppliers to:

- "Verify RSL compliance through laboratory testing."
- "Validate only materials and chemicals meeting the RSL requirements."
- Communicate with chemical sources, "ensuring they are aware of all the chemicals and other goods that they supply have to comply with the prohibitions and restrictions listed in the RSL."[8]

For Nike, "testing materials is mandatory" and includes "routine testing by vendor (material supplier)" and "random testing by factory" at Nike approved laboratories.[9]

Seagate uses a third party to check and audit reports and supporting documentation (see "Knowing Chemicals" Vignette #2, page 18).

Summit

1a.8—*Action:* Require suppliers to report all chemicals in their manufacturing processes.

EXAMPLES

Levi Strauss & Co. is heading in this direction with their requirement that suppliers:

- "Request Material Safety Data Sheets (MSDS) from your chemical sources for every chemical purchased."
- "Understand all the chemical inputs" into their production processes.
- "Document all finishing/printing formulations."[10]

While Levi Strauss & Co is not requiring its suppliers to report all chemicals in production processes, the company is signaling that they need to know this information.

A step for OEMs and brands towards knowing chemicals in manufacturing processes is to collect generic data on the manufacturing processes of suppliers. For example, the Joint Roadmap towards Zero Discharge of Hazardous Chemicals will develop a comprehensive inventory of chemicals used in apparel/footwear manufacturing (see "Knowing Chemicals" Vignette #1, page 18).

See Seventh Generation example under Action 1a.9.

1a.9—*Action:* Require suppliers to report the sources of the feedstocks and chemicals used to manufacture chemicals in the product (for example, if biobased, determine the source of the biological feedstock and the pesticides used to grow the crop).

EXAMPLES

Seventh Generation addresses Actions 1a.6, 1a.7, and 1a.8 as well this Action with its 2014 goal of identifying all toxic chemicals used or produced in creating cleaning products. It started down this path by studying the chemical life cycle of sodium lauryl sulfate (SLS). Palm fruits and coconuts from Indonesia and Malaysia are the raw materials for Seventh Generation's SLS. Coconut and palm kernel oils are processed into lauryl alcohol and then into SLS. Starting with the agricultural chemicals that might be found on palm or coconut plantations, Seventh Generation examined the chemical inputs, outputs, and impurities that might be problematic. The company identified key chemicals of concern—the use of methanol as a catalyst in the conversion of coconut and palm kernel oils to lauryl alcohol, and sulfur trioxide, which is used in processing the lauryl alcohol into SLS.[11] Note that Seventh Generation did not require suppliers to report the data, rather it collected the data independently.

Nike's Materials Sustainability Index (MSI) is possibly the most ambitious effort to date to integrate life cycle chemistry into the evaluation of materials. It addresses both feedstock chemistry as well as production process chemistry. As Nike states:

- "Nike MSI evaluates both naturally sourced (plant-, animal- or mineral-based) and synthetic (fossil–fuel-based) textiles and component part materials. When we started to build the material evaluation structure for Nike MSI, little or no standardized environmental data was available for many of the materials used in Nike products, especially data on the full supply chain. For some materials, details about the supply chain may be well characterized. For other materials, little is known about specific aspects of the supply chain or about specific suppliers' environmental performance, and the material is characterized generically."[12]
- "The Chemistry algorithm assesses significant chemical substances across the cradle-to-gate life cycle. For polymers, significant chemical substances are those substances present in the principal reactions, including known catalysts, from the raw material source through polymer formation. For bio-based agricultural materials, significant chemical substances are the typical pesticides used in cultivation. For yarn and textile processes, we define them as the typical minimum processing chemistry at each manufacturing stage."[13]
- "Chemistry is evaluated in two phases for each material:
  - For most textiles, Phase 1 spans the origin of raw materials to a cone of yarn. Phase 2 spans greige fabric through finished textile.
  - For components, such as molded parts, foams and buttons, Phase 1 spans the origin of raw materials to the formation of the basic material (e.g., polymer pellets). Phase 2 covers additional processes that transform the basic material into the materials that are shipped to an assembly facility (e.g., processing pellets into a foam)."[14]
- "We calculate scores for the two phases independently and then average them to derive an overall score. There is a greater likelihood for high-hazard materials to be present in Phase 1 (such as the use of pesticides in agriculture and benzene, phosgene and toluene in polymer production) compared to Phase 2 (with the use of dyestuffs and auxiliaries in dyeing, and water or carbon dioxide in foam blowing). Nike uses two phases to ensure that the Chemistry impacts of Phase 1 do not totally overshadow the Chemistry of Phase 2 and to provide visibility into areas where we can seek improvement."[15]

KNOWING CHEMICALS: **VIGNETTE 1**

Joint Roadmap towards Zero Discharge of Hazardous Chemicals (ZDHC)

The Joint Roadmap towards Zero Discharge of Hazardous Chemicals (ZDHC) is possibly the most ambitious sector-based initiative to address chemicals of high concern in products and processes. In 2011, under pressure from Greenpeace, a group of major apparel and footwear brands and retailers made a shared commitment to lead the industry towards zero discharge of hazardous chemicals by 2020. "Zero discharge" is defined as the "Elimination of all releases, via all pathways of release, that is, discharges, emissions and losses, from our supply chains and our products. In light of the increasing sophistication of analytical tools and methods, references to 'elimination' or 'zero' must be understood as 'not above background concentration' rather than 'not detectable.'" The ZDHC includes specific commitments and timelines to realize this shared goal.

Implementation of ZDHC will bring apparel and footwear companies close to the Summit for Knowing Chemicals, in terms of knowing both chemicals in products and processes.

Implementation of ZDHC will bring apparel and footwear companies close to the Summit for Knowing Chemicals, in terms of knowing both chemicals in products and processes. Requirements of the ZDHC that relate to knowing chemicals in products and processes include:[16]

- "Develop a comprehensive, generic inventory of chemicals used in textile manufacturing."
- "Develop a joint generic audit approach for environmental performance (including chemicals management)."
- "Develop shared approach with third party for dye house and printer audit."
- "Within legal confines, develop a program to incentivize suppliers to fulfill the dye house and printer audit protocol."
- "Convene cross sector group to explore the best ways to encourage sector wide supplier chemical disclosure and deliver a study based on data collection from a select group of facilities."
- "Explore platform options for suppliers to disclose their chemical inventory under the assumption that disclosing their inventory will have a positive effect."

The only element of the "Know Summit" that the ZDHC does not address is, knowing feedstocks and their associated chemicals.

KNOWING CHEMICALS: **VIGNETTE 2**

How Seagate Knows Chemicals in Products

A model for knowing chemicals in products is Seagate's approach to collecting, managing, and verifying chemical and material ingredient information from suppliers. Seagate, the world's largest manufacturer of disk drives, is demonstrating how a business can collect and manage full disclosure of chemicals in products from its suppliers. While Seagate has yet to reach 100% disclosure of all chemicals in all products, it has made major headway toward this goal and has a system in place to manage the chemicals information it collects from their suppliers.

Key elements of Seagate's approach are that it:

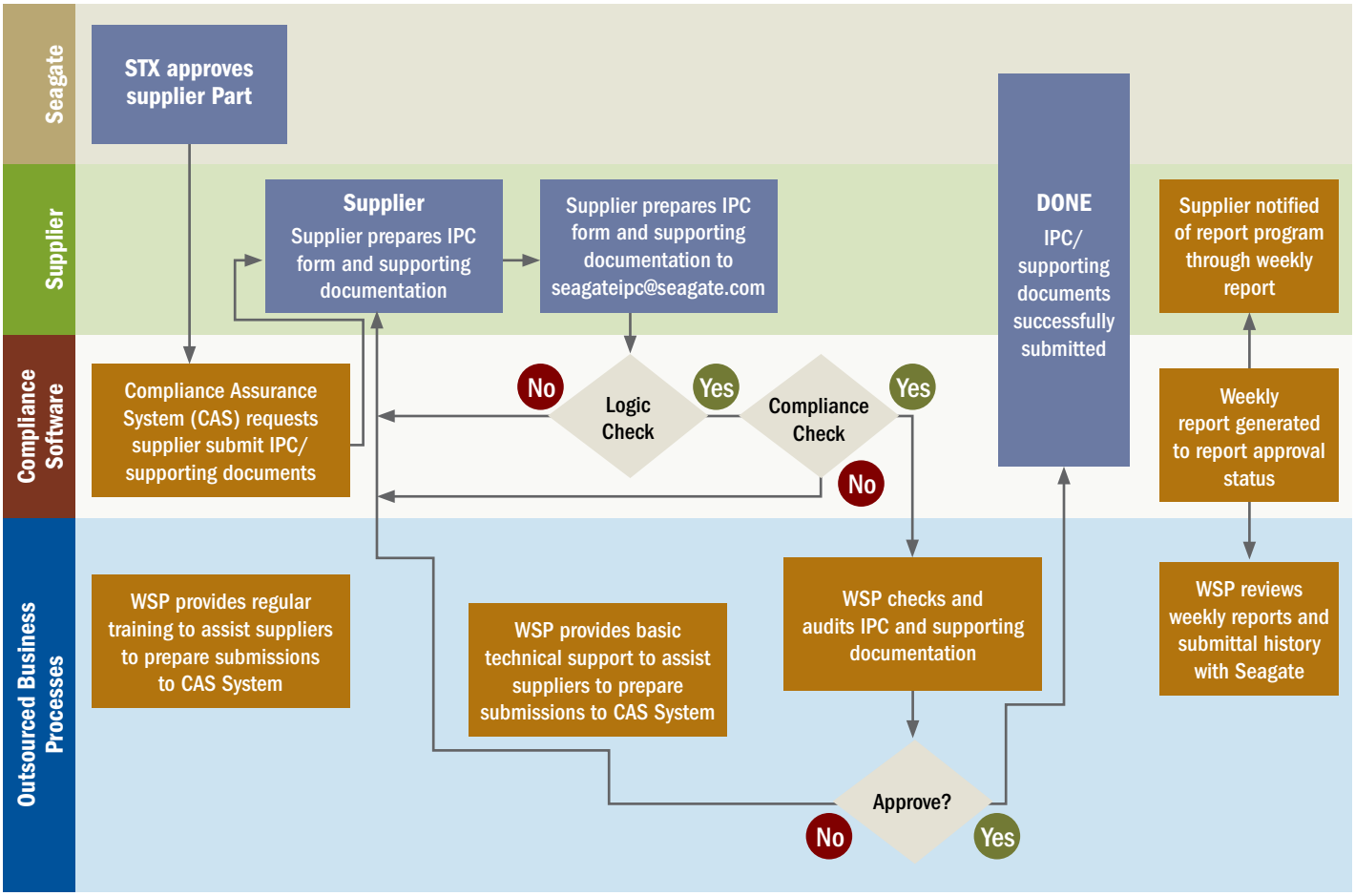
- Requires full disclosure of chemicals and materials in products by suppliers (bill of substances). Full disclosure is used by Seagate to manage compliance to changing regulations and customer specifications.
- Is highly automated, using software tools to align with the electronics sector's reporting standard as defined by IPC 1752—an open, industry data standard, not a Seagate-specific format. Software automation is used to gather and manage data and grade compliance.
- Ties compliance data with product launch requirements.
- Includes third party review and audit.
- Enables transparency to Seagate from suppliers and enhances Seagate's credibility with customers.

Figure 1a-2 illustrates Seagate's system for collecting, maintaining, and validating chemical and material data from suppliers. The system is highly automated, easy to use, and is managed by an outside organization.

Seagate currently does not have a similar system for collecting information on chemicals in processes. It has started to collect "feedstock" data to ensure compliance with Dodd-Frank Section 1502 on Conflict Minerals. Dodd-Frank requires companies whose products contain tin, tantalum, tungsten, and gold to verify that those minerals do not come from the Democratic Republic of the Congo or an adjoining country, and if so, to provide a report describing the "measures taken to exercise due diligence on the source and chain of custody of those minerals, which must include an independent private sector audit of the report that is certified by the person filing the report."[17]

FIGURE 1A–2

Seagate's System for Collecting and Managing Chemical and Material Disclosure from Suppliers



Source: Courtesy of Seagate

Principle #1a Endnotes

1 We use "degradation" broadly to refer to any transformation of chemical compounds by any means, including living organisms and sunlight. A narrower scope is "biodegradation", which the U.S. EPA defines as: "A process by which microbial organisms transform or alter (through metabolic or enzymatic action) the structure of chemicals introduced into the environment," *http://toxics.usgs.gov/definitions/biodegradation.html* (accessed November 11, 2012).

2 "Formulators" mix or blend chemical ingredients by prescribed formulation to create chemical blends with specific characteristics. Formulators include companies that supply industry with blends of chemicals for common or specialty jobs, as well as companies that manufacture final products. Method and Seventh Generation are examples of formulators manufacturing cleaning products.

3 An "article" as defined by Article 3(3) of the REACH regulation is "an object which during production is given a special shape, surface or design which determines its function to a greater degree than its chemical composition" (REACH, Article 3(3), *http://www.reachonline.eu/REACH/EN/REACH_EN/article3.html* (accessed November 11, 2012).

4 A residual of high concern is a chemical that is incidental to manufacturing. Residuals are not part of the intended chemical product, but are present because of factors such as the nature ofthe synthesis and engineering pathways used to produce the chemical. Residuals include: unintended by-products of chemical reactions that occur in product formulation and chemical synthesis, impurities in an ingredient that may arise from starting materials, incompletely reacted components and degradation products. A residual is a "residual of high concern" if it qualifies as a Green Screen benchmark "red" (or benchmark 1) chemical.

5 See *http://living-future.org/sites/default/files/LBC/LBC_Documents/LBC%202_1%2012-0501.pdf*, p. 28 (accessed November 3, 2012).

6 See *http://www.bizngo.org/resources.php*—"Safer Chemicals"—"Red List of Chemicals," (accessed November 11, 2012).

7 Cradle to Cradle certifies to four levels: basic, silver, gold, and platinum.

8 See *http://levistrauss.com/sites/levistrauss.com/files/librarydocument/ 2012/7/rsl-2012.pdf*, p. iv (accessed November 3, 2012).

9 See *http://www.nikeresponsibility.com/report/uploads/files/NIKE_INC_Restricted_Substances_Guidance_Aug_2011.pdf*, p. 15 (accessed November 3, 2012).

10 See *http://levistrauss.com/sites/levistrauss.com/files/librarydocument/ 2012/7/rsl-2012.pdf*, p. iv (accessed November 3, 2012).

11 Paraphrased from *http://www.seventh generation.com/mission/healthy-products/seed-shelf* by Martin Wolf (accessed November 11, 2012).

12 See *http://www.apparelcoalition.org/storage/Nike_MSI_2012_0724b.pdf*, p. 13 (accessed November 3, 2012).

13 Ibid, p.15.

14 Ibid.

15 Ibid, pp. 15–16.

16 The following bulleted quotes are from: *Joint Roadmap: Toward Zero Discharge of Hazardous Chemicals,* Draft for Consultation, November 15, 2011, p. 10, *http://www.roadmaptozero.com/joint-roadmap.php* (accesed November 20, 2012).

17 See *http://www.sec.gov/spotlight/dodd-frank/speccorpdisclosure.shtml* (accessed October 27, 2012).

PRINCIPLE #1B

Disclose Chemicals across the Life Cycle of Products

In Principle #1 of the BizNGO Principles for Safer Chemicals—Know and Disclose Product Chemistry—"know" refers to the sharing of chemical information from business-to-business and "disclose" refers to the reporting of chemical information to the public. "Disclosing" the life cycle chemistry of a product includes reporting to the public: 1) feedstocks: sources of feedstocks and chemicals used in extraction and processing; 2) chemicals in processes: chemicals used across the supply chain in manufacturing processes; 3) chemicals in product: chemicals contained in the product; and 4) byproducts that can form during the degradation[1] of the chemical at any point in its life cycle, including end of life management.

Ideal for Disclosing Chemicals

Ideally all chemicals all along the supply chain are publicly disclosed. All chemical constituents in products down to 100 ppm are reported to the public as well as the presence of residuals of high concern, such as mercury or 1,4-dioxane, above background levels in the environment.

In addition, the sources of feedstocks, the chemicals used in extracting or growing feedstocks, and the chemicals in manufacturing processes are publicly available as well. See box for Principle #1 as stated in the Principles for Safer Chemicals.

Intent for Disclosing Chemicals

Disclosing chemicals in products and manufacturing processes is foundational to advancing the development and use of safer chemicals. The public reporting of chemical information enables all customers, non-governmental organizations (NGOs), and others to evaluate the chemicals in products, processes, or feedstocks. While the numbers of individual consumers who have the capacity to evaluate the hazard of chemicals in products is low, other organizations including institutional customers and NGOs may have the expertise to evaluate the hazards of chemical ingredients.

BizNGO Principle #1b in application does not mean companies must disclose to the public every single aspect of the chemistry of a product across every stage of the product's life cycle. But the application of Principle #1b does mean that companies continuously improve their disclosure of feedstocks, the chemicals used in growing and extracting these feedstocks and manufacturing processes, and the chemicals contained in products.

Context for Disclosing Chemicals

Chemical disclosure across the supply chain is part of a larger trend towards increasing transparency in business practices. As Christopher Meyer and Julia Kirby state in their "Leadership in the Age of Transparency" article in *Harvard Business Review* (April 2010), "The first thing we can all agree on is that greater accountability for corporate impact is unavoidable."[2] They articulate a growing expansion of transparency—that they refer to as "ripples of responsibility"—that emanates out from the core business as shown in Figure 1b-1, page 22. While Meyer and Kirby do not explicitly call out chemicals, the implications are clear: businesses, especially brands, are encountering growing demand for transparency up and down their supply chains. Applying Meyer and Kirby's "ripples of responsibility" to trends in chemical transparency we see downstream businesses taking ownership of chemicals in their products, taking action on chemicals in production processes, and taking interest in the sources of their feedstocks.

PRINCIPLE #1:

Know and Disclose Product Chemistry

Manufacturers will identify the substances associated with and used in a product across its lifecycle and will increase the transparency of the chemical constituents in their products, including the public disclosure of chemicals of high concern. Buyers of products will request product chemistry data from their suppliers.

Yet, of all the BizNGO Principles for Safer Chemicals, disclosing chemicals across the life cycle of a product is the most challenging and the principle where we see the least amount of activity. Significant barriers to disclosure are: 1) confidential business information—downstream users don't have the chemical ingredient information or if they do they signed non-disclosure agreements to get it; 2) challenges of managing the data and reporting it out to the public; and 3) failure to see the benefits of full disclosure, including questions of what consumers will do with the information.

Companies that take the challenge see increased transparency as:

ESSENTIAL TO INNOVATION

- Method—"There can be no sustainability without transparency. That's because no business today, and no product, is yet sustainable. So in order to reach sustainability, then, you have to be committed to getting continually better. Transparency encourages dialogue and innovation, and therefore, is a cornerstone of sustainability."

ESSENTIAL TO CLEAR COMMUNICATION TO CUSTOMERS

- Interface—"Creating an EPD [Environmental Product Declaration] requires the increased transparency that people are requesting and we are committed to being open about our products' environmental impact. Not just a green claim or promise, EPD shares product information in a consistent way, certified to a public standard and verified by a credible third party."

FIGURE 1B–1

Meyer and Kirby, Ripples of Responsibility, from "Leadership in the Age of Transparency"

ESSENTIAL TO INFORMED DECISIONS

- Construction Specialties—"It is our belief that building products that are harmful to humans, animals, and the environment should be avoided when there are reasonable alternatives. To that end, we seek to create a means [a labeling system] that allows people to make informed decisions when they fabricate, specify, install, use, and dispose of building products."
- Health Product Declaration Form—"The building industry needs a product contents transparency system to support informed product selection during the material specification and construction processes in order to meet health and toxicity needs and concerns. Such a transparency system must be based upon full disclosure of product contents and emissions, accompanied by authoritative, data-based information on the hazards associated with those contents and emissions."

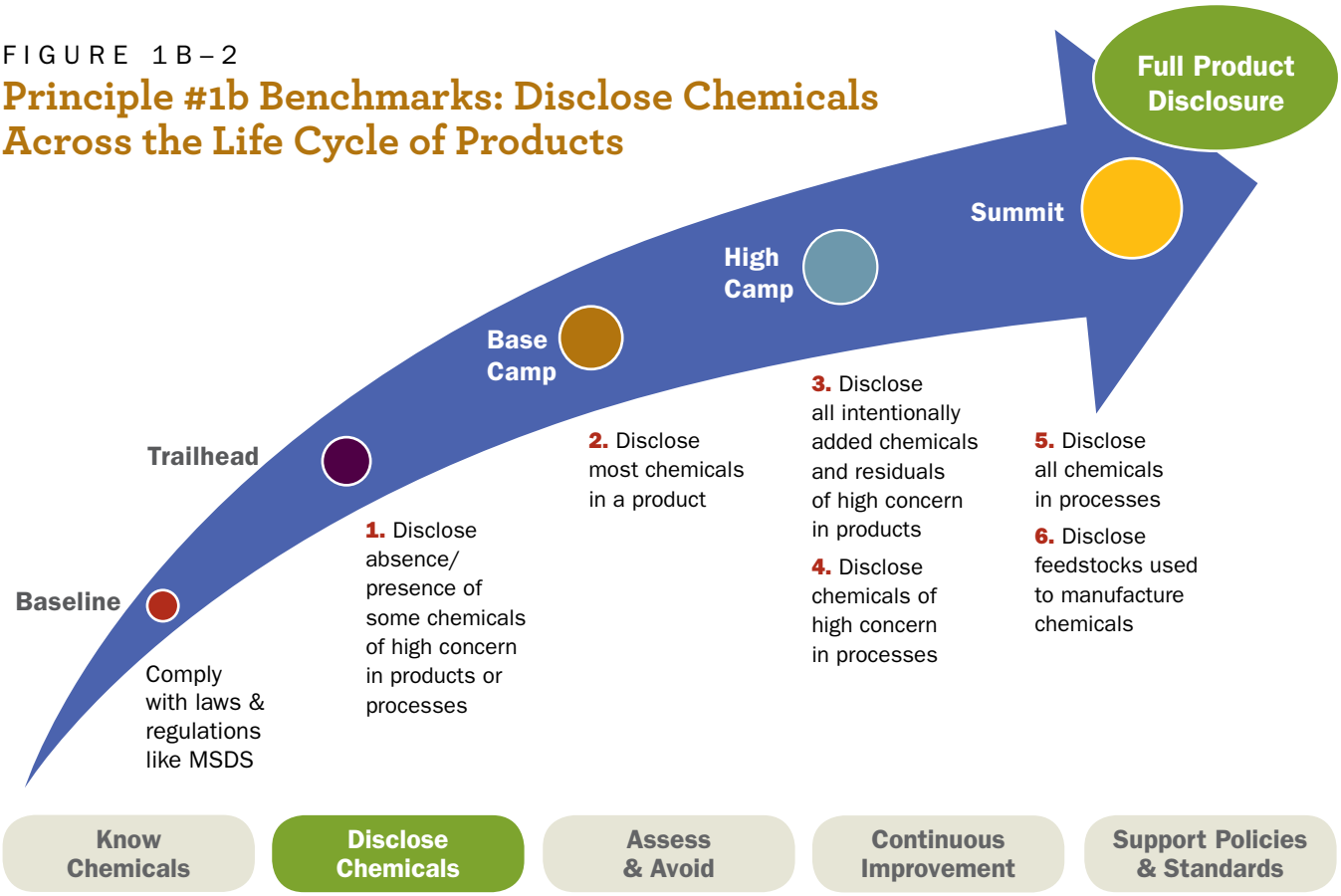
Note that disclosure is not relevant for certain downstream users of chemicals including health care organizations and architects. While disclosure of chemicals in products is not the role of retailers, retailers can set disclosure specifications for products sold in their stores.

Benchmarks to Disclosing Chemicals in Products, Processes, and Feedstocks

Figure 1b-2 depicts the benchmarks—from Trailhead to Summit—for disclosing chemicals in products, processes, and feedstocks. The trajectory of the benchmarks (beyond meeting regulatory requirements at Baseline) is from disclosing a little about chemicals of high concern (their absence) in products or processes at Trailhead to disclosing all chemicals in products at High Camp to disclosing all chemicals in processes and feedstocks at the Summit.

FIGURE 1B–2

Principle #1b Benchmarks: Disclose Chemicals Across the Life Cycle of Products



Baseline

Baseline is compliance with all laws and regulations. Interestingly in the electronics sector companies are known to highlight that their product is "RoHS compliant"—that is, in compliance with European Union's Restriction on Hazardous Substances Directive. The baseline level of regulatory compliance is to have material safety data sheets (MSDSs) for chemicals used in facilities as well as for chemical intensive products.

Trailhead

1b.1—*Action:* Disclose the absence/presence of some chemicals of high concern in products or manufacturing processes.

NOTE: The most common form of disclosure beyond compliance is to state to the public that a product or a production process does not use a chemical or chemicals of high concern. Recent examples include statements that a product is: "BPA-free," "DEHP-free," or "PVC-free." While publicly disclosing the absence of a chemical of high concern is the most common form of disclosure, it is by no means easy. Tracking that data across an entire organization's product line can be a significant challenge.

EXAMPLE

Timberland in its report on progress to "eco-conscious materials (footwear)" notes that 95% of its products by volume of product types (SKUs) are now PVC-free.

Base Camp

1b.2—*Action:* Disclose most chemicals in a product.

NOTE: The trajectory among downstream users is to disclose ever greater information on chemicals in products beyond the limited requirements of MSDSs. The examples that follow highlight how companies are increasing the public disclosure of the material contents of their products. It is important to note, however, that many materials such as plastics contain additives, catalysts, and unreacted monomers at low levels, some of which may be chemicals of high concern.

FIGURE 1A–1

Principle #1b Benchmarks: Disclose Chemicals to the Public

Base Camp (CONTINUED)

EXAMPLES

Interface publishes the material content in its environmental product declarations (EPDs), including information on general material types in the product. For example, its EPD for Carpet Tile: GlasBac, Type 6 Nylon includes the following material content list:

- Nylon 6 post industrial and post consumer recycled = 17% by weight
- Polyester = 3% by weight
- Ethylene vinyl acetate = 5% by weight
- Calcium carbonate = 15% by weight
- Silica = 1% by weight
- PVC copolymer = 10% by weight
- Di-isononyl phthalate = 10% by weight
- Calcium alumina glass spheres, post industrial = 39% by weight

The Interface EPD disclosure is a major step toward full disclosure. However, since the disclosure is at a generic material level, for example, "polyester," the EPD does not report all chemical constituents in a product, such as the additives and monomers that are in the polyester.

Clorox discloses on its website all the chemical ingredients for each product, with the exception of fragrances, preservatives, dyes, and other mixtures where manufacturers claim confidential business information. To maintain confidential business information claims for fragrances, for example, Clorox lists all the fragrances used in all of its consumer and professional cleaning and laundry products in one place on its website.

Method discloses all the chemical ingredients in its products with the exception of fragrances, for which it provides a generic description—fragrances are "free of phthalates and other dirty ingredients, not irritating to skin or toxic in use; partial natural essential oil content, partially synthetic ingredients."

Construction Specialties publishes its Cradle to Cradle Certified reports, which list generic names for the chemicals and materials in its products and the chemical and material risk score that MBDC assigns to that substance.

High Camp

1b.3—*Action:* Disclose all intentionally added chemicals and residuals of high concern by Chemical Abstracts Service number (CAS #) or equivalent classification system.

NOTE: The challenge here is to clearly disclose all intentionally added chemicals and residuals of concern. For the most part businesses are getting better at disclosing aggregate data—as in the material content in Interface's EPD (noted above)—but detailed data on chemical ingredient content outside of the home and personal care products sector is uncommon. Full disclosure of chemical ingredients means, for example, if your product contains PVC, it is not enough to state PVC. Suppliers need to acknowledge the presence of the additives in PVC—such as heat stabilizers and plasticizers—as well as unreacted monomers (in this case, vinyl chloride monomer) and catalysts.

EXAMPLES

The Health Product Declaration (HPD) Open Standard is a just-released format for the reporting of product content and associated health information for individual building products and materials. It specifies criteria for publicly reporting chemical ingredient and related information for building products—see "Disclose Chemicals" Vignette #2, page 27, for further details.

Seventh Generation posts all ingredients for all its products on its website, including the essential oils and extracts that it uses for fragrances. Seventh Generation uses the International Nomenclature of Cosmetic Ingredients (INCI), which is a system of names for ingredients used in cosmetics, soaps, and other similar products.

1b.4—*Action:* Disclose chemicals of high concern in manufacturing processes.

NOTE: Downstream users rarely report data on chemicals, even chemicals of high concern, used in upstream manufacturing processes. At best, downstream users are likely to provide anecdotal examples (see Seventh Generation below) of chemicals of high concern in upstream manufacturing, but do not provide consistent reporting of that data.

EXAMPLE

As noted in Action 1a.9, Seventh Generation identified and disclosed on its website two chemicals of concern used in the manufacture of sodium lauryl sulfate: methanol and sulfur trioxide.

A notable step towards full disclosure of chemicals in processes is Timberland, which reports a complete list and location of all of its global suppliers.

Summit

1b.5—*Action:* Disclose all chemicals in manufacturing processes.

NOTE: OEMs and brands are increasingly collecting data on the chemicals used to manufacture their products. However, examples of companies publicly reporting that data beyond chemicals of high concern are so rare they are hard to find. Some examples may exist, but to date our scan of corporate leaders in the field found none.

1b.6—*Action:* Disclose the feedstocks used to manufacture the chemicals or materials in the product.

NOTE: Often the fastest route to more sustainable materials is the use of post-consumer recycled content in products. It avoids the need for virgin materials that consume the use of chemicals in the first place and is relatively easy to report. Companies readily report their use of recycled content, both post-industrial and post-consumer, in their products. However, beyond recycled content in products and legal requirements, such as reporting on conflict minerals, reporting of feedstocks is rare.

EXAMPLES

Nike, through its Materials Sustainability Index (MSI), has made significant strides in evaluating the materials in its products. MSI evaluates materials on the basis of: chemistry, energy and greenhouse gas intensity, water and land use intensity, and physical waste. The chemistry score as detailed in Action 1a.9 rolls up the upstream concerns with materials production from both the perspective of feedstocks and manufacturing processes. However, because Nike rolls the data up into a single score it is impossible to deconstruct how it arrives at the final chemistry score for a given material.

Nike's Environmental Preferred Materials (EPM) program is an effort to specify requirements for improving the life cycle sustainability of materials. Its target EPMs are: organic cotton, recycled polyester, environmentally preferred rubber, leather (improved sustainability through meeting specifications of the Leather Working Group), and synthetic leather (reduce and eliminate solvents).

Timberland's preferred materials for its Earthkeepers collection are: organic cotton, natural rubber, aluminum, and leather.

Seventh Generation is starting down the path of feedstock disclosure by reporting the sources of its raw materials as well as its purchase of certified sustainable palm oil.

DISCLOSE CHEMICALS: **VIGNETTE 1**

Whole Foods Eco-Scale Requires Full Disclosure

Whole Foods Market's Eco-Scale Rating System establishes four tiers of criteria that it applies to labeling household cleaning products stocked on its shelves. "Red" means that the product fails to meet the "orange" criteria—see Table 1b-1—and cannot be sold in the store. Core to the baseline "orange" criteria is the requirement of "full disclosure of ingredients on packaging." Whole Foods defines full disclosure as requiring that all intentionally added ingredients must be listed on all products using INCI names. If an ingredient does not have an INCI name, then it must be listed by its common chemical name or IUPAC name.

The Eco-Scale rating criteria also include elements related to BizNGO Principle #2 of Assess and Avoid Hazards, with increasingly more stringent requirements on allowable ingredients in the products. This includes reporting on the hazards and sources of those ingredients, with an increasing preference for plant- and mineral-derived ingredients. The purpose of the Eco-Scale Rating System is to enable customers to "make informed decisions about the products they buy."

Household cleaning products that achieve "orange" or higher in the Eco-Scale Rating System would achieve the Disclose High Camp benchmark in the BizNGO Guide to Safer Chemicals.

TABLE IB–2

Whole Foods Market Eco-Scale Rating for Household Cleaning Products

Criterion	Red—Not for sale at Whole Foods	Orange	Yellow	Green
Transparency	Fails any of the "Orange" criteria	Full disclosure of ingredients on packaging	Full disclosure of ingredients on packaging	Full disclosure of ingredients on packaging
Compliance		Third party verified	Third party verified	Third party verified
Ingredient hazards		No significant environmental or safety concerns	No moderate environmental or safety concerns	No moderate environmental or safety concerns
Formaldehyde-donors		None	None	None
Phosphates, chlorine, or synthetic colors		None	None	None
Animal testing		None	None	None
Natural fragrances			100%	100%
Surfactants that have the potential to contain nitrosamines and other impurities			No DEA, MEA, or TEA	No DEA, MEA, or TEA
Synthetic, petroleum-derived thickeners from non-renewable sources			None	None
Plant- and mineral-derived ingredients only				Yes
Petroleum-derived ingredients				None

Source: Whole Foods Market Eco-Scale Rating for Household Cleaning Products

DISCLOSE CHEMICALS: **VIGNETTE 2**

Health Product Declaration (HPD) Form sets Standard for Disclosure

Released in November 2012, the Health Product Declaration Form (HPD) is perhaps the most ambitious effort to publicly disclose all chemical content in an article by Chemical Abstract Services number (CAS#). While ingredients in chemical intensive products such as cleaning products, detergents, and cosmetics are all more widely disclosed largely due to legal requirements, chemical ingredients in articles are rarely reported beyond the level noted in Action 1b.2.

The purpose of the HPD is to facilitate "transparency in the building material industry to support the selection of healthy building products." Initiated in 2011 through a collaboration of the Healthy Building Network and BuildingGreen, Inc., the draft HPD was endorsed by 50 companies representing architecture, design, engineering and building owners. The pilot program involved 30 product manufacturers and 50 expert reviewers from across the building sector. Released in November 2012, the HPD will be managed by a new membership organization, the Health Product Declaration Collaborative. The Collaborative has already obtained the sponsorship of nearly 50 firms in the building industry. If successful in its uptake the HPD will create a consistent reporting format for product content and associated health information and increase the transparency of that data.

The HPD includes chemical ingredients by CAS# and volume as well as a hazard summary of each chemical in the product. The hazard or fate endpoints for chemicals include cancer, reproductive toxicity, and persistence, bioaccumulation, and toxicity. An HPD with no confidential business information claims will achieve the Disclose High Camp benchmark in the BizNGO Guide to Safer Chemicals.

Principle #1b Endnotes

1 We use "degradation" broadly to refer to any transformation of chemical compounds by any means, including living organisms and sunlight. A narrower scope is "biodegradation", which the U.S. EPA defines as: "A process by which microbial organisms transform or alter (through metabolic or enzymatic action) the structure of chemicals introduced into the environment" (see *http://toxics.usgs.gov/definitions/biodegradation.html*) (accessed November 11, 2012).

2 C. Meyer and J. Kirby, 2010, "Leadership in the Age of Transparency," *Harvard Business Review*, April.

PRINCIPLE #2

Assess & Avoid Hazards

Principle #2 is where organizations take action and replace chemicals of high concern with safer alternatives.

Ideal for Assess & Avoid

The ideal for Principle #2 is that manufacturers use chemicals in products, processes, and feedstocks that are inherently safer for human health and the environment, and purchasers prefer these products, processes, and feedstocks. The box details how the BizNGO Principles for Safer Chemicals define Principle #2. Note that the BizNGO Principles define chemicals of high concern using criteria that are similar to those used by governments to restrict chemicals, such as the REACH criteria for substances of very high concern. Additionally, any chemical that meets GreenScreen Benchmark 1 criteria qualify as a chemical of high concern in *The Guide*.

Intent for Assess & Avoid

The intent for Principle #2 is to compel downstream users to know the hazards of chemicals, and select and implement inherently safer alternatives to chemicals of high concern. A safer alternative includes replacing the chemical with an inherently less hazardous chemical, eliminating the need for the chemical through material change, product re-design, or product replacement; or eliminating the chemical by altering the functional demands for the product through changes in consumer demand, workplace organization, or product use.[1]

Knowing the hazards of a chemical is foundational to selecting a safer alternative. Organizations need to know the hazards of alternatives to know whether or not the alternative is safer or not. For purchasing organizations it is important to signal to suppliers that they need to know the hazards of the chemicals in their products. BizNGO Principle #2 in application does not mean companies must know the hazards of every chemical in every product across at every stage of the product's life cycle. But the application of Principle #2, like #1, does mean that companies commit to continuously improving their understanding of the hazards of chemicals in products and supply chains, identifying chemicals of high concern and potential alternatives, and selecting and implementing safer alternatives.

Context for Assess & Avoid

Assessing and avoiding chemicals of high concern is a challenging task. The complexity of hazard assessments, data gaps on chemical hazards, and limited number of alternatives all work against assessing and avoiding chemicals of high concern.

Evaluating the hazards of a chemical and benchmarking a chemical is a complex exercise. The GreenScreen, for example, includes 18 different endpoints for hazard evaluation, including carcinogenicity, reproductive toxicity, development toxicity, neurotoxicity, ecotoxicity, etc. Those 18 endpoints are then translated into a single benchmark for each chemical, on a scale of red to green. Completing a GreenScreen requires technical expertise. However, once a chemical is GreenScreen assessed, it is easy to understand the result as the chemical will fall into one of four benchmarks (see Figure 2–1. page 30).

PRINCIPLE #2:

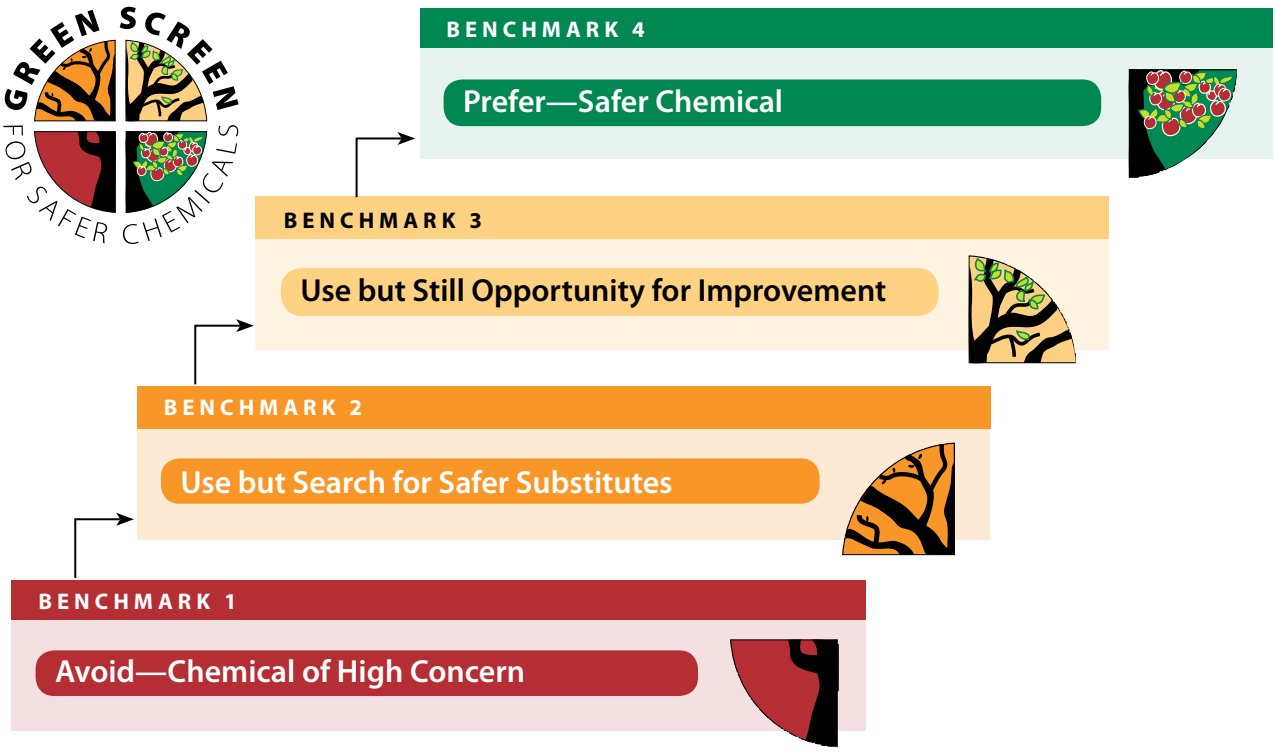
Assess & Avoid Hazards

Manufacturers will determine the hazard characteristics of chemical constituents and formulations in their products, use chemicals with inherently low hazard potential, prioritize chemicals of high concern for elimination, minimize exposure when hazards cannot be prevented, and redesign products and processes to avoid the use and/or generation of hazardous chemicals. Buyers will work with their suppliers to achieve this principle.

"Chemicals of high concern" include substances that have the following properties: 1) persistent, bioaccumulative and toxic (PBT); 2) very persistent and very bioaccumulative (vPvB); 3) very persistent and toxic (vPT); 4) very bioaccumulative and toxic (vBT); 5) carcinogenic; 6) mutagenic; 7) reproductive or developmental toxicant; 8) endocrine disruptor; or 9) neurotoxicant. "Toxic" (T) includes both human toxicity and ecotoxicity.

FIGURE 2–1

GreenScreen for Safer Chemicals: Benchmarks



Source: Clean Production Action GreenScreen for Safer Chemicals Benchmarks

A further challenge to GreenScreen assessments is the lack of hazard data for all endpoints for all chemicals. In fact, very few chemicals on the market have comprehensive empirical data. The Toxics Substances Control Act, the principal statute regulating industrial chemicals in the U.S., does not require chemical producers to generate and disclose comprehensive information on the hazards of and exposures to the vast majority of chemicals in commerce. Given this lack of information, it is difficult to fully evaluate the hazard profile of chemicals, especially chemicals manufactured in smaller volumes. These data gaps can be filled, at least in part, through the use of chemical analogs (chemicals with similar molecular structures), modeling data (computerized models to estimate hazards), and expert judgment. The GreenScreen downgrades the hazard score of chemicals due to data gaps.

When an organization chooses to target a chemical of high concern, a challenge can be in finding available alternatives. Publicly available sources of alternatives include: U.S. Environmental Protection Agency Design for Environment (EPA DfE) Program, Massachusetts Toxics Use Reduction Institute Five Chemicals Alternatives Study, and the European Substitution Portal (SubsPort).

Once alternatives are identified they need to be evaluated for hazards as well as other human and environmental concerns to ensure companies avoid regrettable substitutions—where the alternative is equally or worse for human health or the environment than the chemical it replaced. A question then emerges of how to do that assessment. The common tools for assessing alternatives are life cycle assessment (LCA) and risk assessment. Concerned that the inherent hazards of a chemical and its alternatives are diluted in these assessment tools, BizNGO developed the Chemical Alternatives Assessment Protocol. The BizNGO Protocol is a "decision framework for substituting chemicals of concern to human health or the environment with safer alternatives." It "describes a process for identifying alternatives to a chemical of concern, screening out equally hazardous alternatives, and selecting an alternative that is technically and economically viable and does not have the potential for causing significant environmental or human health impacts." The Protocol highlights the primacy of hazard assessment in relation to life cycle assessment and risk assessment by positioning it as a step before LCA or exposure assessment (see Step 4 in Figure 2–2, page 31).

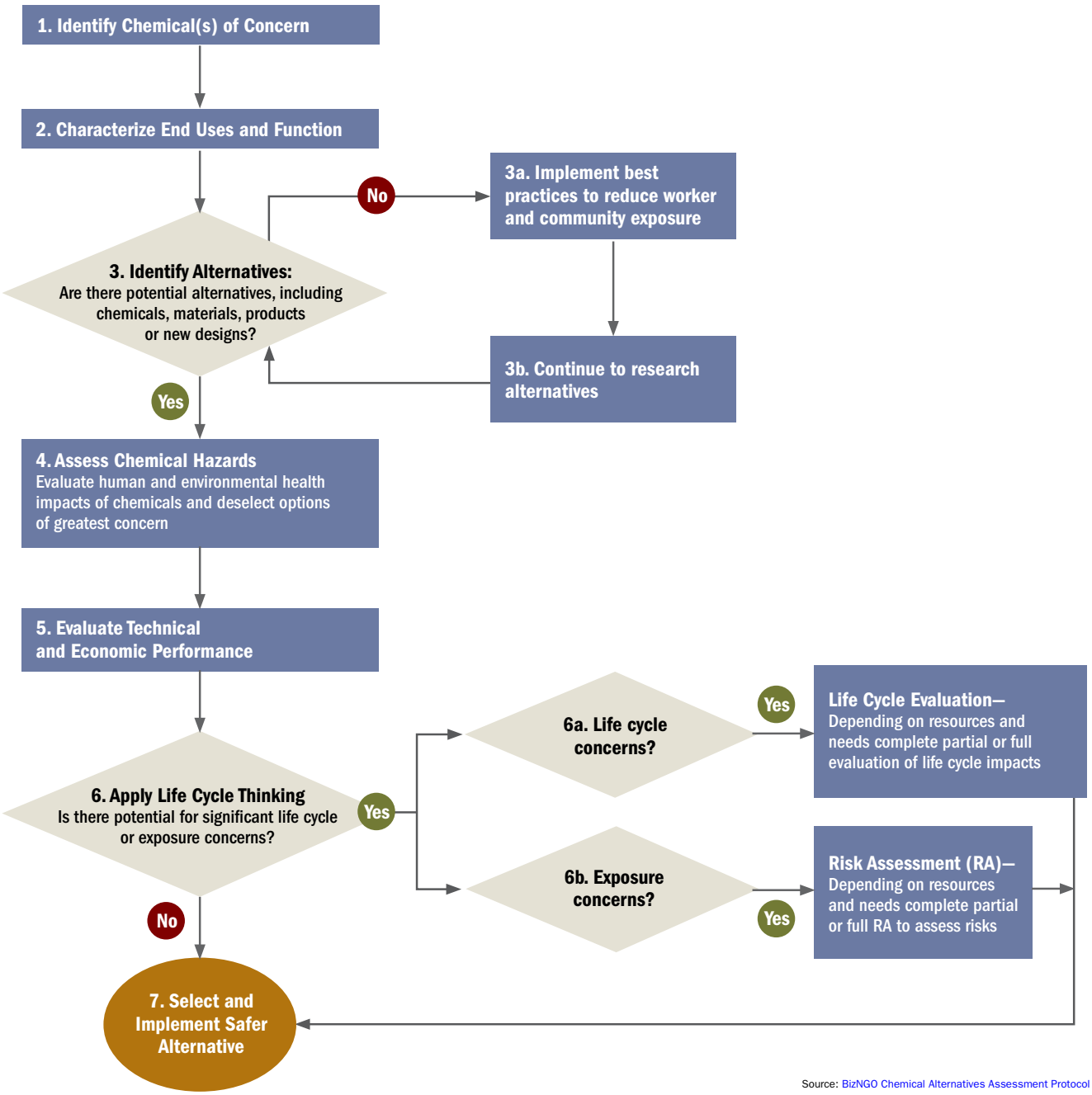
From the alternatives assessment some alternatives will hopefully emerge that are safer, healthier, and more environmentally preferable, as well as technically and economically viable, to the existing chemical of high concern. Companies then select the safer alternative(s) and either manufacture it or require their suppliers to use it. Companies can specify the preferred solutions they want from suppliers and/or specify the criteria by which suppliers evaluate their alternatives to a chemical of high concern.

Benchmarks to Knowing Chemicals in Products, Processes, and Feedstocks

Figure 2–3 summarizes the four benchmarks beyond compliance (Baseline) to assessing and avoiding chemicals in products, processes, and feedstocks.

FIGURE 2–2

BizNGO Chemical Alternatives Assessment Protocol



Source: BizNGO Chemical Alternatives Assessment Protocol

The trajectory of the benchmarks progresses from avoiding some chemicals of high concern on a restricted substances list (RSL) at Trailhead to implementing programs to identify other chemicals of high concern and safer alternatives at Base Camp to selecting and implementing alternatives at High Camp and Summit.

BizNGO Principle #2 benchmarks apply to all downstream users, from formulators to manufacturers to specifiers to purchasers. The language in the benchmarks is not perfectly aligned to every sector. Architects, for example, are specifiers of products. They can "specify" safer alternatives but will not "implement" those alternatives. And purchasers will rely on suppliers to meet specifications.

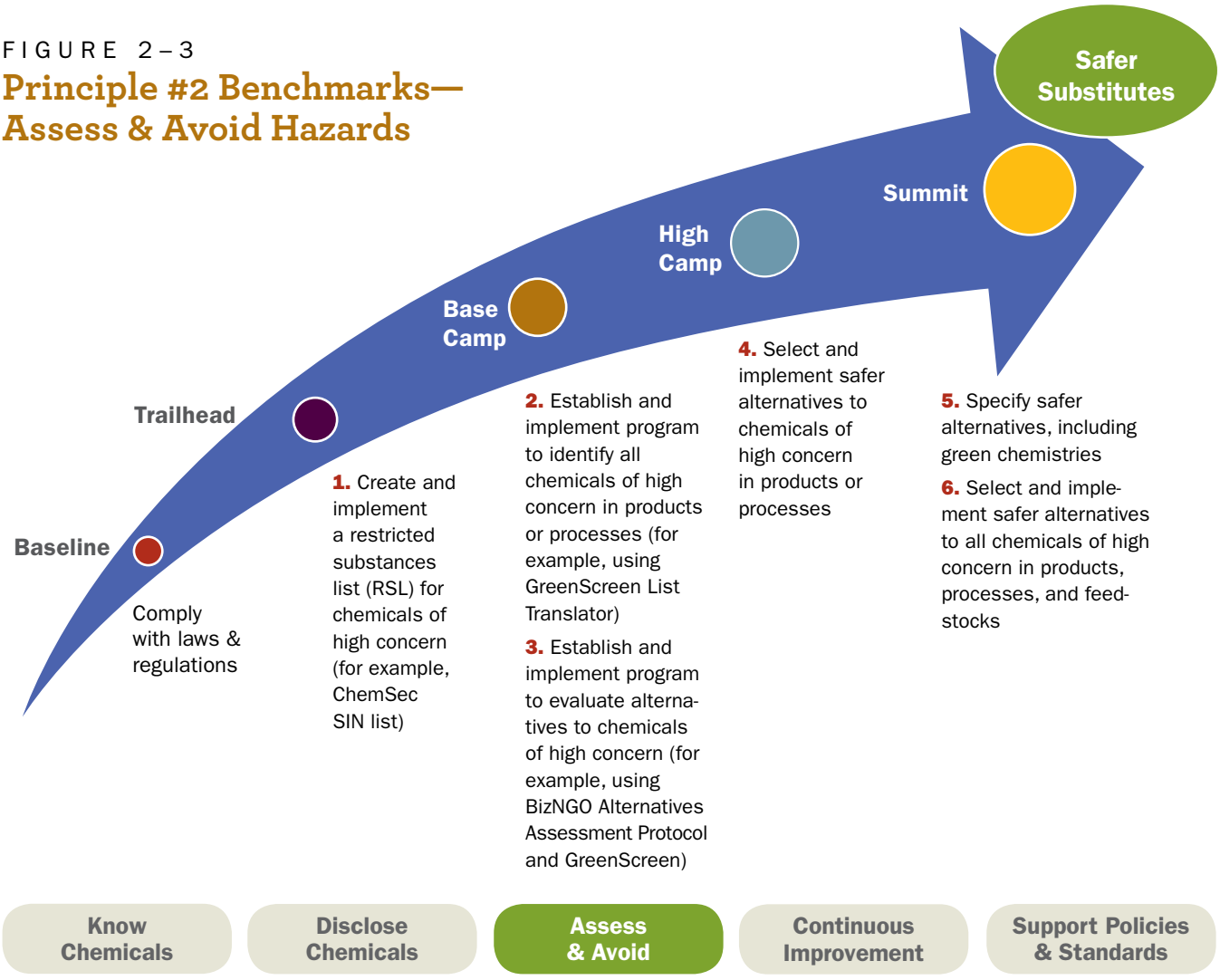
A critical element in the implementation of a safer alternatives program is the frameworks and tools that organizations use to inform their identification of chemicals of high concern, evaluation of alternatives, and the selection and implementation of safer alternatives. The preference of BizNGO is to frameworks (for example, the BizNGO Alternatives Assessment Protocol) and tools (for example, the GreenScreen) that emphasize the primacy of hazard in decision making. As stated in the BizNGO Chemical Alternatives Assessment Protocol, a safer alternative is "one that is less hazardous to human health or the environment than the chemical of concern." The frameworks and tools organizations use will affect the alternatives they select and whether the overall inherent hazards of chemicals in products are reduced by the substitution of currently known chemicals of high concern.

Caveat for this section: It is important to note the authors have a conflict of interest for references to all frameworks, tools, and resources related to Clean Production Action, including the GreenScreen for Safer Chemicals and BizNGO Chemical Alternatives Assessment Protocol.

A critical element in the implementation of a safer alternatives program is the frameworks and tools that organizations use to inform their identification of chemicals of high concern, evaluation of alternatives, and the selection and implementation of safer alternatives.

FIGURE 2–3

Principle #2 Benchmarks—Assess & Avoid Hazards



Baseline

Baseline is compliance with all laws and regulations.

Trailhead

2.1—*Action:* Create and implement a restricted substances list (RSL) for chemicals of high concern, and make the RSL publicly available on website.

NOTE: Companies select chemicals for their RSL based on a variety of reasons, including: hazard, exposure, likelihood of future regulations, volume of use, pressure from advocacy organizations, institutional customer demand, individual consumer demand, and compliance with certification and ecolabel requirements. It is common for companies to have RSLs beyond legal compliance. These RSLs range in numbers of chemicals from a handful to hundreds.

EXAMPLES

Cradle to Cradle Certified

- Basic certification: No polyvinyl chloride (PVC), chloroprene, or related chemical at any concentration.
- Silver certification: No halogenated hydrocarbon content (<100 ppm); and toxic heavy metal content (lead, mercury, cadmium, hexavalent chromium) is less than 100 ppm.

Kaiser Permanente's purchasing policy specifies avoidance of products that contain: persistent bioaccumulative toxics (PBTs), California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986) chemicals, halogenated flame retardants, phthalates, PVC, Bisphenol A (BPA), latex, and mercury.

FIGURE 2–3

Principle #2 Benchmarks: Assess & Avoid Hazards

Trailhead (CONTINUED)

Construction Specialties has eliminated PBTs and PVC in its building products.

The Joint Roadmap towards Zero Discharge of Hazardous Chemicals (ZDHC) identifies 11 priority chemical groups elimination/reduction in textile manufacturing.

Perkins+Will specifications prefer products that don't include substances on its lists of concern: Precautionary List, Asthma Triggers and Asthmagens, and Flame Retardants.

The ChemSec SIN List identifies 378 substances of very high concern.

Nike, Inc.'s RSL is dominated by a legislated list of chemicals, but also includes beyond regulatory requirements, such as: no BPA in water bottles and mouth guards; no PVC in apparel, equipment, footwear, and apparel screen prints; and no formaldehyde, trichloroethylene, perchloroethylene, and toluene, among other chemicals, in manufacturing processes.

Base Camp

As organizations move to expand their RSL and to identify safer alternatives they need consistent, replicable systems for identifying chemicals of high concern as well as safer alternatives. Base Camp Actions for Principle #2 are divided into establishing and implementing programs for identifying all chemicals of high concern (Action 2.2) and safer alternatives (Action 2.3).

2.2—*Action:* Establish and implement program to identify all chemicals of high concern in products or processes (for example, using GreenScreen List Translator).

NOTE: Action 2.2 entails developing criteria—such as persistence, bioaccumulation, and ecotoxicity—for creating a broad list of chemicals of high concern. This would enable organizations to create a systematic response to the ever expanding yet different RSLs and create a master RSL based on consistent, replicable criteria.

The absence of consistent, transparent, replicable criteria leads to the chaos of lists best illustrated by Tom Lent of the Healthy Building Network in his presentation on the ever expanding number of different yet somewhat overlapping RSLs being developed and applied in the building sector.[2]

To address the need for a comprehensive list of chemicals of high concern based on replicable criteria, Clean Production Action and Healthy Building Network developed such a list in 2009 based on authoritative lists that meet specific endpoint criteria—such as consistent with the REACH criteria for substances of very high concern. Since then, Maine, Washington, and Minnesota have all compiled broad lists of chemicals of high concern and whittled them down to chemicals of high concern for children.

More recently, Clean Production Action's GreenScreen List Translator references how authoritative lists (for example, the International Agency for Research on Cancer's (IARC) classifications of carcinogenic chemicals) relate to the GreenScreen criteria for a Benchmark 1 – Red—Chemical of High Concern. The results of the GreenScreen List Translator can be accessed through two fee-for-service databases:

- Healthy Building Network's, Pharos – Chemical and Material Library
- The WERCS – GreenWERCS

Another resource for identifying chemicals of high concern and safer alternatives is "ChemHat," the Chemical Hazard and Alternatives Toolbox designed by and for workers to implement their own safer chemicals efforts and advocate for state and federal policies for safer chemicals.

For the most part, companies are moving from Action 2.1-RSLs to Action 2.3-Implement Program to Evaluate Alternatives, and leapfrogging Action 2.2. Nonetheless, creating a systematic process for identifying chemicals of high concern by comparing all chemicals used in products and processes to a comprehensive list of chemicals of high concern (such as those identified through the GreenScreen List Translator) is the most efficient process for quickly flagging chemicals of high concern in products.

EXAMPLE

An example of an effort to comprehensively identify chemicals of high concern is the Joint Roadmap towards Zero Discharge of Hazardous Chemicals (ZDHC), which plans to:

- Identify and agree upon a screening tool to identify chemical hazards. The screening tool would be used to identify hazardous chemicals beyond the 11 priority chemical groups already identified.
- Establish a plan to evaluate the chemical inventory by intrinsic hazard and establish a sector wide list of hazardous chemicals.

The ZDHC applies to the textile supply chain.

2.3—*Action:* Establish and implement program to evaluate alternatives to chemicals of high concern (for example, using BizNGO Alternatives Assessment Protocol and GreenScreen).

NOTE: Relative to Action 2.2, organizations are putting more effort into initiatives to develop systematic procedures for evaluating alternatives to chemicals of high concern. A significant driver is companies do not want to voluntary phase-out the use of a chemical of high concern and replace it with an alternative that turns out to be another chemical of high concern.

Two essential elements to Action 2.3 are: a) frameworks for assessing alternatives and b) tools for screening out alternatives that are not safer for human health or the environment. No definitive process for performing an alternatives assessment exists. That said, BizNGO's Chemical Alternatives Assessment Protocol recommends a hazard-first approach in evaluating alternatives to chemicals of high concern: first screen out hazards of equivalent or greater concern then proceed to life cycle thinking and exposure assessments if appropriate (see Figure 2-2). But many other frameworks for alternatives assessment are available or under development including:

- U.S. Environmental Protection Agency Design for Environment (U.S. EPA DfE) Program
- Toxics Use Reduction Institute Five Chemicals Alternatives Assessment Study
- Alternatives Assessment Framework of the Lowell Center for Sustainable Production
- German Federal Environmental Agency Guide on Sustainable Chemicals
- Washington State Department of Ecology Alternatives Assessment Guidance Document
- California Proposed Safer Consumer Product Regulations

This guide is not the place to delve into all the tools relevant to alternatives assessment. Good starting points for all tools relevant to alternatives assessment are the U.S. EPA DfE, Washington State Department of Ecology, and California Department of Toxic Substances Control noted above.

Given the primacy BizNGO places on hazard assessment, we highlight methods and tools that include the evaluation of chemical hazards here:

- GreenScreen for Safer Chemicals: publicly available, transparent method, and no cost to use but requires technical expertise.
- Washington State Department of Ecology Quick Chemical Assessment Tool (QCAT): publicly available, transparent method, no cost to use, but requires technical expertise to use. QCAT is a shortened version of the GreenScreen.
- SciVera Lens: proprietary system for evaluating chemical hazards, exposures, and risks.
- Cradle to Cradle Certified: currently a proprietary system (although that may change in the near future) for evaluating chemical hazards, exposures and risks. For a product to be Cradle to Cradle Certified "Basic" or higher all materials and chemicals must be assessed for toxicity to human and environmental health.
- U.S. EPA DfE Program Alternatives Assessment Criteria for Hazard Evaluation: This document details how the US EPA DfE Program evaluates hazard and fate endpoints in its chemical alternatives assessments.

EXAMPLES

Hewlett-Packard (HP) uses an alternatives assessment process that mirrors the BizNGO Alternatives Assessment Protocol and is a leading practitioner of the GreenScreen (see "Assess & Avoid" Vignette #1, page 37).

Nike has possibly the most comprehensive program for evaluating chemicals and materials from feedstock to product (see "Assess & Avoid" Vignette #2, page 38).

FIGURE 2–3

Principle #2 Benchmark: Assess & Avoid Hazards

High Camp (CONTINUED)

High Camp

2.4—*Action:* Select and implement safer alternatives to chemicals of high concern in products or processes.

NOTE: Leading companies, driven by the desire to be competitive and ahead of future regulations, are using tools like the GreenScreen and Cradle to Cradle Certified to, as Cory Robertson of HP states, "use materials no one cares about."[5]

EXAMPLES

Cradle to Cradle Certified Gold products cannot contain any problematic chemicals (assessed by MBDC as "red"). Note that independent evaluation of the validity of this statement is impossible as the MBDC assessments are proprietary and when made public, as in the case of Construction Specialties' certifications, the chemical data are generic and cannot be independently verified.

HP used the GreenScreen to evaluate and select safer alternatives to PVC plastic in power cables and brominated flame retardants (BFRs) in computing products. See "Assess & Avoid" Vignette #1, page 37, for details on these assessments.

Summit

2.5—*Action:* Specify safer alternatives, including green chemistry solutions.

NOTE: The ideal in specifying safer alternatives is that suppliers and purchasers will have complete hazard assessments of the chemical ingredients used in products, processes, and feedstocks. For example if all chemicals were GreenScreen assessed it would be significantly easier for purchasers to specify safer chemistries.

EXAMPLES

HP is moving in this direction by using the GreenScreen to specify preferred alternatives for its PVC-free and BFR-free products from its suppliers.

Nike has started onto this summit with its Green Chemistry Program.

Formulators such as Method and Seventh Generation specify inherently safer chemicals for their products.

2.6—*Action:* Select and implement safer alternatives to all chemicals of high concern in products processes, and feedstocks.

NOTE: This is Summit. Please let us know if your organization is here and how you managed the ascent.

ASSESS & AVOID HAZARDS: **VIGNETTE 1**

Hewlett-Packard (HP) Implements Alternatives Assessments Using the GreenScreen for Safer Chemicals

HP is embedding chemical alternatives assessments into its chemical substitution initiatives. As HP moves away from chemicals of high concern due to either regulatory or market pressures its goal is to ensure the alternatives are safer. HP is in the midst of phasing out a range of chemicals of high concern in its products, including: phthalates, brominated flame retardants, PVC, antimony, BPA, beryllium/beryllium compounds, and perfluorinated compounds.[6]

As articulated in Lavoie, et al.'s article on "Chemical Alternatives Assessment" (CAA), HP recognizes that:

> Treating all unrestricted substances as equally viable greatly increases the risk of unintended consequences; some replacements could be targeted for future restrictions as well. With the increase in restrictions, there is a growing risk of businesses having to do multiple substitutions and incurring costs multiple times if some level of a CAA is not used to evaluate potential replacement technologies.
>
> Companies are increasingly recognizing the importance of reducing the risk of multiple substitutions by requiring that replacement technologies have better hazard profiles than the substances that they replace. Progressive companies can go farther and use the differentiation provided by CAAs to select environmentally preferable materials, not just minimally or incrementally better ones, thereby ensuring their long-term freedom from chasing chemical after chemical for elimination.[7]

HP's "Integrated Alternatives Assessment" approach to evaluating alternatives to chemicals of concern mirrors the BizNGO Chemical Alternatives Assessment Protocol by taking a "hazard first approach" to screen out potential alternatives to chemicals of high concern. According to a presentation by Helen Holder of HP at the National Academy of Sciences (NAS) Green Chemistry meeting in September 2011, hazard assessments are faster and easier to complete than doing LCAs or risk assessments because:

- Their "Narrower, endpoints are relatively well defined."
- They are "Science-based, [which] facilitates relatively quick chemical assessments."
- They "Can screen out undesirable options before investing time and money."[8]

After evaluating a number of tools, HP selected the GreenScreen as its hazard assessment tool. According to Ms. Holder's NAS presentation, using the GreenScreen in its alternatives assessments helps HP "to identify alternatives that won't be restricted in the future" and "articulate materials goals to suppliers and chemical formulators."[9]

HP used the GreenScreen as part of its phase out of PVC in cable cords and brominated flame retardants (BFRs) from new computing products. According to Cory Robertson of HP in his presentation for the National Pollution Prevention Roundtable Safer Chemistry Challenge, all the alternatives were evaluated using the GreenScreen and HP created an approved material list based on benchmark scores of the PVC-free resin additives.[10] The identities of the PVC-free resin additives are not public and therefore the assessments of the alternatives cannot be independently verified.

HP is implementing a systematic process for evaluating chemicals of high concern, using an "Integrated Alternatives Assessment" with hazard assessments completed using the GreenScreen.

In HP's application of the GreenScreen to BFR alternatives, it does list the alternative substances selected. See HP's case study on SubsPort: "Substitution of brominated flame retardants with non-halogenated alternatives using the GreenScreen™ for safer chemicals alternatives assessment tool."

Overall HP is implementing a systematic process for evaluating chemicals of high concern, using an "Integrated Alternatives Assessment" with hazard assessments completed using the GreenScreen. It is using the GreenScreen to send clear messages to suppliers of intent and goals. HP's work places it squarely within High Camp for Assess and Avoid Hazards and extending up to Summit with its specification of preferred chemistries.

ASSESS & AVOID HAZARDS: **VIGNETTE 2**

Nike—Moving to the Specification of Green Chemistry Solutions

Nike has one of the more comprehensive and in-depth programs among large multinational corporations for managing chemicals in products, processes, and feedstocks. Its programs include a Restricted Substances List (RSL), Green Chemistry Program, Materials Sustainability Index, Considered Index, and Environmentally Preferred Materials.

Nike's RSL applies to both chemicals in products and processes and extends beyond regulated chemicals.[11] See Action 2.1 for details.

The Nike Green Chemistry Program uses a risk-based approach to identify chemicals for elimination in both products and processes. Nike's risk calculation involves an assessment of chemical hazards using the GreenScreen chemical hazard criteria times exposure potential to identify priorities for risk reduction (hazard x exposure = risk).[12] How Nike evaluates alternatives to chemicals of high concern cannot be ascertained by Nike's published literature. Therefore we do not know if Nike uses a similar or different approach to HP's process of using hazard assessment to screen out chemicals of equal or greater concern before proceeding to exposure and/or life cycle assessments.

Nike encourages its suppliers to participate in its Green Chemistry Program. To participate, suppliers must evaluate the use of chemicals in their facility and validate their chemical greening efforts for materials or processes.[13] The guidance Nike provides to suppliers on how to evaluate chemicals is not stated, but Nike does specify that suppliers must validate their greening initiatives with Nike staff.

Detailed under Action 1a.9, Nike's Materials Sustainability Index (MSI) evaluates feedstock sources as well as manufacturing processes of materials. The MSI includes numeric scores for materials on chemistry, energy and greenhouse gas intensity, water and land use intensity, and physical waste. The details behind these numeric scores are not publicly available, making it impossible to know how scores were developed for each of the environmental attributes for each material.

Nike is implementing a systematic process for evaluating the chemical inputs into its materials, specifying preferred chemistries and materials, and conveying these metrics to its suppliers along with other opportunities for greening their chemistries.

Nike is moving to the ambitious goals of zero discharge of hazardous chemicals by 2020 (see Action 3.2) and specifying positive lists of chemistries and materials. Its most extensive list of positive chemistries is for PVC and phthalate free screen print inks.[14] As part of its Considered Index, Nike also specifies Environmentally Preferred Materials (EPMs) for organic cotton, recycled polyester, environmentally preferred rubber, leather (improved sustainability through meeting specifications of the Leather Working Group), and synthetic leather (reduce and eliminate solvents).

Overall Nike is implementing a systematic process for evaluating the chemical inputs into its materials, specifying preferred chemistries and materials, and conveying these metrics to its suppliers along with other opportunities for greening their chemistries. Nike's work places it squarely within High Camp for Assess and Avoid Hazards and extending up to Summit with its specification of preferred chemistries and materials.

Principal #2 Endnotes

1 M. Rossi, J. Tickner, and K. Geiser, 2006, *Alternatives Assessment Framework of the Lowell Center for Sustainable Production,* *http://www.chemicalspolicy.org/downloads/FinalAltsAssess06.pdf* (accessed November 11, 2012).

2 T. Lent and M. Rossi, "Toxic Materials in Buildings", slide #15, presented at CleanMed, April 7, 2011, *http://www.cleanmed.org/2011/downloads/presentations/B-4/B4_Lent.Rossi.pdf* (accessed November 16, 2012).

3 See *http://www.bizngo.org/resources.php*; listed under header: Safer Chemicals—bullet: Red List of Chemicals (accessed November 16, 2012).

4 For an example of the raw data of the state lists go to the Minnesota website, *http://www.health.state.mn.us/divs/eh/hazardous/topics/toxfreekids/highconcern.html#list* (accessed November 16, 2012).

5 C. Robertson, Hewlett-Packard, "The GreenScreen@hp," National Pollution Prevention Roundtable Safer Chemistry Challenge Webinar, November 1, 2012, *http://www.p2.org/wp-content/uploads/robertson-nppr-safer-chemistry-challenge-webinar-nov-2012.pdf* (accessed November 16, 2012), slide 3.

6 See *http://www.hp.com/hpinfo/globalcitizenship/pdf/products_timeline.pdf* (accessed November 16, 2012).

7 E. Lavoie, et al., "Chemical Alternatives Assessment: Enabling Substitution to Safer Chemicals," *Environmental Science and Technology* 44(24) (2010): 9244–9249.

8 H. Holder, Hewlett-Packard, "HP's Search for Green Replacements for Restricted Substances in Electronics," NAS Green Chemistry meeting, September 20–21, 2011, *http://nas-sites.org/emergingscience/files/2011/10/Holder.pdf* (accessed November 16, 2012), slide 13.

9 Ibid, slide 16.

10 Robertson, op. cit., slide 12.

11 Nike, Inc., August 2011, *Nike Restricted Substances List (RSL) and Sustainable Chemistry Guidance (SCG),* *http://www.nikeresponsibility.com/report/uploads/files/NIKE_INC_Restricted_Substances_Guidance_Aug_2011.pdf* (accessed November 16, 2012).

12 Ibid, p. 44.

13 Ibid, p. 45.

14 Ibid, p. 49.

PRINCIPLE #3

Commit to Continuous Improvement

Leading businesses are setting goals and reporting progress on their path to safer chemicals. They are creating and implementing the systems necessary for organization-wide success on the paths to safer alternatives in products, processes, and feedstocks. The Principle #3 benchmarks specify how organizations can create and implement organizationwide initiatives.

Ideal for Continuous Improvement

Ideally organizations will:

- set goals for safer alternatives to chemicals of concern to human health or the environment,
- have clear metrics for measuring progress to those goals,
- provide transparent data that supports their progress to their goals, and
- publicly report on their progress to those goals.

The box details how the BizNGO Principles for Safer Chemicals defines Principle #3.

Intent for Continuous Improvement

The intent of Principle #3 is to engage organizations in setting goals to safer alternatives to chemicals of concern and publicly reporting on their progress towards those goals. The benchmarks in *The Guide* demonstrate how organizations can begin to set goals and report on their progress to safer alternatives.

Context for Continuous Improvement

Setting clear metrics and benchmarks for safer chemicals is a challenge. In 2005, Richard Liroff of the Investor Environmental Health Network published an article on the need for "Benchmarking Corporate Management of Safer Chemicals in Consumer Products."[1] Seven years later, not much progress has been made in this domain.

Downstream users of chemicals lack clear, standardized metrics for evaluating progress to safer chemicals.

Downstream users of chemicals lack clear, standardized metrics for evaluating progress to safer chemicals. There is no standardized "chemical footprint" tool like the carbon footprint metric for energy use. In fact, the benchmarks for Principles #1 and #2 are the closest to a standardized metric for a chemical footprint that we have. Lacking clear metrics, very few businesses will report on their progress to safer chemicals.

At best, downstream users report on their avoidance of chemicals of concern. An example of this is the Greenpeace "Guide to Greener Electronics."[2] which evaluates companies on whether their products are free of PVC, brominated flame retardants, antimony, beryllium, and phthalates, among other corporate sustainability practices.

PRINCIPLE #3:

Commit to Continuous Improvement

Establish corporate governance structures, policies, and practices that create a framework for the regular review of product and process chemistry, and that promote the use of chemicals, processes, and products with inherently lower hazard potential.

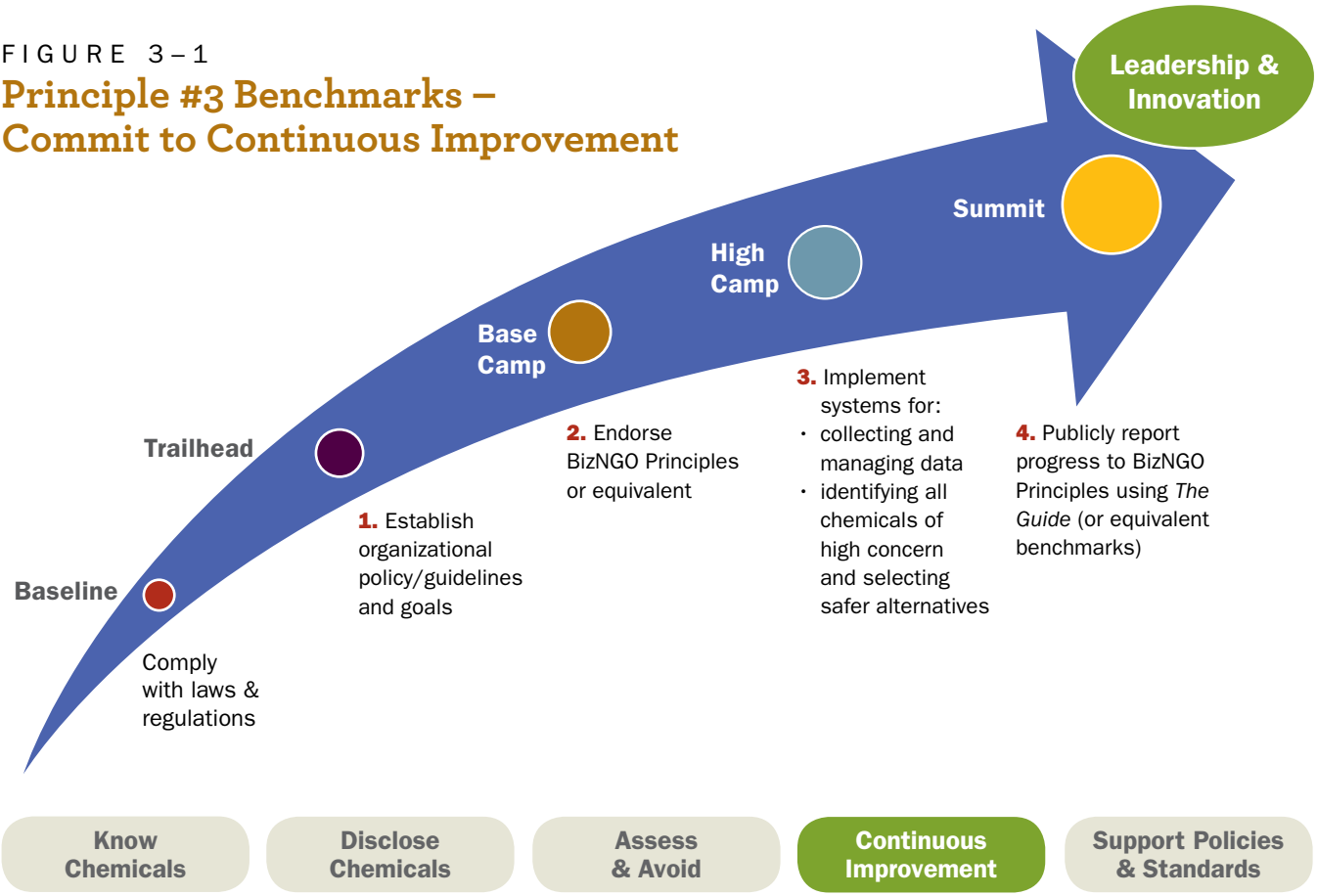
In implementing Principle #3, organizations confront challenges in how to transparently report on their level of knowledge about chemicals of concern in their products and supply chains and their willingness to disclose this information to the public.

Benchmarks to Continuous Improvement

Figure 3-1 depicts four benchmarks that move beyond compliance towards full commitment to continuous improvement. The trajectory of the benchmarks progresses from establishing an organizational chemical policy at Trailhead to endorsing the BizNGO Principles or equivalent at Base Camp to implementing systems at High Camp and then to publicly reporting progress to the BizNGO Principles or equivalent at Summit.

FIGURE 3–1

Principle #3 Benchmarks – Commit to Continuous Improvement



Baseline

Baseline is compliance with all laws and regulations.

Trailhead

3.1—*Action:* Establish organizational chemicals policy or guidelines (that support implementing BizNGO Principles) and goals for reducing use of chemicals of high concern, and publish policy and goals on website.

NOTE: Beyond restricted substances lists (RSLs), leading organizations develop comprehensive chemical policies or guidelines that place them on the path to achieving the BizNGO Principles.

EXAMPLES

Examples of organizations that have corporate guidelines, policies, and/or goals that align with implementing the BizNGO Principles include:

- Construction Specialties
- Dignity Health
- Google
- Kaiser Permanente
- Novation
- Perkins+Will
- Premier
- Seventh Generation

Base Camp

3.2—*Action:* Endorse BizNGO Principles or equivalent.

NOTE: Equivalent principles or metrics to the BizNGO Principles include: Richard Liroff's corporate benchmarks[3] and the goal set in the Roadmap to Zero Discharge of Hazardous Chemicals (ZDHC) of "zero discharge of hazardous chemicals for all products across all pathways in our supply chains by 2020." Hazardous chemicals are defined by ZDHC as substances "that show intrinsically hazardous properties (persistent,

bio-accumulative and toxic; very persistent and very bio-accumulative; carcinogenic, mutagenic and toxic for reproduction; endocrine disruptors; or equivalent concern), not just those that have been regulated or restricted in other regions."[4]

EXAMPLES

Endorsers of the BizNGO Principles include the companies and health care organizations listed in the side box, as well as many other organizations.

Companies that have signed on to ZDHC are: Adidas Group, C&A, G-Star Raw, H&M, Jack Wolfskin, Levi Strauss & Co., Nike, Puma, and Li-Ning.

High Camp

3.3—*Action:* Create systems for collecting and managing data, identifying all chemicals of high concern, and selecting safer alternatives.

NOTE: Systems are essential to the success of organizations in moving beyond Trailhead for Principles #1a, #1b, and #2. Without systems being implemented internally, through external parties, or some combination of the two organizations cannot implement comprehensive chemical management programs.

EXAMPLES

Seagate created a system for the collection and management of its full material disclosure requirements of suppliers (see Principle #1a).

HP created a framework for alternatives assessment that it calls "Integrated Alternatives Assessment" (it mirrors the BizNGO Chemical Alternatives Assessment Framework). HP's integrated framework uses the GreenScreen for its hazard assessment, which screens out chemicals of equal or greater concern to the targeted chemical of high concern and identifies safer alternatives (see Principle #2).

Nike developed the Considered Design Index, which it uses in the development of products to reduce waste, identify environmentally preferred products, and eliminate toxics.

Method and Seventh Generation used hazard assessment to screen out inherently hazardous chemicals and to select inherently safer chemicals.

Summit

3.4—*Action:* Publicly report progress to the BizNGO Principles using this Guide or equivalent benchmarks.

NOTE: For examples of equivalent benchmarks see Action 3.2.

EXAMPLES

Dignity Health reported on progress toward implementing the BizNGO Principles in its 2011 Social Responsibility Report. (See "Commit to Continuous Improvement" Vignette, page 44.)

All the apparel and footwear companies that signed the Roadmap to Zero Discharge of Hazardous Chemicals (ZDHC) have committed to regular reports of their progress toward the 2020 goal of zero discharge as well as intermediate targets.

Endorsers of the Principles for Safer Chemicals

- American Sustainable Business Council
- Brooks Sports
- Construction Specialties, Inc.
- Dignity Health
- Forbo Flooring Systems
- HDR
- Health Care Without Harm
- Hewlett-Packard Company
- Hospira, Inc.
- Kaiser Permanente
- Method
- Naturepedic
- Novation
- Perkins+Will
- Practice Greenhealth
- Premier, Inc.
- Seventh Generation
- Shaw Industries
- Staples, Inc.
- Whole Foods Market, Inc.

COMMIT TO CONTINUOUS IMPROVEMENT: **VIGNETTE**

Dignity Health: Reporting Progress to the BizNGO Principles for Safer Chemicals

Dignity Health in collaboration with Health Care Without Harm, Practice Greenhealth, and Clean Production Action engaged in an in-depth pilot of its activities using a beta version of *The Guide*. Over the course of a year staff from across Dignity Health delved into the benchmarks for each of the Principles and openly discussed their work in relation to each benchmark. Table 3-1 summarizes the results of that pilot. Note that alignment of Dignity Health's work and benchmarks achieved in Table 3-1 are not perfectly aligned with the benchmarks in this final version of *The Guide* because their results are based on a beta version of *The Guide*.

To Dignity Health's credit it published the results of this pilot in its FY 2011 Social Responsibility Report, publicly acknowledging its beginning, yet pioneering, work on Principles #1 and #2, its further ascent on Principles #3, and its progress towards the Summit of Principle #4. Among the leaders in the health care sector in advancing safer chemicals in products, the fact that Dignity Health did not reach beyond Trailhead for Principles #1 and #2 reflects the the challenges organizations confront in moving beyond some chemicals of high concern.[5] This is especially true for large complex organizations like health care providers. Dignity Health's "single" move of eliminating its use of PVC intravenous (IV) bags in 2006 was an incredibly large and challenging action that had to be implemented across 41 hospitals, 45 clinics, and 9 trauma centers.

Dignity Health's commitment to continuous improvement is demonstrated by endorsing the Biz-NGO Principles and releasing the results of the BizNGO pilot in its Social Responsibility report.

Without replicable procedures and systems for advancing safer alternatives, the best of organizations will remain at Trailhead. In reflecting upon the leadership of HP and Nike towards safer alternatives in Principle #2, a pathway for Dignity Health to accelerate its suppliers towards safer alternatives would be to require suppliers to have a publicly transparent, replicable system for evaluating and reporting on chemical hazards in products. HP's requirement that suppliers evaluate alternatives using the GreenScreen is an example of how to short cut that path.

Dignity Health's commitment to continuous improvement is demonstrated by endorsing the BizNGO Principles and releasing the results of the BizNGO pilot in its Social Responsibility report. The fact that Dignity Health achieved Summit Action 3.4 of reporting progress to the BizNGO without addressing the High Camp Action 3.3 of implementing systems highlights how pathways to the Summit will vary across organizations. Note that the benchmark in Figure 3-2 for Principle #3 differs because it is based on a beta version of *The Guide*.

Dignity Health's attainment of Summit for Principle #4 demonstrates: support for public policies including the draft California Safer Consumer Product Regulations, and the federal Safe Chemicals Act; engagement with NGOs, including Health Care Without Harm, Practice Greenhealth, and Clean Production Action; and co-chairing of the BizNGO Policy Work Group.

FIGURE 3–1

Dignity Health Pilot of beta Version of *The Guide*

Principle	Benchmark	Strengths	Opportunitiesfor Improvement
#1 Know and Disclose Product Chemistry	Trailhead	Dignity Health is already requesting that suppliers/ GPO request data for a handful of chemicals of high concern.	Dignity Health could, with its GPO, ask if suppliers: • know all chemical ingredients in their product (beyond MSDS) • publicly disclose all ingredients.
#2 Assess and Avoid Hazards	Trailhead	Dignity Health is already purchasing safer alternatives for a handful of chemicals and has established internal and external (with GPO) protocols for environmentally preferable procurement.	Expand target chemicals for elimination/ reduction • Ask IT firms if they evaluate product content using Green Screen; many are already doing this. • Other easy actions for Dignity Health to address are halogenated chemicals in electronics and RoHS chemicals in all electronic products.
#3 Commit to Continuous Improvement	Base Camp	Solid foundation in place for implementing comprehensive safer chemicals program across the organization.	• Set clear goals for knowing chemicals in products and moving away from chemicals of high concern in products • Publicly report on goals and progress towards them.
#4 Support Public Policies and Standards	Summit	Very active in advocacy work and collaborating with NGOs.	• Set annual priorities and report on activities.

Source: Dignity Health, FY2011 Social Resibility Report

Principle #3 Endnotes

1 R.A. Liroff, 2005, "Benchmarking Corporate Management of Safer Chemicals in Consumer Products—A Tool for Investors and Senior Executives," *Corporate Environmental Strategy*, v.12, n.1., *http://www.iehn.org/documents/CESBenchmarkingarticle_000.pdf* (accessed November 17, 2012).

2 Greenpeace, August 2011, *Guide to Greener Electronics: Ranking Criteria Explained (v.17)*, *http://www.greenpeace.org/international/Global/international/publications/climate/2012/GuideGreenerElectronics/Guide-Ranking-Criteria-v18.pdf* (accessed November 23, 2012).

3 Liroff, 2005, op. cit.

4 See *http://www.nikeresponsibility.com/report/content/chapter/targets-and-performance#Chemistry* (accessed November 17, 2012).

5 Note that the requirements for disclosure under Principle #1b do not apply to Dignity Health, which is a health care provide. As noted in the introduction and the Principle #1b section, disclosure to the public is not a relevant activity for health care organizations.

PRINCIPLE #4

Support Public Policies and Voluntary Initiatives

Increasingly business leaders are engaging in public and private initiatives that advance the development and use of safer alternatives in products, processes, and feedstocks. They collaborate with universities, NGOs, and other businesses. They develop and support the implementation of foundational actions, such as those specified in *The Guide,* into industry standards, certifications, and ecolabels. And they make their resources publicly available. Principle #4 applies to organization-wide actions.

Ideal for Supporting Public Policies and Voluntary Initiatives

In the ideal scenario business and health care leaders join with NGO, government, and academic leaders to support the implementation of the BizNGO Principles or their equivalent in public policies and voluntary initiatives such as industry standards. The leadership these organizations demonstrate internally to change their products, processes, and feedstocks, finds its way into external engagement. Efforts are made to transform the civic foundations of the safer chemicals economy including public policies, ecolabels, industry standards and certifications, and voluntary sustainability initiatives. See the box for Principle #4 as stated in the BizNGO Principles for Safer Chemicals.

Intent for Supporting Public Policies and Voluntary Initiatives

Imagine the impact a loud community of business and health care voices would have if they strongly supported the realization of the BizNGO Principles for Safer Chemicals in public policies and voluntary initiatives. It would be transformative. And it would dramatically change the discourse of all public policies and voluntary initiatives towards safer chemicals.

Publicly stating internal company successes and advocating for external policies and initiatives are critical to creating larger, societal action to safer chemicals. Principle #4 strives to achieve the "snowball effect" of rapidly growing the diffusion and adoption of ideas, methods, tools, systems, and innovations for safer alternatives to chemicals of high concern.

In addition, Principle #4 addresses the willingness of organizations to align their internal actions for safer alternatives with external actions and positions. Public policies and industry standards must change in order to gain robust information on the toxicity of chemicals, their presence in products and supply chains, and the availability of safer alternatives. The active participation of businesses and health care organizations, among others, is necessary for the successful integration of the Principles and *The Guide*'s benchmarks into public policies and voluntary initiatives.

PRINCIPLE #4:
Support Public Policies and Industry Standards

Support public policies and industry standards that: advance the implementation of the above three principles, ensure that comprehensive hazard data are available for chemicals on the market, take action to eliminate or reduce known hazards and promote a greener economy, including support for green chemistry research and education.

The active participation of businesses and health care organizations, among others, is necessary for the successful integration of the Principles and *The Guide*'s benchmarks into public policies and voluntary initiatives.

Context for Supporting Public Policies and Voluntary Initiatives

Downstream users typically do not try to integrate the Principles of Know, Disclose, Assess and Avoid Hazards,

and Continuous Improvement into public policies, industry standards, or other voluntary initiatives. Their tendency is to defer to their trade association or chemical manufacturers on chemical-related issues because chemicals are not considered their core function. Often their trade association will align with a chemical manufacturers' trade association. Yet chemical manufacturers do not represent the interests of downstream users who carry the liability—both legal and to brand image—of having chemicals of high concern to human health and environment in their products and supply chains.

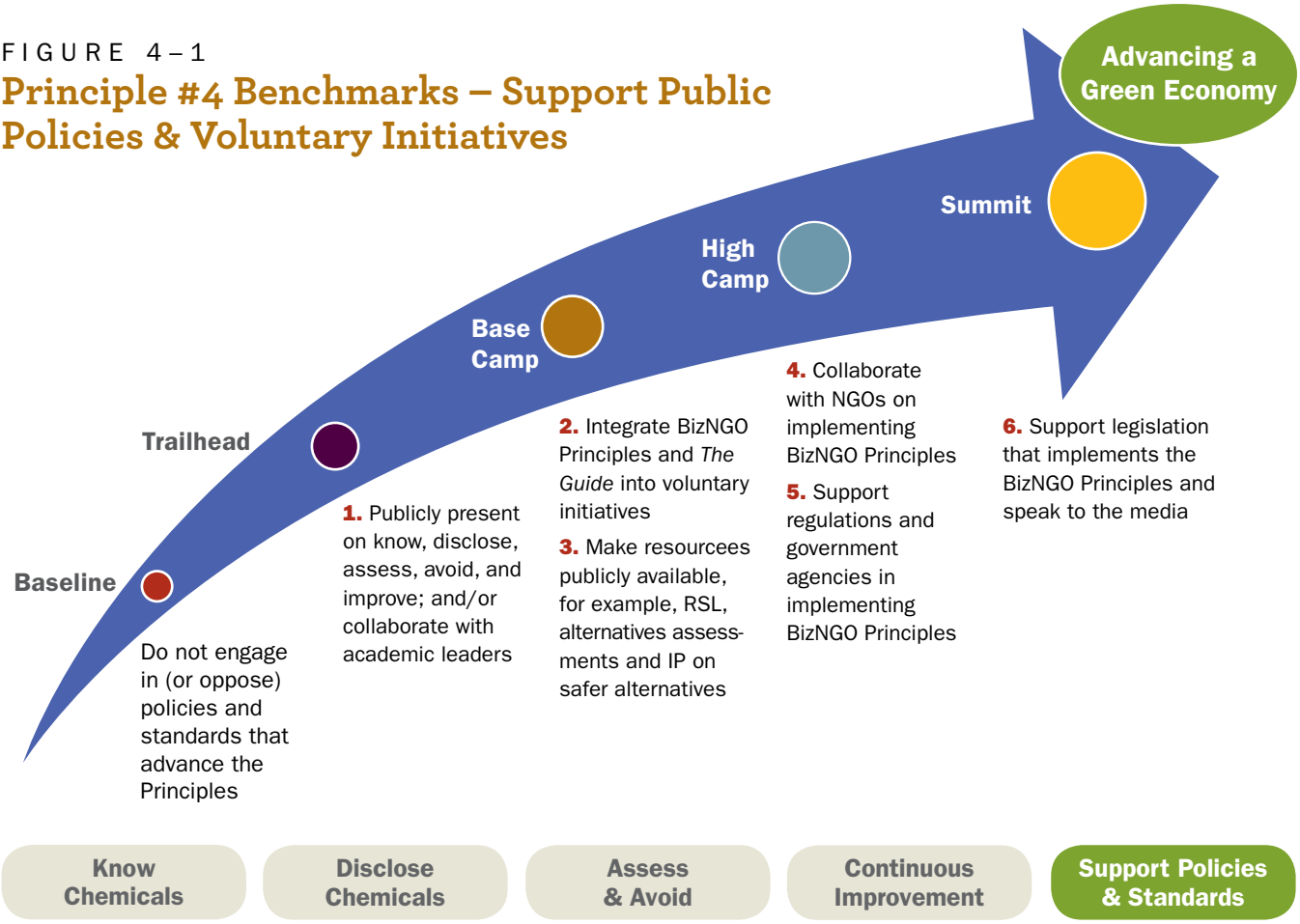
An outcome of the lack of loud voices for safer chemicals in voluntary initiatives is weak or non-existent benchmarks or actions for safer chemicals implementation in voluntary initiatives like The Sustainability Consortium, Global Reporting Initiative, ULE 880—Sustainability for Manufacturing Organizations, and other standards. The recent movement to integrate the GreenScreen and Health Product Declaration form into the U.S. Green Building Council's (USGBC's) LEED v4 and the draft Outdoor Industry Association Chemical Management Framework are bright spots in the bleak landscape of sustainability standards or certifications.

Benchmarks to Supporting Public Policies and Voluntary Initiatives

Figure 4-1 depicts four benchmarks beyond compliance to full engagement in policies and initiatives. The trajectory of the benchmarks progresses from publicly presenting at the usual conferences and meetings at Trailhead; to attempting to integrate elements of the BizNGO Principles into voluntary initiatives such as the Sustainability Consortium at Base Camp; to supporting regulations at High Camp; to supporting legislation at the Summit.

FIGURE 4–1

Principle #4 Benchmarks – Support Public Policies & Voluntary Initiatives



Baseline

The standard operating procedure for downstream users of chemicals is to oppose, remain neutral, or allow trade associations to define their position on public policies and voluntary initiatives that might advance the implementation of the BizNGO Principles.

Beyond Baseline, all the following actions are in support of public policies, industry standards, and other voluntary initiatives that would advance the BizNGO Principles of knowing, disclosing, assessing and avoiding hazards, and committing to continuous improvement.

Trailhead

4.1—*Action:* Publicly present on know, disclose, assess, avoid, and improve; and/or collaborate with academic leaders.

NOTE: It is quite common for businesses and other organizations to present their research work and best practices at industry conferences and trade shows. Many examples abound of such conferences and will vary in type depending on the sector.

EXAMPLES

Two examples of leading U.S. academic centers whose work to advance safer chemicals aligns with the BizNGO Principles are:

- The University of Massachusetts Lowell, which includes the Lowell Center for Sustainable Production, the Green Chemistry and Commerce Council (GC3), and the Toxics Use Reduction Institute, and
- The University of California Berkeley Center for Green Chemistry.

Base Camp

4.2—*Action:* Integrate BizNGO Principles and The Guide's benchmarks into voluntary sustainability initiatives or trade association practices.

NOTE: Very few voluntary sustainability initiatives include criteria or actions that address the principles of

FIGURE 4–1

Principle #4 Benchmark: Support Public Policies & Voluntary Initiatives

Base Camp (CONTINUED)

know, disclose, assess, avoid, or commit to continuous improvement. Yet these initiatives are often the vehicles for scaling sustainability beyond regulatory compliance. For example, voluntary sustainability initiatives that BizNGO participants have engaged in, with wide variations in success, include: Global Reporting Initiative, ULE 880, USGBC LEED, Outdoor Industry Association, The Sustainability Consortium, TCO, EPEAT, and the Sustainable Apparel Coalition.

Engage trade associations. Because the work of trade associations happens behind closed doors, it is usually impossible to independently verify what any organization does within its trade association. That said, companies need to engage their trade associations in supporting public policies and voluntary initiatives that advance the Principles. This engagement is challenging because trade associations tend to represent the lowest common denominator among the organizations and tend to align with chemical trade associations on public policies.

EXAMPLES

The proposed USGBC LEEDv4 is an example of where many and diverse voices, including those of businesses and health care organizations, will be needed to keep credits that encourage meeting the goals of BizNGO Principles #1 and #2. LEEDv4 includes a new credit series called "Building product disclosure and optimization" "to encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts."

In the proposd LEEDv4, "MRc4—Building product disclosure and optimization—material ingredients" includes two options. Option 1-Material Ingredient Reporting can be met through either a: manufacturer inventory, complete Health Product Declaration form, or Cradle to Cradle Certified Silver. Option 2-Material Ingredient Optimization can be met through either: no GreenScreen List Translator Benchmark 1 ingredients, Cradle to Cradle Certified Gold, or no REACH Substances of Very High Concern Authorization or Candidate List ingredients. Broad-based support for MRc4 is needed for it to withstand attacks by opponents to inherently safer chemicals in building products

4.3—*Action:* Make resources publicly available on safer alternatives including the company's RSLs, alternatives assessments, or their intellectual property.

NOTE: A promising route to the broad dissemination of safer alternatives to chemicals of concern is the sharing of information on chemical hazards and safer alternatives, and intellectual property. Demand for readily available data on chemical hazards and GreenScreen assessments of companies' chemicals is growing rapidly.

EXAMPLES

On the intellectual property front, the GreenXchange works to accelerate and scale sustainability and innovation through sharing intellectual property assets. One of the first innovations made available through GreenXchange was the formulation for Nike's Environmentally Preferred Rubber.

HP published its case study, "Substitution of brominated flame retardants with non-halogenated alternatives using the GreenScreen™ for safer chemicals alternatives assessment tool" on SubsPort.

Many businesses publish their RSL on their website, including VF Corporation (owner of many brands including Timberland and North Face), Nike, and Levi Strauss & Co.

High Camp

4.4—*Action:* Collaborate with NGOs (non-governmental organizations) on implementing the BizNGO Principles for Safer Chemicals or equivalent initiatives.

NOTE: Collaborating with advocacy organizations may be a challenging step for many large businesses due to concerns with trust and how the collaboration might come back to haunt the company. Businesses are wary of stepping forward and making public commitments with NGOs because it can make them a target for attacks that they are not doing enough or are not meeting their targets. Yet many large and small businesses are finding common ground with NGOs and successfully overcoming these challenges.

EXAMPLES

Examples of business-advocacy organization collaborations specific to chemicals:

- BizNGO—including video on the BizNGO Principles
- Health Care Without Harm
- Safer Chemicals Healthy Families Coalition
- Campaign for Safe Cosmetics Campaign
- Healthy Building Network—Pharos and Health Product Declaration Form
- ChemSec—Business Group
- BlueGreen Alliance

4.5—*Action:* Support regulations and government agencies in implementing BizNGO Principles or equivalent initiatives.

NOTE: It is often a challenge for downstream companies to engage in any public policy related to chemicals—be they regulation, legislation, or other initiatives — due to a lack of resources and technical capacity. Looking back to Principle #1b and the "Ripples of Responsibility" developed by Meyer and Kirby (see Figure 1b-1), most downstream users consider policy as a "take interest" issue. However, downstream users should consider "taking action" because they have "problem solving competence" and they alone know how regulations should be implemented to be effective. This makes their voice influential in the policy arena.

We recognitze that support for any regulation is never absolute. Regulations, by the very nature of their construction, are imperfect at best. Reflecting the challenge of gaining agreement among diverse stakeholders on imperfect policies, we crafted the "BizNGO Note on Government Policy Positions" (see box) to note that participants may not agree on every comment by BizNGO but do agree to the spirit of those comments. It is interesting to note that within BizNGO differences of opinion are as varied between businesses as between businesses and NGOs.

EXAMPLES

Comments to California Department of Toxic Substances Control (DTSC) proposed Safer Consumer Product Regulations from BizNGO and Hewlett-Packard.[1]

Howard Williams' of Construction Specialties video presentation to the "Chemicals in Products" side event to the third session of the International Conference on Chemicals Management (ICCM3), Nairobi, Kenya, September 15, 2012.

Summit

4.6—*Action:* Support legislation that implements the BizNGO Principles and speak to the media in support of public policies or industry initiatives.

NOTE: Speaking to the media or publicly in favor of legislation is challenging for downstream users of chemicals for the reasons noted in Action 4.5. Generally the negatives of public engagement are viewed as greater than the negatives of remaining quiet. However, the long term reality is chemicals of concern eventually end up downstream in the supply chains and products of brands, retailers, and hospitals, and they bear the burden of managing those chemicals as well as defending the reputation of their brands. Increasingly downstream business leaders are speaking truth to power to redress their downstream burden.

EXAMPLES

Howard Williams' of Construction Specialties blog in *The Hill*.

Testimony to the U.S. Senate on Toxic Substances Control Act reform by Kathy Gerwig, Kaiser Permanente and Howard Williams, Construction Specialties.[2]

Health care support for the federal Safe Chemicals Act.

Briefings before Congressional staffers on the need for chemicals policy reform by Barry Cik of Naturepedic, Peter Syrett of Perkins+Will, and Howard Williams of Construction Specialties.[3]

BizNGO Note on Government Policy Positions

Participants in BizNGO are all working towards the use of safer chemicals in commerce. Reflecting the diversity of participants in the Working Group, we have a diversity of perspectives on government, NGO and industry initiatives. While BizNGO strives for consensus on all of its policy positions and all participants agree on the government policy issues we address, we may not achieve consensus on the specifics of every BizNGO policy statement.

SUPPORT POLICIES & INITIATIVES: **VIGNETTE**

Amplifying the Voice of Downstream Users in Public Policies and Voluntary Initiatives

The collective voice of downstream users, of businesses and health care organizations large and small, engaging in public and private spaces is critical for accelerating the broader global movement to safer alternatives to chemicals of high concern to human health or the environment. BizNGO, the American Sustainable Business Council (ASBC), and the Green Chemistry and Commerce Council (GC3) are all leaders in bringing together a diverse community of businesses and other stakeholders in supporting and growing the community of engaged organizations.

Downstream users are increasingly engaging in and shaping initiatives for safer chemicals. Such actions range from presenting at UN meetings (Construction Specialties) to testifying before Congress or at Congressional briefings (Perkins+Will, Kaiser Permanente, Construction Specialties, Naturepedic, Staples, Nike, Method, Seventh Generation)[4] to supporting the U.S. EPA DfE Program (GC3) to supporting the California Green Chemistry Initiative (Dignity Health, Staples, Kaiser Permanente, Method, Hewlett-Packard, Naturepedic, Saunders Hotels, and many others).

As an article in *Chemical Watch* highlighted, "Downstream users play an important role in the government's efforts to revise its policies related to chemical safety, Bob Sussman, the Environmental Protection Agency's senior policy counsel said to a group of business and NGO leaders who met in Washington yesterday. Downstream companies 'occupy a unique position at the end of the value chain, where the rubber meets the road,' Mr. Sussman told the meeting participants. 'Your voice is critical.... We want to encourage you to stay in the game and to help shape the end product,' he said, referring to the draft documents being discussed in Congress to revise the Toxic Substances and Control Act (TSCA)."[5]

Joint collaborations such as BizNGO are helping to advance the diffusion of tools and resources for safer alternatives. For example, in 2011, when BizNGO jointly released the Principles for Sustainable Plastics and the Chemical Alternatives Assessment Protocol v1.0 it was critical to have the support of Staples, HP, and Construction Specialties.[6] This joint release led to the article in Forbes on "Better Profits through Green Chemistry" where author Amy Westervelt highlighted that "Companies like Staples and Construction Specialties that have already put a considerable amount of time and money into sourcing safer chemicals are also working together to share what they've learned with other companies looking to green their chemical supply chains."[7] Rich Liroff of the Investor Environmental Health Network added, these tools are "extremely important—the pressure on companies to green their chemical supply chain will only grow and companies will need tools with which to respond."[8]

Ultimately corporate leaders in safer chemicals will only succeed if their efforts are mainstreamed globally. This will require the insertion of know, disclose, and assess and avoid hazards into public policies, industry standards, ecolabels, certifications, and voluntary sustainability initiatives. Without significant downstream user engagement NGOs and others will fail at their efforts to transform the global chemical economy. Yet we now see a few bright spots in the mountain summits including the proposed USGBC LEED v4, Outdoor Industry Association Chemical Management Framework, and the California Safer Consumer Product Regulations.

Ultimately corporate leaders in safer chemicals will only succeed if their efforts are mainstreamed globally. This will require the insertion of know, disclose, and assess and avoid hazards into public policies, industry standards, ecolabels, certifications, and voluntary sustainability initiatives.

Principle #4 Endnotes

1 For example, see comments to DTSC submitted by all organizations, including BizNGO and HP, *http://www.dtsc.ca.gov/SCPRegulations.cfm* (accessed November 17, 2012).

2 See *http://www.bizngo.org/reform.php* (accessed November 17, 2012).

3 See *http://org2.democracyinaction.org/o/6269/t/0/blastContent.jsp?email_blast_KEY=1168630* (accessed November 17, 2012).

4 For example, Kathy Gerwig of Kaiser Permanente testified before the U.S. Senate Environment Public Works Committee on efforts to reform the Toxic Substances Control Act on March 9, 2010, *http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=4acbc06b-75d1-41f8-b06b-e606bd681cfb* (accessed November 17, 2012).

5 Chemical Watch, June, 4, 2010, "US EPA says downstream users are critical to TSCA reform," *http://chemicalwatch.com/3885* (accessed November 17, 2012).

6 See *http://www.bizngo.org/pdf/BizNGO_PressRelease_30nov2011.pdf* (accessed November 17, 2012).

7 A Westervelt, 2011, "Better Profits through Green Chemistry," *Forbes,* December 28, *http://www.forbes.com/sites/amywestervelt/2011/12/28/better-profits-through-green-chemistry* (accessed November 17, 2012).

8 Ibid.

CONCLUSION

Steps for Downstream Users: How to Succeed in Chemicals Management

The Guide provides users with a series of benchmarks to safer chemicals, moving from Trailhead to Summit for each of the BizNGO Principles. With varying sectors and organizations taking different paths, *The Guide* aggregates their actions into a composite of steps to safer chemicals. The figure on page 56, From Trailhead to Summit, summarizes the trajectory of actions downstream users are implementing to advance safer chemicals. For each of the BizNGO Principles, *The Guide* articulates a deeper level of knowledge, commitment, action, and public engagement as organizations move from Trailhead to Base Camp to High Camp, and ultimately to Summit.

In the previous sections we detailed actions from Trailhead to Summit for each of the BizNGO Principles. In this section we start from Trailhead for all the BizNGO Principles, then move to Base Camp and High Camp for all the Principles, and then to key elements of success at the Summit.

Getting to Trailhead: Stepping Beyond Compliance

Trailhead is where downstream users start on the path beyond compliance to safer chemicals. As shown in the figure, From Trailhead to Summit, the journey starts with a few chemicals of high concern in products or processes:

- ***Know: Action 1a.1***
  Require suppliers to report some chemicals of high concern
- ***Disclose: Action 1b.1***
  Disclose absence or presence of some chemicals of high concern
- ***Assess and Avoid: Action 2.1***
  Implement a restricted substances list (RSL)

examples of commonly known chemicals of concern that all downstream users can identify.

Once chemicals of concern are identified, determining the scope of products impacted and how to prioritize actions is next. For example, when health care organizations targeted PVC and its

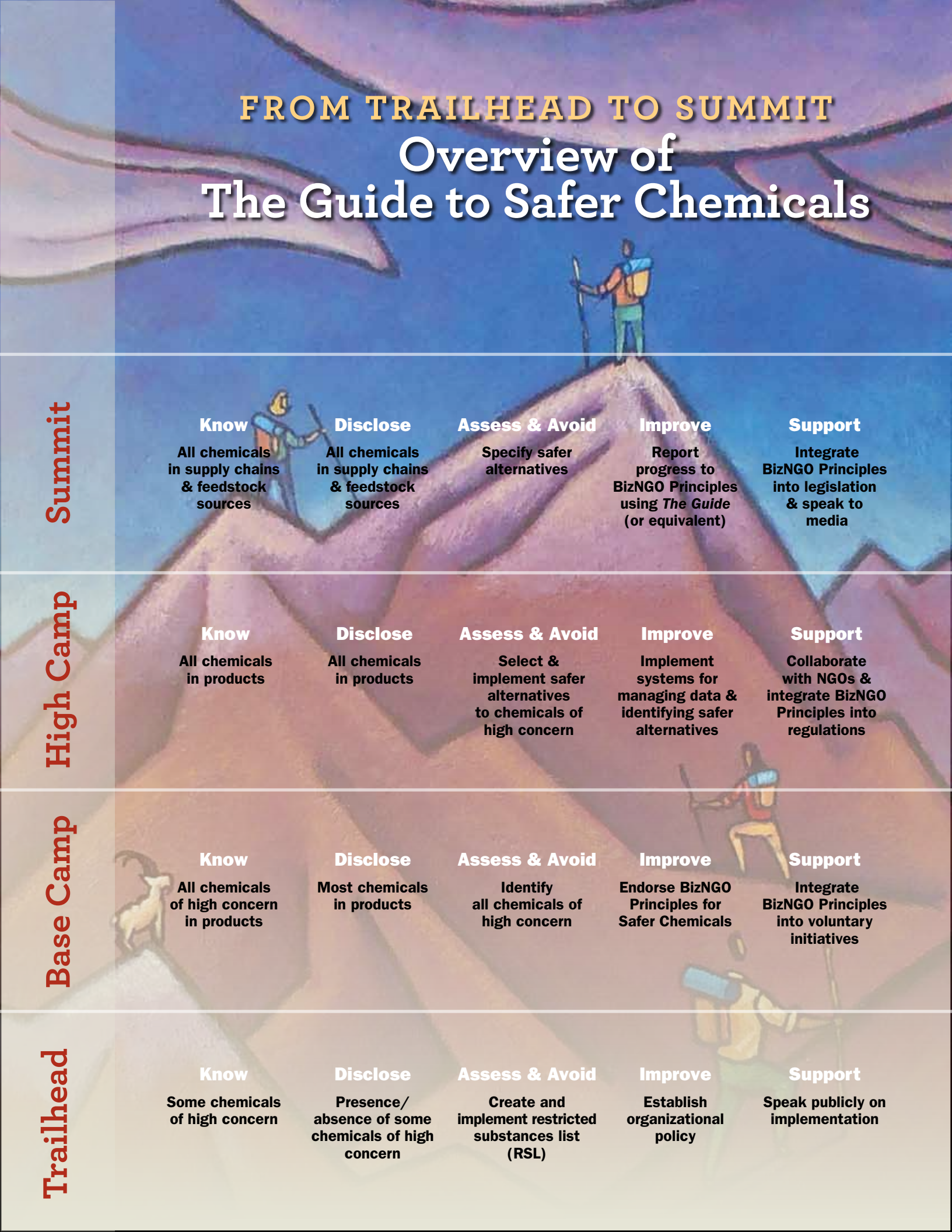
Finding chemicals of high concern in products is not the challenge for downstream users. The challenge is determining which ones to target first.

Chemicals of high concern are so prevalent in our global economy that it is common for a product have a chemical of high concern in it. Finding chemicals of high concern in products is not the challenge for downstream users. The challenge is determining which ones to target first.

A company can move beyond regulatory compliance and identify and target chemicals of high concern through a variety of pathways. Environmental organizations, government agencies, institutional consumers, and other companies are all good sources for identifying emerging and existing chemicals of high concern. For many years institutional and individual consumers have highlighted the problems with polyvinyl chloride (PVC), phthalates, brominated flame retardants, Bisphenol A (BPA), formaldehyde, and perfluorinated compounds. These are all

plasticizer di-2-ethylhexyl phthalate (DEHP) for reduction they confronted a vast array of products. PVC and DEHP are found in everything from medical devices to building products to packaging and within each of those categories there can be thousands of individual product types with PVC/DEHP in them. Kaiser Permanente and Dignity Health, for example, prioritized neonatal intensive care units where exposuring babies to DEHP was a priority concern.

Organizationally, companies may start with the Trailhead Action for Continuous Improvement of 3.1–Establish organizational policy or guidelines. In some companies, however, it is easier to work below the radar screen of upper management and take action against a few chemicals of high concern, demonstrate success, then gain organizational support for what was



FROM TRAILHEAD TO SUMMIT

Overview of The Guide to Safer Chemicals

Summit

Know	Disclose	Assess & Avoid	Improve	Support
All chemicals in supply chains & feedstock sources	All chemicals in supply chains & feedstock sources	Specify safer alternatives	Report progress to BizNGO Principles using *The Guide* (or equivalent)	Integrate BizNGO Principles into legislation & speak to media

High Camp

Know	Disclose	Assess & Avoid	Improve	Support
All chemicals in products	All chemicals in products	Select & implement safer alternatives to chemicals of high concern	Implement systems for managing data & identifying safer alternatives	Collaborate with NGOs & integrate BizNGO Principles into regulations

Base Camp

Know	Disclose	Assess & Avoid	Improve	Support
All chemicals of high concern in products	Most chemicals in products	Identify all chemicals of high concern	Endorse BizNGO Principles for Safer Chemicals	Integrate BizNGO Principles into voluntary initiatives

Trailhead

Know	Disclose	Assess & Avoid	Improve	Support
Some chemicals of high concern	Presence/ absence of some chemicals of high concern	Create and implement restricted substances list (RSL)	Establish organizational policy	Speak publicly on implementation

already achieved and approval for an organizational chemicals policy. In other companies, high level policies are the first step in driving action across the organization.

Taking these initial actions public is typically done through presentations at conferences and meetings as outlined in Trailhead Action 4.1–Speak publicly on implementation. Telling stories of successes as well as of challenges and how they were overcome or remain is critical to both advancing safer alternatives as well as creating a community of fellow practitioners.

Getting to Base Camp and High Camp: Creating Systems for Change

Replicable and scalable systems are essential to moving beyond a handful of chemicals of high concern. Systems for collecting and managing data, identifying chemicals of high concern, evaluating alternatives, and selecting safer alternatives are needed to reach Base Camp and High Camp, including:

- ***Know: Actions 1a.2 and 1a.5*** Require suppliers to report all chemicals of high concern and all chemicals in products
- ***Disclose: Actions 1b.2 and 1b.3*** Disclose most to all chemicals in products
- ***Assess and Avoid: Action 2.2*** Identify all chemicals of high concern in products or processes
- ***Assess and Avoid: Action 2.3*** Evaluate alternatives to chemicals of high concern
- ***Assess and Avoid: Action 2.4*** Select and implement safer alternatives

Without systems and procedures organizations cannot scale their work, cannot manage their supply chains, and cannot systematically implement their programs. These procedures can be developed internally, they can reference external methods and tools such as the BizNGO Chemical Alternatives Assessment Protocol, and GreenScreen for Safer Chemicals, and/or can rely upon third party certifications such as Cradle to Cradle Certified.

An example of a linked set of systems is:

1. ***Know chemical ingredients in products.*** Examples include the Health Product Declaration form and Seagate's system for collecting and managing data in products.
2. ***Identify chemicals of high concern.*** Examples include ChemSec's SIN List and GreenScreen Benchmark 1 Chemicals (as determined using the List Translator).
3. ***Employ a framework for evaluating alternatives.*** Examples are HP's Integrated Alternatives Assessment Framework and BizNGO's Chemical Alternatives Assessment Protocol.
4. ***Assess hazards of alternatives.*** Examples are the GreenScreen for Safer Chemicals and Cradle to Cradle Certified.

to create the procedures and systems necessary for success. Champions are able to articulate the value of safer chemicals implementation, especially in financial terms. Business benefits include: reduced reputation risk, increased sales and market share, differentiated products, improved quality, enhanced brand image, loyal employees, and increased customer satisfaction. Somewhat ironically, the best business case for taking action can be prompted by protesters camped in front of corporate headquarters or hanging from corporate buildings with slogans protesting the use of toxic chemicals in products. Such actions highlighting toxic chemicals in the products and supply chains of brands create pressure for action to alleviate brand vulnerability.

The focus on external engagement in Principle #4 increases as organizations move from Trailhead to Base Camp and High Camp. Here company staff

The business case must be made for committing organizational resources to create the procedures and systems necessary for success. Champions are able to articulate the value of safer chemicals implementation, especially in financial terms.

The questions purchasers at the far end of the supply chain need to ask suppliers are, what are your systems for:

- knowing chemicals in products,
- identifying chemicals of high concern,
- evaluating alternatives, and
- selecting safer alternatives.

A short version of these questions would be how do you score on the BizNGO benchmarks.

The business case must be made for committing organizational resources

gain some flexibility to express their internal leadership in transforming products and purchasing specifications to a wider public. Champions in these organizations recognize that organizational success depends on a deeper movement to safer chemicals in supply chains, competitive companies, trade associations, and the broader public as represented by governments and environmental advocacy organizations. Company champions engage various public communities to promote a wide scale and popular movement to safer chemicals. They do this, for example, by advocating for the Principles for

Safer Chemicals in voluntary initiatives and government regulations while also directly collaborating with NGOs.

Moving from Base Camp to High Camp requires organizational support to advance beyond chemicals in products and up into supply chains and feedstocks. Procedures established in Base Camp now need staffing to implement.

Getting to the Summits: Setting the Compass to Inherently Safer Alternatives

Travelers to the Summits of *The Guide* have set their sights on specifying inherently safer chemicals, materials, and feedstocks across all of their products and supply chains. In looking across companies that are able to reach the summit for some principles or come close to the summit share three common elements of success, namely they have the capacity, will, and systems in place to ensure long term adoption and implementation.

CAPACITY MATTERS

Effectively managing chemicals in products and across supply chains requires technical capacity or staff. Organizations at or near the summit have:

- Deep knowledge and understanding of chemicals in products and supply chains, as well as the sources of feedstocks.
- Technical capacity and systems for managing data, evaluating alternatives, and selecting and implementing safer alternatives.

Many downstream companies do not consider chemicals management an important component of their operations and indeed some can be characterized as "chemophobic" because they avoid the whole issue of managing chemicals in their products. Alternatively they may hope that external organizations such as third parties will solve the problems of managing chemicals in products and supply chains for them. However, while third parties and other external resources can be effective, they still require an in-house manager to ensure that internal goals and priorities are being met. Ultimately third parties do not absolve companies of their responsibility for chemicals in their products and in their supply chains.

An alternative route for leveraging technical resources and capacity is through the engagement of non-profit organizations, trade associations, or consultants. For example, many organizations in health care are effectively leveraging non-profit organizations—Practice Greenhealth, Health Care Without Harm, and Healthy Hospitals Initiative—to support, help develop and implement their safer chemical programs. Manufacturers of outdoor products are leveraging their trade association, the Outdoor Industry Association (OIA), to create a comprehensive chemical management framework. OIA is leading a multi-year, multi-stakeholder technical group to create this framework.

WILL IS ESSENTIAL

An effective chemicals management program requires organizational motivation and drive to move beyond legal compliance and maintain that trajectory over time. This comes in many forms, including: organizational mission, internal champions, and implementation of a chemicals policy or guideline. Some of the most successful organizations on the path to safer chemicals have an internal mission to promote safer chemicals and values consistent with addressing chemicals of concern to human health or the environment. Non-profit health care organizations and mission-driven for-profit companies (for example, Seventh Generation and Method) are among the leaders in safer chemical implementation. They allocate internal resources and engage externally to realize their company's core values.

An effective chemicals management program requires organizational motivation and drive to move beyond legal compliance and maintain that trajectory over time. This comes in many forms, including organizational mission, internal champions, and implementation of a chemicals policy or guideline.

A company's chemical management policy and guideline will reveal the extent to which its senior management expresses their will to advance safer chemicals. Organizations at or near the Summit are implementing policies that support the BizNGO Principles, including commitments to transparency and engaging in external policies and initiatives. Such chemical management policies and guidelines should be foundational, but our initial research reveals that in reality senior management, including sustainability officers, invest little if any time into the chemicals management of their products and supply chains. This may be because traditionally chemical impacts were considered to be important only on the factory floor.

A clear driver within many leading organizations is the presence of internal champions. Champions have a personal passion for the issue and possess technical or organizing skills that enable them to demonstrate the

value of safer chemicals implementation. Internal champions gain organizational support for this work and share many of the characteristics of "tempered radicals:"

> [I]ndividuals who identify with and are committed to their organizations and also to a cause, community or ideology that is fundamentally different from, and possibly at odds with, the dominant culture of their organization. Their radicalism stimulates them to challenge the status quo. Their temperedness reflects the way they have been toughened by challenges, angered by what they see as injustices or ineffectiveness, and inclined to seek moderation in their interactions with members closer to the centre of organizational values and orientations.[1]

Organizations must internalize the outcomes of a champion's work to implement safer chemicals otherwise these impacts will be lost when the champion leaves the organization.

SYSTEMS ARE FUNDAMENTAL

Successful implementation over the long term requires the development and implementation of systems. Systematic procedures are needed to collect and evaluate chemicals and their alternatives, validate data, select and implement safer alternatives, and specify green chemistry solutions. These procedures can be internal, outsourced, or a combination of the two. Leaders in safer chemicals implementation develop procedures that can be implemented over the long term and that are organizationally integrated as part of long term planning. Examples of organizations that are leaders in systems or procedures for safer chemicals include:

- Nike and their criteria for evaluating materials and advancing green chemistry specifications.
- Seagate and their systems for collecting, managing, and validating chemical ingredient data.
- Hewlett-Packard and their procedures for conducting alternatives assessments that include identifying chemicals of high concern, and evaluating and selecting safer alternatives.

The outdoor industry and apparel and footwear sectors, are taking a leadership role on a sector-wide basis in defining a comprehensive framework that builds from earlier iterations of *The Guide*.

The Guide is a Living Resource: Tell Us of Your Journey

Significant insights we learned over the course of writing *The Guide* are:

1. ***Stepping beyond Trailhead requires systems.*** Organizations moving beyond Trailhead have systems in place for managing data, identifying chemicals of high concern, communicating with suppliers, and evaluating and selecting alternatives.
2. ***Having an agreed upon list of chemicals of high concern accelerates the rapid screening of chemicals.*** The ChemSec SIN List and GreenScreen Benchmark 1 chemicals are readily available solutions. And the GreenScreen List Translator is the quickest route to rapidly identifying GreenScreen Benchmark 1 chemicals (although we must note the conflict of interest of the authors, one of whom is a co-author of the GreenScreen).
3. ***Leveraging the primacy of hazard facilitates priority setting, communicating with suppliers, and selecting inherently safer alternatives.*** The BizNGO Chemical Alternatives Assessment Protocol and the GreenScreen for Safer Chemicals are both well-suited for supporting hazard-based decision making (although note again the conflict of interest of the authors).
4. ***Raising the collective voice of downstream users is critical for growing the broader global movement to safer alternatives to chemicals of high concern to human health or the environment.*** Ultimately corporate leaders in safer chemicals will only succeed if their efforts are mainstreamed globally. This will require the insertion of know, disclose, and assess and avoid hazards into public policies, industry standards, ecolabels, certifications, and voluntary sustainability initiatives.

The Guide is a living resource and will evolve over time as we learn more about the challenges and opportunities that organizations face in implementing these benchmarks. If you are a downstream user of chemicals and want to join us on the journey to safer chemicals, please contact us at *TheGuide@bizngo.org*. We look forward to hearing your feedback and experiences.

1 *D.E. Meyerson and M.A. Scully, 1995, "Tempered Radicalism and the Politics of Ambivalence and Change," Organization Science, v.6n.5.*

The Guide to Safer Chemicals

Implementing the BizNGO Principles for Safer Chemicals

The BizNGO Guide to Safer Chemicals—is a unique resource for downstream users of chemicals. It is a hands-on guide 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.

Chemicals are at the core of our materials, products, and manufacturing systems, and as such should be at the core of our sustainability programs. Yet many a downstream business, those organizations that use chemicals by virtue of the products they purchase, has avoided starting this journey thinking that the path to greener and safer chemicals is too clouded in complexity and uncertainty. *The Guide* is our response to these uncertainties and is intended for both novices and experts.

The Guide:

- marks pathways to safer chemicals in products and supply chains.
- sets relative benchmarks for each of the four BizNGO Principles for Safer Chemicals.
- specifies actions for each benchmark.
- presents examples of business practices for each benchmark.
- illustrates how downstream users are getting started and advancing on their paths to safer chemicals.

Users of *The Guide* will learn how to:

- measure internal performance, identify areas of improvement, and track progress to safer chemicals.
- benchmark performance in comparison to other organizations.
- communicate to the public their organization's performance in moving to safer chemicals based on an independent metric.

The question of how to implement the Principles for Safer Chemicals is the inspiration for *The Guide*. As many a potential traveler has said to us: "We agree with the spirit of the BizNGO Principles. But what does it mean to implement them?" This guide is our initial (v.1.0) answer to that question.

BizNGO
FOR SAFER CHEMICALS AND SUSTAINABLE MATERIALS

A PROJECT OF CLEAN PRODUCTION ACTION

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