2012

ZERO DISCHARGE OF HAZARDOUS CHEMICALS PROGRAMME

ANNUAL REPORT

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Contents

Acronyms and Abbreviations

APE	alkylphenol(s)
APEO	alkylphenol ethoxylate(s)
BAT	best available techniques
CAS	Chemical Abstract Numbers
C.I. Index	Colour Index International
CiP	Chemicals in Products
CMWG	Chemicals Management Working Group
DfE	Design for Environment
EICC	Electronics Industry Citizenship Coalition
EOG	European Outdoor Group
FLA	Fair Labor Association
GSCP	Global Social Compliance Program
MRSL	manufacturing restricted substances list
NGO	nongovernmental organisation(s)
OIA	Outdoor Industry Association
PFC	perfluorinated chemicals
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PRTR	Pollutant Release and Transfer Register
RSL	restricted substances list
SAC	Sustainable Apparel Coalition
SAICM	Strategic Approach to International Chemicals Management
SCCP	short-chained chlorinated paraffin(s)
SUSCHEM	European Technology Platform for Sustainable Chemistry
UBA	Umweltbundesamt (German Environmental Agency)
US EPA	United States Environmental Protection Agency
ZHDC	Zero Discharge of Hazardous Chemicals

A Message from the ZDHC Group

We are pleased to share the inaugural year results of the Zero Discharge of Hazardous Chemicals (ZDHC) programme in this 2012 Annual Report. Our goal for 2013 remains more important than ever, contributing to a cleaner environment and laying the foundation for expanding environmental accountability.

The results presented in this report illustrate the focus on results and commitment of the ZDHC community—signatory brands, the textile chemical industry and supply chain industry associations, environmental and social nongovernmental organisations (NGOs), suppliers, and the academic community—during the past year to work towards the goal of zero discharge. We are grateful to the ZDHC partners, whose efforts have supported us in advancing this vital goal.

Our greatest challenge remains in galvanizing support throughout the supply chain. Engaging additional stakeholders to advance our shared goal is a strategic imperative for 2013. We welcome your interest and participation. Please consider areas of potential collaboration and alignment with us as you read through this report.

Implementing the Joint Roadmap is very challenging and represents an opportunity to contribute to a cleaner environment and to safe and secure conditions for people. We hope you will join us in addressing this challenge.

Warm regards,

adidas Group, C&A, G-Star Raw, H&M, Jack Wolfskin, Levi Strauss & Co., Li Ning, NIKE, Inc., and PUMA SE

Introduction

The Zero Discharge of Hazardous Chemicals (ZDHC) programme's mission is highly ambitious and sets a new standard of environmental performance for the global apparel and footwear industry. Moving towards the goal of zero discharge of hazardous chemicals from the production of apparel, footwear, and accessory goods, will be an enormous challenge.

This Annual Report outlines the ZDHC group's progress during 2012 towards commitments we made in the Joint Roadmap (www.roadmaptozero.com/joint-roadmap.php). The report also introduces our plans for the coming year, including the release of the Joint Roadmap Version 2.0 scheduled for Spring 2013. Multiple links are provided throughout the text to connect you with more detail on specific programme efforts.

The ZDHC brand members have made a large resource investment in this work during the last 16 months. An important part of our work has been building alignment and infrastructure of the ZDHC programme and associated governance. This work has all been conducted with team members in Asia, Europe, and North America.

Over the past year, we have:

- **Conducted over 100 group webinars and project team calls**
- **Conducted three very productive week-long face-to-face meetings with our full team**
- **Reached out to over 200 potential stakeholders, including intensive collaboration with 20 to 30 key stakeholders**
- **Many of the member brands have invested well over one full-time resource into this programme, with more than 10-person years spent on this work to date**

ZDHC Programme History

Since the 1990s, many apparel and footwear companies have been working on the restriction of harmful substances in products. In support of this, industry organisations have been working collaboratively for the past decade to harmonise product standards and communicate these standards throughout the supply chain. While these efforts have achieved great progress, it is clear that it is essential for brands to consider more than just controlling restricted chemicals in products.

In 2011, the ZDHC programme formed to catalyse positive change in the discharge of hazardous chemicals across the product life cycle. Current members include adidas Group, C&A, Esprit, G-Star Raw, H&M, Inditex, Jack Wolfskin, Levi Strauss & Co., Li Ning, NIKE Inc., PUMA SE, and key influencers in the chemical industry. Our group continues to expand, welcoming new members who are interested in contributing to these goals.

From the onset, we recognized that holistic system change was required to achieve our goal and placed focus on improving inputs and processes, not just end-of-pipe controls. As such, the first Joint Roadmap, released in November 2011, identified the areas in which ZDHC members could collaborate to conduct research and take action, moving the group towards our 2020 goal of zero discharge of hazardous chemicals. In developing our first 12-month work plan, we asked ourselves several fundamental questions:

- How do we know which restricted chemicals are still in use in our supply chain?
- How do we communicate to our suppliers about the ZDHC programme?
- How do we best train our suppliers?
- How do we know which chemicals to prioritise?
- When are these chemicals used in ways that pose risk?
- How should we best assess chemicals for the risks they cause?
- How do we select chemicals on which to focus our efforts?

To this end, we identified projects in seven main categories for our first year of work:[1]

- Benchmarking and Phase Out
- Water Repellency
- Chemical Identification and Hazard Assessment
- "Green" Chemistry
- Audit Protocol
- Joint Training
- Disclosure

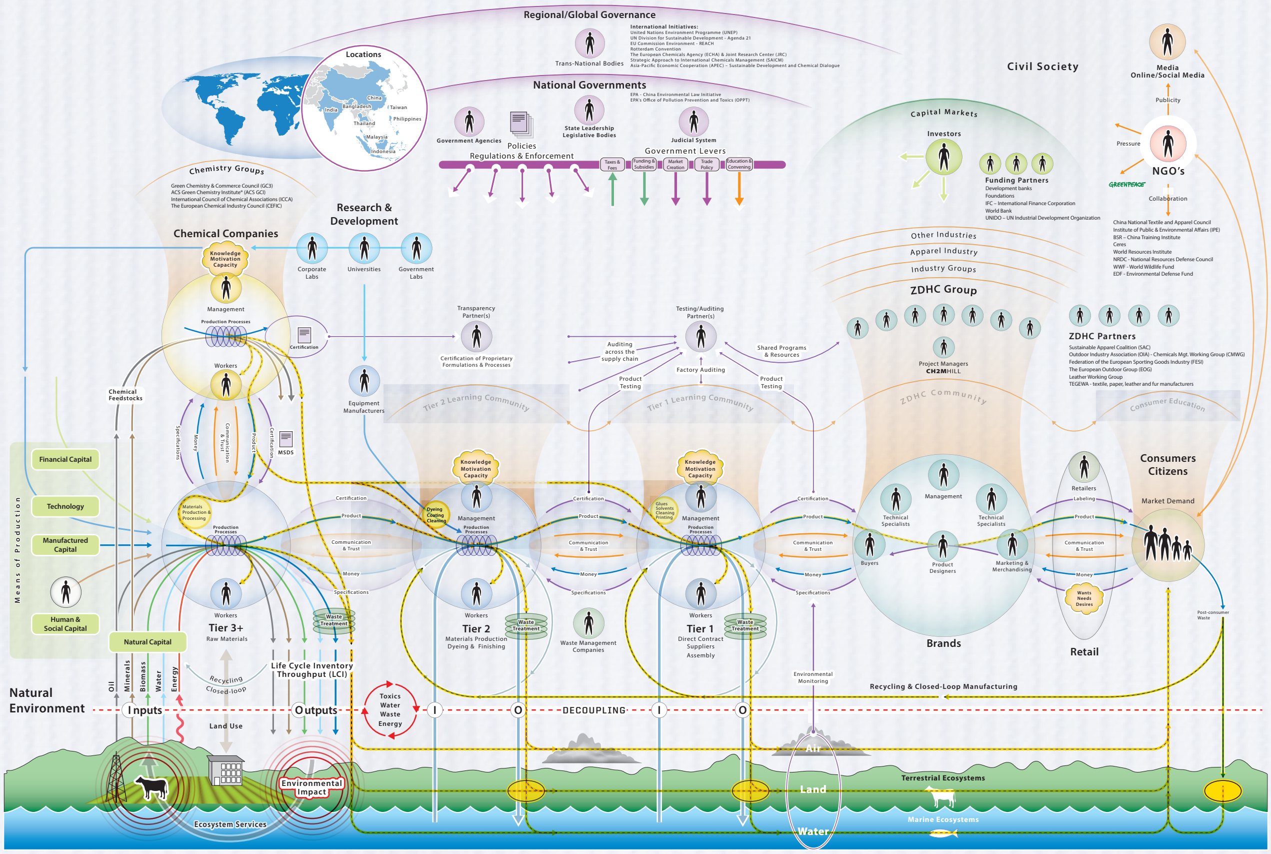
From the onset, we recognized that holistic system change is required to achieve our 2020 goal.

Within each project category, we defined projects that would further our understanding during the initial phase of the programme. Then we set specific timelines and milestones for these individual projects.

An essential element to programme success, stakeholder outreach and engagement, is embedded across all of the project categories. Project teams actively engage with a diverse network of stakeholders who serve a critical role in reaching our 2020 programme vision. To better understand this complex stakeholder community, we completed a systems map (www.roadmaptozero.com/df.php?file=pdf/Systems_Map.pdf) that identifies the many influencers required to develop and implement the solutions (see Figure 1). These stakeholders provide guidance and resources to effect positive change. In some cases, we have aligned with industry associations, such as the European Outdoor Group (EOG), the Outdoor Industry Association (OIA), and the Sustainable Apparel Coalition (SAC). By actively engaging with stakeholders across the system, we envision leveraging our collective strength and encouraging system-wide change.

Figure 1

The ZDHC Systems Map Provides a Holistic Prospective of the Apparel Production Process



Purpose of Report

With this Annual Report, we aim to:

- ***Report on Progress and Results.*** Outline our progress against planned milestones, along with conclusions we have drawn from our work. We did this by discussing approach, progress, and next steps with regard to each of the seven main categories of work we pursued in our first year.
- ***Promote Industry Collaboration.*** Introduce stakeholders to our project work in enough detail that interested stakeholders understand our objectives and begin to actively contribute to this initiative.
- ***Extend Opportunities for Continuous Dialogue.*** Communicate with interested collaborators by reporting on a regular basis.
- ***Build upon Learnings.*** Document the learnings from this past year's work. These learnings laid the foundation for developing the next version of the Joint Roadmap.

Future Reporting Processes

Maintaining communication with stakeholders is a priority for the ZDHC programme. In order to keep stakeholders informed, we will continue to post progress reports, as well as project-specific reports as they become available, on our web site (www.roadmaptozero.com/progress-reports.php). Interested stakeholders also may subscribe to receive information about our latest activities and programme updates. Additionally, we engage stakeholders through webinars and face-to-face meetings to gather input on our progress and next steps.

We welcome input and assistance from stakeholders who wish to contribute to our 2020 goals. Send any questions, comments or requests to ZDHCbrands@roadmaptozero.com to engage further with the ZDHC community.

Project Summary: 2012 Status

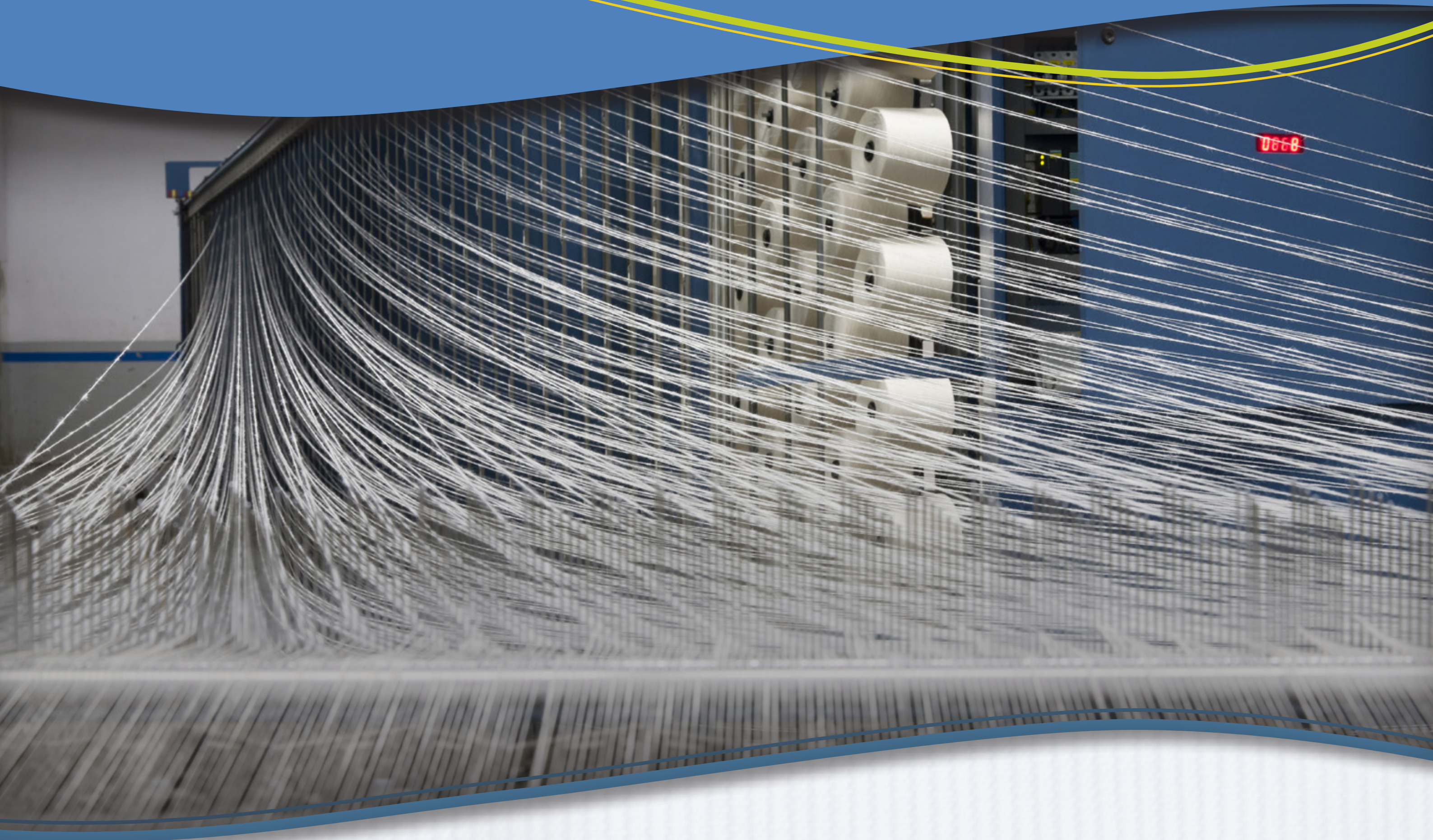
The ZDHC Joint Roadmap outlines specific projects and milestones for the group's first year of work. Table 1 summarizes the progress of each project against these commitments. The following sections expand on those project details.

Table 1

Project Progress Across the Seven Main Categories During the First Year of Work

Project Group Category	Progress Tracker	More Information
Benchmarking and Phase Out		Page 10
• Benchmark visits		
• Phase out plans		
• APEO phase out confirmation		
Water Repellency Research Report		Page 13
Chemical Identification and Hazard Evaluation		Page 15
• Create textile chemical inventory		
• Create chemical hazard screening tool		
• Create plan to prioritize chemical inventory by hazard		
Green Chemistry		Page 18
• Prescribe preferred chemicals for use in manufacturing		
Audit Protocol Development and Use		Page 20
• Create environmental audit protocol for use at supplier facilities		
• Create dye-house and printer-specific protocols	*not started*	
Joint Training		Page 23
• Deliver introductory training to suppliers		
Supplier Disclosure Options and Platform		Page 24
• Explore options for chemical disclosure		
• Explore disclosure platforms		
• Disclose studies created by our group		
• Provide quarterly and annual progress updates		

Ordering of categories not intended to denote priority



Project Updates

Benchmarking and Phase Out

Benchmarking

The benchmarking project is one approach that we took to understand supplier chemicals management activities, as well as priority, harmful chemicals that may be present in wastewater and sludge discharge. The ZDHC group believes it is important to holistically understand the issues and root cause for chemicals in discharge. This project is essential in getting the right information to target actions and improve the situation.

The benchmarking project goal is to verify whether 11 priority chemical classes are present in wastewater discharge or sludge at various supplier locations. The project also aims to document and understand how textile processes and chemicals management connect to the possible discharge of priority chemicals at supplier sites. The 11 chemical classes represent nine classes historically targeted for elimination in industry restricted substances list (RSLs) plus two additional classes—alkylphenol ethoxylates (APEOs) and perfluorinated chemicals (PFCs), including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS).

Eleven Chemical Classes Reviewed During Benchmarking

1. Alkylphenol Ethoxylates/ Alkylphenols (APEOs/APEs)
2. Brominated and Chlorinated Flame Retardants
3. Chlorinated Solvents
4. Chlorobenzenes
5. Chlorophenols
6. Heavy Metals
7. Organotin Compounds (e.g., TBT)
8. Perfluorinated Chemicals (PFCs)
9. Phthalates (ortho-phthalates)
10. Short-Chained Chlorinated Paraffins (SCCPs)
11. Toxic Azo Dyes

Project Approach

We evaluated the presence or absence of the target chemicals in discharges through a carefully designed process that included site selection, on-site assessments and analysis, inventories, and analytics, where appropriate. In addition, when applicable, data also were collected on the use and discharge of APEOs and PFCs, including PFOA and PFOS.

Benchmarking Site Selection

The ZDHC group selected a sample of suppliers that ensured a mix of processes, raw materials, and geographic locations. Key processes targeted were dyeing and finishing, washing, printing, and durable water repellent application for a range of specific textile types including cotton, polyester, denim, and leather.

The project team completed benchmarking at 19 sites in Bangladesh, China, India, Taiwan, and Vietnam. Due to supplier type and overlap, the work was split among fashion and sportswear brands. The sportswear brands conducted benchmarking at eight sites—four in China, three in India, and one in Vietnam—while fashion brands investigated 11 sites—five in Bangladesh, three in India, and three in China (see Figure 2).

Figure 2

Benchmarking Occurred at Sites Throughout Asia

On-Site Assessment, Inventory, and Analysis

We developed a common list of analytes for wastewater and sludge discharge testing and adjusted this list based on the exact processes conducted at each supplier site (www.roadmaptozero.com/df.php?file=pdf/Analyte_List.pdf). In-country project teams coordinated with labs to ensure proper technical procedures for sampling, including sample containers, preservations, and quality control. During the facility site visit, a third-party supply chain consultant helped to collect chemicals management information to gain a better understanding of suppliers' chemicals management practices.

Progress to Date

The ZDHC programme will publish a detailed report in Spring 2013 on the benchmarking results. The report will include the toxicological context for the data. Initial results indicate the following:

- Key chemical groups detected were APEOs, azo dyes, chlorobenzenes, heavy metals, phthalates, and short-chained paraffins. We are working with a toxicologist to understand the levels and impact of these detections in order to develop appropriate next steps with suppliers.
- Chemicals management assessments revealed that some suppliers have difficulty obtaining specific information on chemicals used, due to confidential business information concerns. The ZDHC community may need to find ways to obtain better information.
- The chemicals management assessments indicate that there is room for improvement in formal chemicals management and inventory. This presents an opportunity for the industry to define best practices.
- The project team provided significant technical support to labs to instruct them on our required data collection and testing protocols. The need for this support has wider implications for future testing—both in capacity and capability of labs.

Next Steps

Based on the findings of our initial benchmarking studies, our immediate next steps are to:

- Issue a project-specific report on the ZDHC web site in Spring 2013.
- Develop an action plan to address any problematic chemicals found in discharge.
- Together with chemical suppliers, work to improve chemicals management processes and practices.

Additional next steps will be rolled into the next version of the Joint Roadmap, which is due for publication in Spring 2013.

Table 2

Benchmarking Project Progress

Joint Roadmap Commitment	Original Date	Revised Date	Status	Progress Tracker
We will benchmark and verify whether nine classes of chemicals are not in discharge to water or sludge through a carefully designed process of on-site visits and audits, inventories, and analytics where appropriate.	End of 2012	Beginning of 2013	Report to be published Spring 2013	
By mid-2013, we will develop an action plan to address phase out of any of the nine chemicals that are found from this benchmarking study.	Mid-2013	TBD	In progress	

APEO Phase Out

The Joint Roadmap includes specific commitments to address the discharge of APEOs from supply chain partners. APEOs are synthetic surfactants used in detergents and cleaning products that do not biodegrade easily after being discharged. One of our earliest activities, as a group, was to act on our commitment to APEO phase out by issuing a letter to supply chain partners asking them to work with their suppliers to ensure that APEO-free formulations are being used. We also provided sources of information for suppliers to find APEO-free alternatives. Since APEOs were found to be present in benchmarking tests, we will also continue to work with chemical companies and suppliers in 2013 to ensure APEO is eliminated from our production processes (www.roadmaptozero.com/df.php?file=pdf/APEO_Letter.pdf).

Table 3
Phase Out Project Progress

Joint Roadmap Commitment	Original Date	Revised Date	Status	Progress Tracker
Communicate to all suppliers the requirement to source preparations that are APEO-/NPE-free.	End of 2011	--	Complete	
In early 2012, we will initiate a project with chemical suppliers to identify a "positive list" of APEO-/NPE-free detergents.	Early 2012	--	Complete	
In early 2012, we will conduct a follow-up study at a selection of facilities that have converted to APEO-/NPE-free detergents to evaluate if there are remaining sources including non-intentional uses of these chemicals.	Early 2012	--	Rolled into next Joint Roadmap	

Water Repellency

PFCs are a class of chemical substances that belong to the larger family known as fluorinated chemicals. These are a wide range of chemical substances that are very different in their composition and environmental profiles. PFCs can break down to form long-chain perfluorinated chemicals, such as PFOA and PFOS, that are known to have persistent, bioaccumulative, and toxicological properties. Because of these properties, they are listed as a priority chemical group that the Joint Roadmap brands are addressing.

Project Approach

Fluorinated chemicals are widely used in multiple industries to help deliver a broad range of water, stain, and oil repellent performance to a variety of consumer products. In the apparel and footwear industry, these substances are used in products to protect consumers from water, stains, and oils. Fluorinated repellent finishes are widely used because they are able to achieve high levels of repellent performance requirements.

Initially, we are focused on replacing C8 fluorinated water repellent chemistry—molecules containing 8 carbon atoms—with alternative technologies including short-chain fluorochemical water repellents that are approved by global regulators (e.g., fluorotelomer-based C6 technology). Unlike C8 substances, alternative, short-chain-based ("C4, C6") fluorinated durable water repellent substances do not breakdown to form the more harmful PFOA or PFOS. Finding alternatives to PFCs is a complex challenge and one that the ZDHC group cannot solve alone. Collaboration, research, and communication form the basis of our approach. The ZDHC community is collaborating with the outdoor industry, chemical suppliers, academics, textile experts, and others to understand the challenges and limitations for eliminating durable water repellent technologies associated with PFOA and PFOS.

Progress to Date

In collaboration with our partners, we have:

- Conducted extensive research into understanding the problems with long chain chemistry, what alternatives are available, and how alternatives impact performance, such as water and stain repellency.
- Reached out to multiple chemical companies to request information on alternative chemistries.
- Developed and distributed a research report to help the ZDHC community make informed decisions (see next section).

- Developed tools, such as templates for collecting information from chemical suppliers, to help the brands search for solutions.
- Confirmed or set timelines for the phase out of C8 chemistry by no later than January 1, 2015 (www.roadmaptozero.com/df.php?file=pdf/Phaseout.pdf). Some ZDHC brands have individually committed to earlier timelines.
- Identified further research studies to assess the feasibility of a complete phase out of fluorinated chemistry for different performance levels.

Research Report

Our Water Repellent Chemistry Research Report provides a comprehensive review of commercially available alternative durable water repellent technologies and chemistries (www.roadmaptozero.com/df.php?file=pdf/DWR_Report.pdf). The report also describes the steps required to move from long-chain C8 to short-chain (C6 carboxylates or C4 sulfonates) or non-fluorinated chemistries. Importantly, we discuss the various types of repellent chemistries (both fluorinated and non-fluorinated), their performance attributes and limitations, and their related human health and environmental properties.

Our most important findings include:

- Durable water repellents containing short-chain C6 fluorinated chemistries are currently promoted as viable alternatives to long-chain C8 chemistry.
- Products of the decomposition of short-chain C6-carboxylate or C4-sulfonate fluorinated chemistries are still persistent in the environment and innovations are needed for non-fluorinated chemistries to meet required performance standards.
- The phase out of all fluorinated durable water repellent chemistries is more challenging than the move from long-chain to short-chain chemistries, especially for products requiring high performance levels.
- There is limited information available on this topic, with much of the research material being provided by the chemical industry.
- There is a lack of harmonised testing methodology and parameters for discharge limits.

We recognize that there is a strong call to move away completely from perfluorinated chemistry due to its persistence in the environment and bioaccumulative potential. However, the move from fluorinated to non-fluorinated durable water repellent chemistries is challenging. Substitutions for perfluorinated chemistry will require extensive research, if it is at all possible.

Next Steps

Some members of the textile and clothing industry may be able to phase out fluorinated chemistry in the near term. However, it may not be possible for all ZDHC members to commit to complete phase out. To be able to make an informed decision on this topic, further research is necessary.

Based on our learnings thus far, future research should include:

- Investigation of the practical application of non-fluorinated water, oil, or soil repellent finishes on textile products to understand if these finishes will achieve the water, stain and oil protection performance standards required by consumers.
- Investigation of whether non-fluorinated chemistries meet the requirements of the textile industry, including meeting defined performance levels and durability.
- Investigation of the environmental and potential human health impacts of the alternatives.

We should further be aware that research for new products and applications is a process that can take several years. In addition, even when a solution has been tested, the time until products would be free of a target chemical is between 12 and 18 months.

Table 4
Water Repellency Project Progress

Joint Roadmap Commitment	Original Date	Revised Date	Status	Progress Tracker
By the end of 2012, we will confirm or set timelines for the elimination of products that are associated with PFOA and PFOS. This program will focus initially on replacing C8 fluorinated water repellent chemistry with alternatives	End of 2012	--	Complete	

Chemical Identification and Hazard Evaluation

Contract manufacturing, complex supplier relationships, and confidentiality of brand-name formulations make it difficult for apparel and footwear brands to know exactly which chemicals are being used in the production of products. To address this information challenge, we established the Chemical and Hazard Evaluation project group. The goal of this group of projects is to refine our knowledge of which chemicals are commonly used in textile manufacturing and to prioritise these chemicals for further action based on their inherent hazard, risk profiles, and impacts on human health and the environment.

Chemicals identified and agreed upon as priority hazards in the course of this work will be reviewed further to understand the use in the supply chain and as a first step towards inclusion in updates to individual brands' RSLs and manufacturing RSLs (MRSLs).

Chemical Identification

In 2012, we committed and started to develop an inventory of chemicals used in textile manufacturing. Due to the lack of transparency of proprietary formulations and the large number of chemicals involved, our inventory is "generic," meaning that we do not link specific chemicals to a trade name chemical formulation. Our inventory catalogues most types of chemicals used in the textile industry and we believe it provides the most comprehensive compilation of chemicals used in the textile industry.

Project Approach

Many commercial chemical formulations used in the textile industry are treated as proprietary information. For this reason, they are referred to by their trade names rather than constituent chemical ingredients. Industrywide compilations of chemical products also are listed by trade name. Therefore, we found limited information on the exact chemical composition or even chemical identity of most commercial formulations.

To address this challenge, we relied on existing public databases of textile chemicals in order to compile our generic inventory. In summary, we created our inventory by:

» Researching and compiling existing publicly available datasets

» Working with the chemical industry to review the list of chemical substances

Progress to Date

We have determined that two publicly available databases are the most complete and reliable options for our purposes. These databases are searchable, list chemical substance names as well as Chemical Abstract Numbers (CAS#), and focus on chemicals used in the textile industry. These databases are:

» The KEMI Commodity Guide (www.kemi.se/en/Content/Statistics/The-Commodity-Guide/)

» The OEKOpro Interactive Chemical Database

We used both lists to create a compiled database. The KEMI and OEKOpro database attributes are summarized in Table 5.

We found additional sources of information that link trade names to the specific chemicals that comprise these formulations, including:

- The guide maintained by the TEGEWA organisation (www.tegewa.de/en/tegewa-ev.html) offers a compilation of textile chemical formulations. This includes trade names and chemical classes and not individual chemical names or CAS numbers.
- The Colour Index International (C.I. Index) maintained by the Society of Dyers and Colourists and the American Association of Textile Chemists and Colourists is a database of dyes and pigments. These are only referenced by Colour Index Generic Names and Colour Index Constitution Numbers, not CAS number (www.colour-index.com/).

Next Steps

The Chemical Inventory project is now complete. While our inventory is not exhaustive, we believe it to be the most complete, publicly available compilation of information on chemicals used in the textile industry. Both the chemical inventory database and summary list (www.roadmaptozero.com/df.php?file=pdf/Chem_Inventory.pdf and www.roadmaptozero.com/df.php?file=accdb/Chem_Inventory.accdb) are located on the ZDHC programme web site.

We will use our chemical inventory as input to our hazard and risk evaluation tasks. A hazard and risk evaluation process will help us understand which textile chemicals—beyond the 11 classes that were the focus of our initial work—are most harmful, and should be the focus of our efforts in 2013 and beyond.

Hazard Evaluation Project Approach

All chemical substances[2] have various types of inherent hazards associated with their use. These hazards depend on the chemical formula and its physical state at the time of exposure. The degree to which that hazard poses a risk to humans and the environment is a function of the chemical's inherent hazard, the duration and type of exposure, and the resulting dose.

Hazard and Risk

Chemicals which pose only a small hazard but to which there is frequent or excessive exposure may pose as much risk as chemicals which have a high degree of hazard but to which only limited exposure occurs.[3]

- ***Risk = Hazard x Exposure***
- ***Exposure = Dose x Time***
- ***Hazard = potential of a substance to cause harm***

Table 5

Preferred Database Attributes

Database	Data collection: Year	Description of Data
KEMI Commodity Guide	2007 (also datasets for 1996 & 2001)	The Commodity Guide was prepared by the Swedish Chemicals Agency (KEMI) in order to allow searching of chemical substances used in commodities in Sweden. The database was searched for chemicals associated with Textiles and Textile Articles.
OEKOpro	OEKOpro was started in 1984 and the last date referenced is 2011.	OEKOpro is described as an independent database produced by the "Ecological Branch Concepts at the Institute for Environmental Research (INFU) at the University of Dortmund." According to the site, "the data collection was mainly financed by the German Federal Environmental Agency (Umweltbundesamt [UBA])" with other donors, including the EU-Commission and interested industrial companies.

As a group, the textile industry will need to identify and prioritise chemical substances of concern and substitute their use with safer alternatives. We believe that this should be done through a screening methodology that is science-based and focused on minimising risk.

As a first step towards prioritising and substituting harmful chemicals, we worked with the OIA Chemicals Management Working Group (CMWG) to develop a guidance document titled *Using Chemical Hazard Assessment for Alternative Chemical Assessment and Prioritisation.* Representatives from NGOs, the chemical industry, retailers, brands, and textile chemistry consultants collaborated to produce this guidance. This chemical hazard assessment report is currently undergoing final review by the OIA CMWG and beta testing by the ZDHC group. Once the review is complete, it will be made publicly available by the OIA CMWG.

The report describes an approach to alternative chemical assessment and prioritisation. It was designed to be flexible with many paths leading to the same endpoint, so that companies can use different screening tools and customize those tools to their specific business needs. We will use the chemical hazard assessment guidance document to screen the inventory of textile chemicals and prioritize them for elimination. Alternatives will be assessed by the screening methodology to make sure that a regrettable substitution is not chosen—a regrettable substitution is a substitution that is as unsafe as the original chemical it was meant to substitute.

Once the chemical inventory has been screened for risk, they will be organized by the following groups:

1. Black List: Avoid or phase out; Chemical of High Concern
2. Manage List: Use, but search for safer chemicals and/or processes
3. Positive List: Preferred, safer chemical

Table 6 shows the recommended hazard endpoints—specific types of adverse effects a substance might have—ecotoxicity, and fates—what ultimately happens to a substance after its release— that are considered in the Chemical Hazard Assessment.

Table 6

Recommended Hazard Endpoints for Hazard Evaluation

Human Toxicity Effects	Ecotoxicity and Fate
• Acute Mammalian Toxicity (oral, dermal, inhalation) • Neurotoxicity • Skin Irritation and Corrosivity • Reproductive and Developmental Toxicity • Carcinogenicity • Systemic Toxicity/ Organ Effects • Repeated Dose Toxicity (oral, dermal, inhalation) • Eye Irritation and Corrosivity • Skin Sensitization • Mutagenicity/Genotoxicity • Respiratory Sensitization • Endocrine Disruption	• Persistence • Bioaccumulation • Chronic and Acute Aquatic Toxicity (on daphnia, algae, and fish)

Progress to Date

This project is nearly complete (see Table 7). The *Using Chemical Hazard Assessment for Alternative Chemical Assessment and Prioritisation* report will be published and posted to the ZDHC web site in the coming months. A draft version is now available (www.roadmaptozero.com/df.php?file=pdf/Haz_Assessment.pdf).

Next Steps

The next steps for this project are two-fold:

- In the short-term, we will work with industry experts and use existing studies to identify key chemicals to examine. For chemicals that are identified to have high risk and hazard profiles, we will develop immediate action plans. Other chemicals may be identified for further research and analysis.
- In the long-term, we will use our inventory and hazard assessment framework and collaborate with industry partners to develop an ongoing assessment framework. This will link to other efforts of chemical analysis in the industry and policy arena.

Table 7
Progress Towards Completion of the Hazard Evaluation Project

Joint Roadmap Commitment	Original Date	Revised Date	Status	Progress Tracker
In 2012, we will develop a comprehensive list of chemicals used in textile manufacturing	End of 2012	--	Complete	
By mid-2012 we will identify and agree to a cross-industry screening tool for chemical hazards	Mid 2012	--	Complete	
Beginning in early 2013, we will determine a plan to evaluate the chemical inventory by intrinsic hazard and establish a sectorwide list of hazardous chemicals	End of 2013	--	In progress	

Green Chemistry

Project Approach

Prescribing Alternative (Greener) Chemistries

Alternative, safer chemical formulations or chemical substances that can be used to incorporate inherently less hazardous chemicals into the design and manufacture of products are more useful than RSLs and so-called “blacklists” of banned chemicals. For example, there are positive lists of ingredients that have undergone scientific review of their inherent hazards for use as alternatives to APEO surfactants, such as:

- CleanGredients® database for surfactants (www.cleangredients.org/home)
- The United States Environmental Protection Agency (US EPA) Design for Environment (DfE) program list of alternatives to APEOs (www.epa.gov/dfe/pubs/projects/npe/index.htm)

The ZDHC community is working to identify and make widely known, alternative chemistry formulations and chemical substances that do not intentionally contain any of the 11 priority classes of chemicals. Knowledge of these alternative products coupled with proper manufacturing processes will reduce human health and environmental risks from the use of chemicals. It is pollution preventive at the source rather than an end-of-pipe solution.

The current general practice is for positive lists to be provided by chemical suppliers to individual manufacturers with whom they have (or seek to gain) a business relationship. During the past year, the ZDHC community met with representatives from chemical suppliers to explore how positive lists of safer chemical formulations might be made more widely available to global suppliers.

The ZDHC community is developing recommendations for how these lists might be made more widely available and how they might be evaluated to ensure they are accurate and science based. If inclusion of products on a list of "positive" preferred chemistries were viewed as a competitive advantage to chemical suppliers, it would be a powerful tool to incentivise those suppliers to invest in these new chemicals or chemical processes. This could lead to systemic change and commercialisation of new, preferred alternatives. It would be a "pull" of safer alternatives into the marketplace rather than a "push" down the supply chain from the brands.

This work will be continued and built upon in the next version of the Joint Roadmap, due for release Spring 2013.

Sustainable/Green Chemistry

Sources of safer alternative chemistries are but one aspect described by the design principles known as green chemistry. In a similar way, green chemistry design principles are but one aspect of the broader area of sustainable chemistry. Both concepts are important to reach the goal of zero discharge of hazardous chemicals in the supply chain. In the next version of the Joint Roadmap, the ZDHC community will seek to build on the initial work around positive chemicals lists to broaden the scope and incorporate additional aspects of sustainable chemistry, including green chemistry.

> The ZDHC community aims to forge systemic change and commercialisation of new, preferred alternative chemistries.

The German Federal Environmental Agency (Umweltbundesamt [UBA]) defines sustainable chemistry as:[5]

"Sustainable chemistry is a broad-ranging area that concerns stakeholders in the scientific community, the economy, public authorities, and environmental and consumer advocate associations."

The European Technology Platform for Sustainable Chemistry (SUSCHEM)[6] uses the following description for sustainable chemistry:

> "Sustainable chemistry … seeks to improve the efficiency with which natural resources are used to meet human needs for chemical products and services. Sustainable chemistry encompasses the design, manufacture and use of efficient, effective, safe and more environmentally benign chemical products and processes."
>
> "Sustainable chemistry … stimulates innovation across all sectors to design and discover new chemicals, production processes, and product stewardship practices that will provide increased performance and increased value while meeting the goals of protecting and enhancing human health and the environment."

Based on these definitions, sustainable chemistry represents the many over-arching aspects of sustainability related to chemistry including but not limited to: government policy, socio-economic issues, resource efficiency, product stewardship, and use of efficient, effective, safe and more environmentally benign chemical products and processes (i.e., green chemistry).

The US EPA defines Green Chemistry as:[7]

> "Green chemistry, also known as sustainable chemistry, is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, and use."

UBA cites both the twelve principles of green chemistry developed by Warner and Anastas[8] as well as the European level 12 criteria for Best Available Techniques (BAT)[9] as being relevant to the implementation of sustainable chemistry.

Taken together, the green chemistry principles and the European BAT criteria represent three main design principles to be used for chemical and process design, specifically:[10]

- Maximize resource efficiency (including energy and water)
- Design systems holistically, using life-cycle thinking
- Eliminate and minimise hazards and pollution

Because the terms green chemistry and sustainable chemistry are often used (or misused) interchangeably, it is clear that the ZDHC community needs to develop strict working definitions in order to focus on areas beyond providing a positive list of chemistries.

Next Steps

During the coming year, we will be working with internal and external stakeholders to agree on definitions for green chemistry and sustainable chemistry for our purposes. We will also work to understand what we can do to promote a positive chemistry framework.

Table 8

Planned green chemistry tasks.

Joint Roadmap Commitment	Original Date	Revised Date	Status	Progress Tracker
We will expand our current efforts of prescribing alternative (greener) chemistries to be used on our products.	--	--	Rolled into next version of Joint Roadmap	

Audit Protocol Development and Use

This project group aims to create a joint generic audit approach that would be used to ensure strong environmental performance and continuous improvement throughout the supply chain. The audit protocol addresses environmental performance, including chemicals management. It also allows for the possibility of ZDHC community members to share supplier results between brands within legal confines.

Project Approach

Factory audits have been carried out for nearly 20 years in the apparel and footwear industry on a range of topics. Historically, lack of coordination between brands has led to a proliferation of audit standards. This duplication results in inefficiencies and unnecessary effort amongst brands and their suppliers. We are committed to collaborating and relying on existing protocols, such as those developed by the Global Social Compliance Program (GSCP, www.gscpnet.com), and the SAC (www.apparelcoalition.org). We also hope to rely on existing information sharing platforms, such as those developed by the Fair Labour Association (FLA, www.fairlabor.org). This collaboration will also extend to creating audit tools.

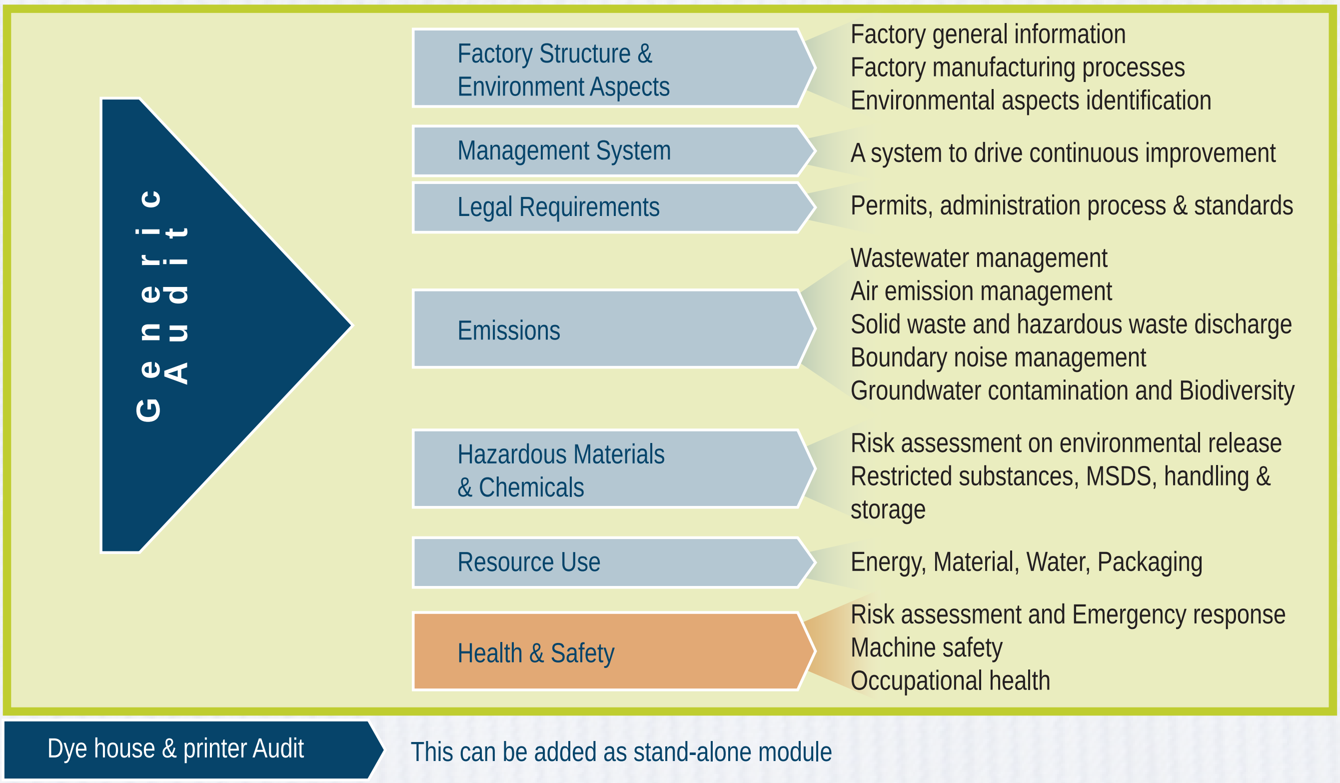
Our audit process is risk-based, prioritising facilities to be audited by a number of factors including environmental risk. Our audit protocol is designed in "modules," with the generic protocol used as the basis for all types of audits (see Figure 3). The more detailed dye house audit protocol, printer audit protocol, and others will be added as stand-alone modules in the future. Our hope is that this modular approach will ensure an aligned audit process (see Figure 3).

We also will be exploring how the results of the audits may be shared amongst the ZDHC community.

In summary, the purpose of this project is to:

- Develop and align around a generic environmental audit protocol and process that can be applied to any type of factory facility.
- Ensure that suppliers' environmental performance can be assessed against minimum and advanced standards.
- Ensure minimum legal requirements pertaining to the facility are met, in regards to all environmental aspects including those related to chemicals.
- Ensure that the audit will lead to a set of recommendations that will lead to improved environmental performance within a specified period of time.
- Support facilitation, where applicable, of other Joint Roadmap projects.
- Engage with international audit companies with a view to align on tools and protocols applicable to all supplier categories within the sporting goods and fashion industry.
- Evaluate the feasibility to develop a protocol that is governed by an independent third party.

Figure 3
Modular Audit Approach



Progress to Date

In 2012, we mapped existing, relevant audit tools to understand what processes are covered as well as what types of supporting documents, data sharing protocols, and environmental aspects are included in these tools. We analysed tools from member ZDHC brands, the Electronics Industry Citizenship Coalition (EICC), FLA, GSCP, and SAC. Based on this mapping exercise, we created a summary report and also documented requirements and guidelines for the development of tools for the Generic Environmental Audit Protocol.

We are actively working with GCSP and SAC to align on auditing tools and avoid duplication of efforts. The continuation of this project also will be rolled into the upcoming version of the Joint Roadmap, due for publication in Spring 2013.

Next Steps

The next steps in this audit protocol project involve developing prototype tools, pilot testing, revising, and release to the ZDHC community for use. Timelines for these tasks are shown in Figure 4. The main prototype tools to be developed are listed in Table 9.

Figure 4

Joint Generic Audit Protocol Development

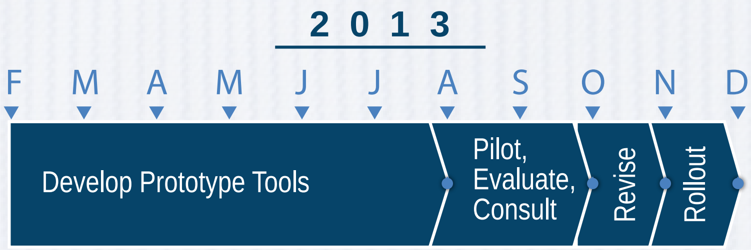


Table 9

Audit Protocol Tools

Audit Step	Prototype Tools to be Developed
Facility Selection for Audit	Method for facility selection
Performance/Guidance	Guidance document for suppliers and auditors
Visit Preparation	Pre-audit questionnaire, letter templates, and training module for suppliers
Audit Execution	Audit questions, guidance documents, and auditor selection procedure
Audit Outputs	Reporting and scoring approach, remediation guidelines, and KPI setting
Auditing Reporting/Data Platform	Data sharing approach that conforms with anti-trust and competition laws

Table 10

Audit Protocol Development and Use Project Progress

Joint Roadmap Commitment	Original Date	Revised Date	Status	Progress Tracker
We will develop a joint generic audit approach for environmental performance (including chemicals management) with the possibility for brands to, within legal confines, share supplier results.	--	--	In Progress	
By the end of 2013, we will develop a shared dye house and printer audit protocol with a competent third party	End of 2013	--	In Progress	not started
By the end of 2014, within legal confines, we will develop a program to incentivize suppliers to fulfil the dye house and printer audit protocol	End of 2014	--	In Progress	not started

Joint Training

Our supply chains are large, complex, and global. To achieve our 2020 vision, we need knowledgeable and aligned individuals at every link in the chain. The joint training program focuses on the critical role of training to enable our ZDHC vision. In 2012, the joint training project delivered a joint training and knowledge transfer programme with a focus on suppliers.

Project Approach

We are using a modular approach to training, delivering on-demand in video format via the ZDHC web site, to increase awareness of the ZDHC Programme and our commitment among our supply chain partners (www.roadmaptozero.com/training.php). Our ultimate goal is to develop a robust training series that will empower our suppliers to create change towards the vision of zero discharge. We hope to work with other organisations for implementation, follow up, and certification.

Currently, our training is available in English. They will later be translated and published in Chinese (Mandarin). Further translation of the materials will be made available based on demand.

Progress to Date

The introductory awareness module is complete and available on the ZDHC web site (see Figure 5). The next training modules will be more complex than the initial awareness modules and the delivery of this will go beyond online video formats. We have also developed follow-up material to accompany the training and gauge its reach and impact. This material includes:

> We are developing a robust training series to empower our suppliers and partners.

- A letter to be distributed to suppliers that explains the awareness module.
- A follow-up survey to ensure that the supplier has watched the video and to obtain feedback on future training needs and focus areas.

Next Steps

Our ambition is to move the method towards an institutional approach. We will develop a module together with governmental and non-governmental organisations, partners, and service providers. Once we have identified the correct collaborators, we will then create a long term plan and construct a comprehensive curriculum with a focus on strengthening infrastructure and certifying training participants.

Figure 5

Awareness Module of ZDHC Joint Training

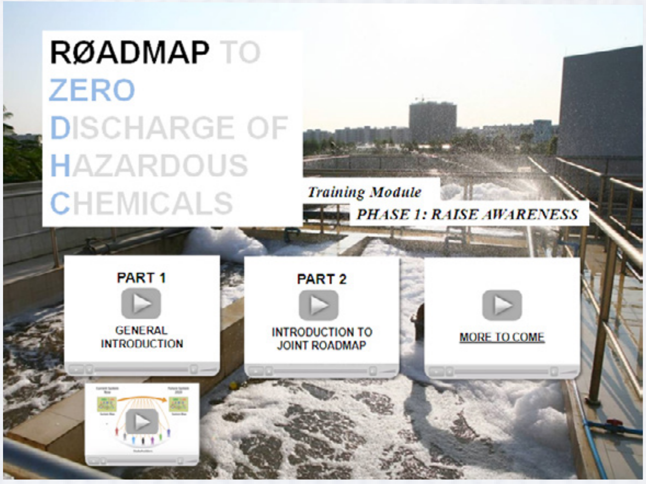


Table 11

Progress Towards Joint Training Commitment

Joint Roadmap Commitment	Original Date	Revised Date	Status	Progress Tracker
By the end of 2012, we will deliver a joint pilot training program in one or more of the following countries: China, Philippines, Taiwan, Bangladesh, Thailand, Indonesia, or India.	End of 2012	Beginning of 2013	Complete	

Supplier Disclosure Options and Platform

To increase visibility into the environmental impacts of the supply chain, the ZDHC group is exploring how we can encourage our manufacturing partners to disclose environmental information regarding chemical use and discharge at their facilities, including water quality information. For this disclosure to be valuable to society, we will consider the audience, level of detail, and timing.

The "right to know" principle is a key tenet of our programme and information disclosure is an essential activity in support of this commitment. Broadly, the goal of the disclosure project group is to encourage disclosure of information regarding discharge of hazardous chemicals from suppliers, with the assumption that disclosure will have a positive effect on the overall system. Specifically, we aim to:

- Convene a cross-sector group to explore the best ways to encourage sectorwide supplier chemical disclosure and deliver a study based on data collection from a selected group of facilities.
- Explore platforms for suppliers to disclose their chemical inventory under the assumption that disclosing their inventory will have a positive effect.

Project Approach

The disclosure issue is particularly complex, as environmental information may not always be available and necessary systems may not be in place for disclosure. Our approach has been to first analyse the different interpretations of disclosure, especially differences in disclosing information on chemicals used versus chemicals discharged. In both cases, we undertook a literature review, a mapping of stakeholders and existing platforms, and an analysis of the benefits and drawbacks, incentives, and obstacles for disclosure. We then examined the roles of various disclosure processes, including from industry to regulatory authority, from industry to industry, and from industry to public.

We selected China as a pilot country to research existing disclosure regulatory requirements and develop a list of legal requirements, since many of our suppliers are located in China and subject to Chinese law (www.roadmaptozero.com/df.php?file=pdf/China_Regs.pdf).

Project Progress to Date

Our literature review, stakeholder mapping, and analysis of existing platforms for disclosing environmental information have been finalized. A draft analysis of the benefits, drawbacks, incentives, and obstacles of disclosure also has been prepared. Research on existing disclosure regulatory requirements in China and a list of legal requirements is currently available.

Challenges

Development of disclosure systems is challenging, especially since our group does not have the authority to supersede individual country governments and regulators. Although NGOs and regulators across the globe are trending towards requesting increased transparency and disclosure, disclosing information may prove to be a challenge since there is no globally applicable platform and no standard practice around the issue.

While raw data are important, without context, the data are unlikely to lead to concrete improvements that impact human health or the environment. In addition, the development of extremely detailed disclosure systems also may not be the most efficient way to move towards our 2020 vision and could be very costly.

Each stakeholder has its own interpretation of disclosure and of the environmental information to be disclosed. A factual and careful description of the issue is necessary to avoid misunderstanding. As such, activities are ongoing to harmonise at a global level the list of chemicals for the Pollutant Release and Transfer Register (PRTRs) (see Figure 6).

Next Steps

Disclosure of environmental information related to chemicals used and chemicals discharged is important to all stakeholders—industry, authorities, NGOs, and civil society organisations. We will work with the Strategic Approach to International Chemicals Management (SAICM) Chemicals in Products (CiP) Textile project and broadly with the chemical industry.

Figure 6

Global Pollutant Release and Transfer Register (PRTR) Programmes.

PRTR regimes are a type of emission inventory that collect and disseminate information on environmental releases and transfers of toxic chemicals. PRTR programmes are under development in many countries and are an important type of chemicals disclosure system.

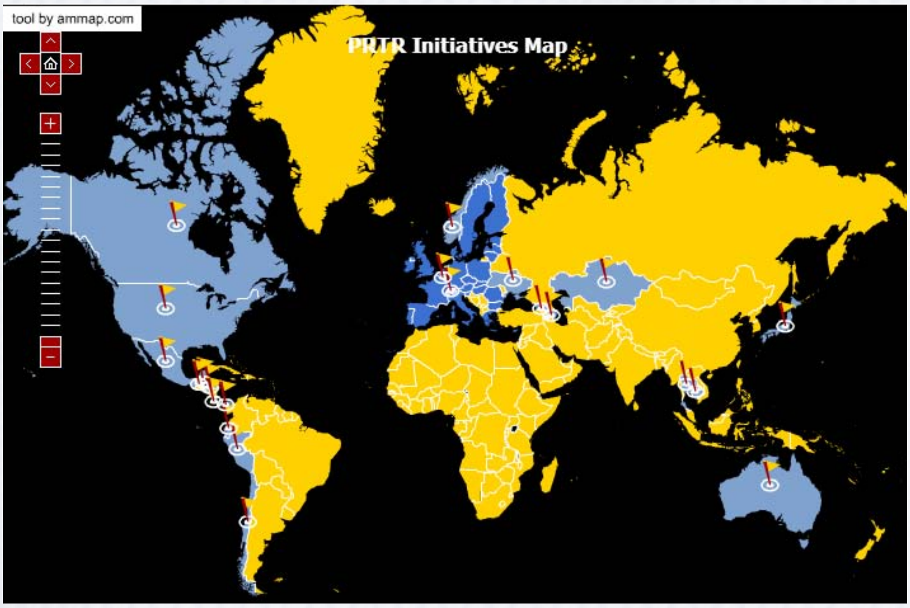


Table 12

Progress Towards Joint Training Commitment

Joint Roadmap Commitment	Original Date	Revised Date	Status	Progress Tracker
In 2012, we will convene a cross-sector group to explore ways to best encourage sectorwide chemical disclosure. We will also deliver a study based on data collection from a select group of facilities.	End of 2012	Ongoing	In Progress	
In 2012 we will explore platform options for suppliers to disclose their chemical inventory.	End of 2012	--	Complete	
On an ongoing basis, we will disclose all studies undertaken as a result of this program, without reference to specific facilities.	Ongoing	--	Complete	
In 2012 we will provide quarterly updates to projects/programmes, and starting in 2013 will publish annual performance updates on the roadmap.	End of 2012	--	Complete	

Stakeholder Engagement

Because the Joint Roadmap is a highly ambitious plan that sets a new standard of environmental performance, support from and alignment with our stakeholders underpins every aspect of the zero discharge goal and affects every programme project. True transformation will not happen unless there is full system collaboration.

Project Approach

We approached this project in three ways, specifically by:

1. Developing a stakeholder engagement framework to identify and group according to areas of expertise and influence
2. Communicating actively with stakeholders using a variety of methods
3. Conducting systems mapping to identify system leverage points and dynamics (www.roadmaptozero.com/df.php?file=pdf/Systems_Map.pdf)

Project Progress to Date

- Conducting a stakeholder consultation on the first Joint Roadmap, the results of which were published in February 2012 (www.roadmaptozero.com/joint-roadmap.php).
- Conducting a systems mapping exercise that was published externally in November 2012. The systems mapping enabled the ZDHC group to grasp the complexity of the supply chain and gain alignment around the various barriers currently preventing a zero discharge scenario.
- Conducting stakeholder meetings, webinars, and consultations related to the Joint Roadmap, programme updates, and individual projects.
- Delivering presentations at industry conferences and events in Europe and Asia and ongoing communication to media and interested organisations throughout Asia and Europe.
- Engaging key technical stakeholders in several of our projects and through a technical advisory committee.
- Engaging with industry groups such as SAC and the OIA CMWG to ensure alignment around programme efforts.
- Reaching out to stakeholders through meetings and webinars, including an in-person stakeholder forum in Portland, Oregon, USA; a webinar with European stakeholders; a meeting with Greenpeace in Munich, Germany; and a visit to the Chinese Ministry of Environmental Protection.
- Suppliers have been engaged through some of the project work in 2012 and will be included in the next phase of roadmap development work.

Next Steps

As the next version of the Joint Roadmap is developed in 2013, we will conduct extensive stakeholder outreach for comments and alignment. This will take the form of webinars, written submission of comments, and stakeholder meetings in Europe and Asia.

Key tasks for 2013 include more extensively and directly engaging suppliers, implementing the Asia stakeholder engagement plan, and formalising collaboration with a number of key stakeholders in support of projects.

Closing

Having completed our inaugural year, we have laid a foundation to improve the environmental performance of our supply chains. 2013 holds enormous promise.

Good progress has been achieved thus far. In 2012, we conducted on-the-ground testing to understand how we are currently controlling discharges of priority chemicals. We compiled a list of hundreds of chemicals that are in use in our industry and will share this list with the public. We worked with suppliers to address the most pressing chemicals of concern, starting with APEOs, and will continue to do so in 2013. We worked hard to identify preferred chemistries and mechanisms to incentivise our chemical suppliers to invest in these alternatives.

We expanded our reach and market voice by partnering with other organisations with goals similar to our own. Through research, we learned a great deal about specific issues in the apparel industry—such as durable water repellent chemistry—though we found it more difficult than expected to develop a process to study, prioritise, and create action plans for the many chemicals used in our industry.

Despite our successes in 2012, many challenges remain. Deeper partnerships with all influencers in the system and especially the textile chemical industry and manufacturers will be necessary, both to increase the industry's environmental performance and to ensure that new, needed training is effectively delivered.

We are excited to take on these challenges and expand our successes in the years to come. We have an ambitious goal, but we are committed to working together to achieve it.

To reflect what we have learned in 2012, we are issuing a new version of the Joint Roadmap in Spring 2013. This document incorporates conclusions and lessons learned from 2012 and outlines our approach to the next years of the ZDHC programme. The Roadmap also will include a set of specific actions and commitments that our group will tackle in 2013 and beyond.

As always, we welcome your input, support, and questions. Please continue to watch for communications from us on our web site, www.roadmaptozero.com. Please also visit our web site to reach out with specific questions, or join our mailing list to stay apprised of our activities. Thank you for your interest and support!

References

1 *The ordering of projects matches the listing in our Joint Roadmap and is not intended to denote priority.*

2 *A chemical element and its compounds in the natural state or obtained by any manufacturing process, including additives necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition (as defined by REACH).*

3 *John Duffus & Howard Worth. 2007. Hazard and Risk: IUPAC Educators' Resource Material. The Science of Chemical Safety Essential Toxicology – 4, IUPAC.*

4 *These endpoints are selected from the following regulatory or chemical assessment programs:*

- *Organization for Economic Cooperation and Development (OECD), Screening Information Data Set (SIDS) Manual for the Assessment of Chemicals (2011)*
- *United States Environmental Protection Agency (US EPA) Design for Environment (DfE) Assessment Criteria for Hazard Evaluation version 2.0 (2011)*
- *Umweltbundesamt (UBA), Guide on Sustainable Chemicals (2011)*
- *Global Organic Textiles Standard version 3.0 (GOTS, 2010)*
- *REACH and CLP; www.echa.europa.eu: www.echa.europa.eu/documents/10162/13562/clp_en.pdf*
- *WHO Human Health Risk Assessment toolkit: www.who.int/ipcs/publications/methods/harmonization/toolkit.pdf*
- *The GHS 4th edition: www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html*
- *Washington State Department of Ecology Quick Chemical Assessment Tool (QCAT) www.ecy.wa.gov/programs/hwtr/chemalternatives/QCAT.html*
- *NSF/GCI/ANSI 355 – 2011, Greener Chemicals and Processes Standard, http://webstore.ansi.org/RecordDetail.aspx?sku=NSF%2FGCI%2FANSI+355-2011*

5 *www.umweltbundesamt.de/chemikalien/nachhaltige_chemie/index.htm*

6 *www.suschem.org/about-suschem/sustainable-chemistry.aspx*

7 *www.epa.gov/greenchemistry/*

8 *Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice, Oxford University Press: New York, 1998, p.30. Oxford University Press*

9 *Listed in Annex IV of the Council Directive concerning integrated pollution prevention and control (IPPC Directive, Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control; Official Journal L 257 , 10/10/1996 P. 0026 – 0040*

10 *Green Chemistry and Engineering - A Practical Design Approach by Jimenez-Gonzalez and Constable (from GlaxoSmithKline and Lockheed Martin respectively), Wiley, 2011*