

2014 RIGHT-TO-KNOW CHEMICAL DISCLOSURE METHODOLOGY RESEARCH

JOINT ROADMAP
VERSION 2 MILESTONE

Ø ZDHC

ZERO DISCHARGE OF HAZARDOUS CHEMICALS PROGRAMME

adidas
GROUP



ESPRIT

Gap Inc.

G-STAR RAW



INDITEX



Lbrands

LEVI STRAUSS & CO.



YOUR M&S



UNITED COLORS
OF BENETTON.

IN ASSOCIATION WITH



Acronyms and Abbreviations

CDP	Carbon Disclosure Project
EEA	European Environment Agency
E-PRTR	European Pollutant Release and Transfer Register
EPCRA	Emergency Planning and Community Right-To-Know Act
EU	European Union
GADSL	Global Automotive Declarable Substance List
GCA	Green Choice Alliance
GRI	Global Reporting Initiative
IPE	Institute of Public and Environmental Affairs
IPPC	Integrated Pollution Prevention and Control
MSDS	Material Safety Data Sheet
NGO	non-governmental organization
NPDES	National Pollutant Discharge Elimination System
NPI	National Pollutant Inventory (Australia)
OECD	Organisation for Economic Co-operation and Development
POTW	publicly owned treatment works
PRTR	Pollutant Release and Transfer Register
RCRA	Resource Conservation and Recovery Act
RET	release estimation technique(s)
RtK	Right-to-Know
SOCMI	Synthetic Organic Chemicals Manufacturing Industry
TRI	Toxic Release Inventory
TURI	Toxic Use Reduction Institute
UNECE	United Nations Economic Commission for Europe
US EPA	U.S. Environmental Protection Agency
ZDHC	Zero Discharge of Hazardous Chemicals



Right-to-Know Chemical Disclosure Methodology Research

1 Overview

The Zero Discharge of Hazardous Chemicals (ZDHC) Joint Roadmap (2013) cites Right-to-Know (RtK) as a guiding principle that allows members of the public to access environmental information. This principle involves sharing information on the use, discharge and transfer of hazardous chemicals based on facility-by-facility, year-by-year reports of the quantities of such chemicals released to the environment. The RtK precept of transparency forms the basis for the ZDHC Programme's workstream efforts, specifically Workstream 3 RtK.

In 2012, the ZDHC team conducted extensive research into chemical compliance and disclosure methodologies. In the Joint Roadmap (2013), the team committed to continuing to engage with stakeholders in this work and to issue a summary report of this research. This report documents the team's findings.

2 The Right-to-Know Principle

At the 1992 Rio Earth Summit, participants in the United Nations Conference on Environment and Development developed the *Rio Declaration on Environment and Development*. Principle 10 of this declaration states that:

Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided (United Nations Conference on Environment and Development, 1992).

Principle 10 forms the foundation for the RtK principle with regards to environmental affairs.

A key activity in the Joint Roadmap (2013) is supporting improvement of chemicals management and publicly available indicators throughout apparel and footwear supply chains. This activity reduces the discharge of hazardous chemicals and pollutants to air, water and soil and results in better business performance.

3 Right-to-Know Disclosure Platforms

To support improvement of chemicals management throughout apparel and footwear supply chains, RtK transparency includes public disclosure of actions related to the discharge of pollutants and chemicals and other environmental impacts. Transparency, a key principle that reinforces accountability for companies and organizations, is promoted through reporting frameworks like the Global Reporting Initiative (GRI) (2013) and corporate social responsibility reports.

Governments have been leading RtK implementation through the adoption of relevant laws. In addition, non-governmental organization (NGO) stakeholders have taken ownership of RtK implementation, particularly in countries where relevant laws do not exist. For example, the Institute of Public and Environmental Affairs (IPE) in China is implementing the RtK principle via a web-based platform that hosts information on pollution, environmental audit results and voluntary disclosure of discharge data (IPE, 2013b).

The following examples represent the current diversity of RtK platforms:

Carbon Disclosure Project

The Carbon Disclosure Project (CDP) is an NGO that provides a reporting mechanism for companies and cities to disclose their impacts on climate change, watersheds and forests and includes toxic releases. By

gathering information about and reporting these impacts, the CDP helps organizations recognize their impacts and prioritise where to take action to reduce them (CDP, 2013). Annual CDP programme reports on climate change, supply chain, cities, water forests and carbon action can be found at <https://www.cdproject.net/en-US/Results/Pages/reports.aspx>.

Global Reporting Initiative

The Global Reporting Initiative (GRI) is an NGO with a mission of making sustainability a standard practice for all organizations. GRI encourages reporting participation by promoting the long-term benefits associated with a company's public perception. GRI maintains a sustainability disclosure database that provides an overview of environmental impact reports submitted to them by organizations annually. The database currently contains profiles of 5,971 organizations (GRI, 2013) and is available at <http://database.globalreporting.org/>.

Institute of Public and Environmental Affairs

The IPE platform contains two pollution databases, specifically water and air, that help companies and the public monitor corporate environmental performance. By making these databases available, IPE aims to increase disclosure of environmental information to facilitate local community comprehension of the hazards and risks in their environment. In addition, through their Green Choice Alliance (GCA), the IPE joined with other NGO coalitions in China to help promote a global green supply chain by encouraging large corporations to improve the environmental performance of their suppliers (IPE, 2008). More information about the IPE is available at <http://www.ipe.org.cn/en/>.

Massachusetts Toxic Use Reduction Institute

As mandated by the Massachusetts Toxic Use Reduction Act, the Toxic Use Reduction Institute (TURI) at the University of Massachusetts maintains a database of the use of toxics in the state. The act requires that companies must report on toxics manufactured, processed, generated as byproduct, shipped in products and released to the environment (TURI, 2013). The TURI website reports on these activities by chemical, company or community at http://www.turi.org/TURI_Publications.

The Global Automotive Declarable Substance Programme

The Global Automotive Declarable Substance List (GADSL), developed by a global team from the automotive, automotive parts supplier and chemical/plastics industries, communicates information about the use of toxic substances in automotive products that are present in a material or part after the point of sale (GADSL, 2013). The GADSL development resulted from worldwide industry efforts to harmonise the communication and exchange of information regarding the application of harmful substances in the automotive industry. The master list of declarable substances and supporting guidance documents can be downloaded from the internet at <http://www.gadsl.org/>.

4 Incentives for Disclosure, Improvement and Capacity Building

Incentives for sharing information on the use, discharge and transfer of hazardous chemicals, such as the following, could accelerate implementation of the RtK principle:

- Requiring information disclosure on pollution management encourages facilities to pollute less. This yields many positive business benefits, including:
 - Attracting business and gaining easier access to credit because facilities are perceived as successfully managing their pollution risks
 - Minimizing chemical expenditures by decreasing loss or contamination
 - Reducing employee injury or illness
 - Promoting a positive reputation for the facility in local communities

- Creating positive feedback loops, in which an increase in disclosure by a growing number of actors would encourage others to share information.
- Allowing businesses to distinguish themselves as environmental leaders.
- Developing opportunities for suppliers to work with customers who have embraced advanced environmental goals.

5 Right-to-Know and Chemical Compliance

Methods for managing chemical compliance vary. In fact, several methods and tools have been suggested to improve pollution management (see *Getting to Green: A Sourcebook of Pollution Management Policy Tools for Growth and Competitiveness* [Ahmed, 2012]). ZDHC brand members who source products from worldwide supply-chains and production units have a responsibility to ensure that the production of their final products cause minimal environmental impact. Product designers also have a role beyond specifying chemical functional properties, this role should be extended to consider the implications of a chemical's presence in the manufacturing processing stages.

Managing chemical compliance typically falls under the responsibility of the production units in the manufacturing chain and local authorities. Methods exist for managing chemical compliance, including environmental (or chemical) management systems, corporate environmental and social responsibility programs and training and education on chemical compliance and environmental information disclosure. Governments also can establish environmental regulations and standards, and monitoring, inspection, compliance and enforcement programs, although this necessitates well established institutions in the countries managing compliance. ZDHC member brands encourage mills to proactively disclose information about their pollutant release and transfer.

6 Pollutant Release and Transfer Registers

The ZDHC Programme is focused on the "zero discharge of hazardous chemicals" and the right to access information about facility chemical uses and discharges. Given the variety of chemical compliance methods available, the environmental information disclosure, in the form of a Pollutant Release and Transfer Register (PRTR), specifically addresses the issues posed by ZDHC and the RtK and was thus selected for additional research. Furthermore, the PRTR system, which requires the involvement of multiple stakeholders (government, private sector and the public), is seen as a system that would meet one of the ZDHC key principles of engaging stakeholders to improve the apparel and footwear supply chain system.

As defined by the UNECE: "A Pollutant Release and Transfer Register (PRTR) is a national or regional environmental database or inventory of potentially hazardous chemical substances and/or pollutants released to air, water and soil and transferred off-site for treatment or disposal" (UNECE, 2013). This report summarises the processes, challenges and opportunities for using PRTRs and provides practical suggestions to enhance the positive effects of PRTRs for the footwear and apparel industry.

Several countries and regional authorities have implemented the RtK principle using PRTRs. For example, the *Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters* (Aarhus Convention [Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters]) (UNECE, 1998) led to the implementation of the European PRTR system (European Environment Agency [EEA], 2013). Following the Aarhus Convention, the Kiev PRTR Protocol was developed and passed in 2009. This is the first legally binding international instrument on PRTRs. To date, 31 countries and the European Union (EU) have ratified the PRTR Protocol (UNECE, 2008). In addition to the EU's adoption of PRTR systems, Australia, Canada, Chile, Japan, Mexico, Norway, Switzerland and the United States of America also have implemented PRTRs. Countries currently developing PRTRs include Cambodia and Thailand (PRTR: Learn, 2013).

Pollutant Release and Transfer Registers are a means to implement the Right-to-Know principle and report on chemical management performance.

Most PRTR systems provide access to the following information in the local language:

- Databases of the volumes of chemical substance discharges (or groups of substances or pollutants) per year per industry sector (at the facility level)
- Screening tools that target specific research (for example, year 2011 releases of chemicals for all reporting EU countries documented in the European Pollutant Release and Transfer Register [E-PRTR], include as one of the reported economic activities, the pretreatment or dyeing of fibres or textiles)
- Maps that localise the facilities and the discharged substances
- Questions and answers related to the PRTRs

Figures 1 and 2 present examples of the type of data available from PRTRs.

Figure 1. 2011 Pretreatment or Dyeing of Fibres or Textiles for Releases (by Country in Europe and by Chemical)

Source: EEA, E-PRTR, 2013, Industrial Activity.

Industrial Activity / Pollutant Releases					
Year: 2011					
Area: All Reporting States for E-PRTR					
Industrial Activity: 9.(a) Pretreatment or dyeing of fibres or textiles					
Facilities: 19 (Total in search: 173)					
All values are yearly releases.					
Releases per country		Facilities	Air	Water	Soil
Chlorinated organic substances (2/20)		5			
Tetrachloroethylene (PER)	Total	4	40.4 t	54.0 kg	-
	Accidental	0	0	0	-
Trichloroethylene	Total	1	10.3 t	-	-
	Accidental	0	0	-	-
Greenhouse gases (1/7)		1			
Hydro-fluorocarbons (HFCs)	Total	1	746 kg	-	-
	Accidental	1	746 kg	-	-
Heavy metals (6/8)		6			
Cadmium and compounds (as Cd)	Total	1	-	18.6 kg	-
	Accidental	0	-	0	-
Chromium and compounds (as Cr)	Total	1	-	71.7 kg	-
	Accidental	0	-	0	-
Copper and compounds (as Cu)	Total	1	-	82.6 kg	-
	Accidental	0	-	0	-
Nickel and compounds (as Ni)	Total	3	-	171 kg	-
	Accidental	0	-	0	-
Lead and compounds (as Pb)	Total	1	-	55.9 kg	-
	Accidental	0	-	0	-
Zinc and compounds (as Zn)	Total	3	-	953 kg	-
	Accidental	0	-	0	-
Other gases (5/11)		11			
Chlorine and inorganic compounds (as HCl)	Total	1	11.1 t	-	-
	Accidental	0	-	-	-
Hydrochlorofluorocarbons(HCFCs)	Total	2	90.4 kg	-	-
	Accidental	1	47.0 kg	-	-
Non-methane volatile organic compounds (NMVOC)	Total	6	1,706 t	-	-
	Accidental	0	0	-	-
Nitrogen oxides (NOx/NO2)	Total	4	926 t	-	-
	Accidental	0	0	-	-
Sulphur oxides (SOx/SO2)	Total	1	176 t	-	-
	Accidental	0	0	-	-
Other organic substances (3/16)		4			
Di-(2-ethyl hexyl) phthalate (DEHP)	Total	1	-	1.30 kg	-
	Accidental	0	-	0	-
Phenols (as total C)	Total	1	-	103 kg	-
	Accidental	0	-	0	-
Total organic carbon (TOC) (as total C or COD/3)	Total	2	-	262 t	-
	Accidental	0	-	0	-

Figure 2. 2011 European Pollutant Release and Transfer Register (Fibre or Textile Pretreatment or Dyeing Releases)
 Source: EEA, E-PRTR, 2013, Industrial Activity.



Potential Uses

The Organisation for Economic Co-operation and Development (OECD) PRTR Task Force described the following potential uses of PRTR data in its *Application, Use and Presentation of Pollutant Release and Transfer Registers (PRTR) Data* (OECD, 2013a):

- Estimating risks
- Evaluating performance and efficiency
- Determining compliance status
- Characterising facility universe and operations of interest
- Characterising data quality

Other end-users of PRTR data, such as the following, may be engaged to improve the benefits from a PRTR (OECD, 2013a):

- Environmental programs within the government
- Non-environmental government programs
- The public (individual citizens, NGOs, advocacy groups)
- Researchers
- Facilities and trade associations of sectors subject to PRTR reporting

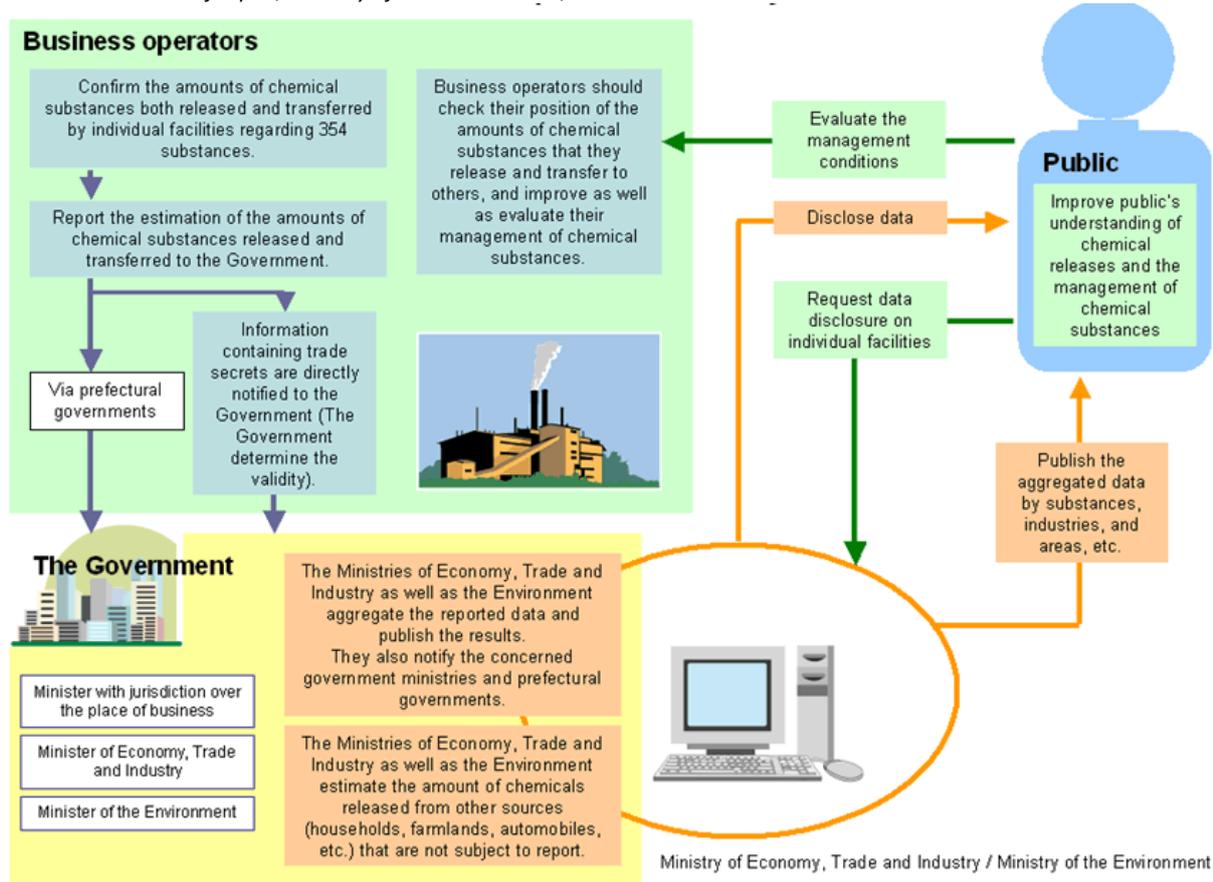
Because PRTRs have been designed within varying legislative environments, the reporting conditions for companies, classification of industry types and the list of substances and their thresholds vary. An OECD PRTR Task Force (OECD, 2013b) is currently assessing opportunities to harmonise the information of these different PRTRs. The task force publishes reports such as the following (OECD, 2013c):

- Global Pollutant Release and Transfer Register, Proposal for a Harmonised List of Pollutants (OECD, 2012)
- Global Pollutant Release and Transfer Register: Proposal For A Harmonised List of Reporting Sectors (OECD, 2013d).

PRTR reporting processes follow similar formats. Figure 3 provides an example from Japan’s national PRTR system.

Figure 3. Flowchart of Japanese PRTR System

Source: Government of Japan, Ministry of the Environment, 2013a.



The subject facility provides information for inclusion in a PRTR. The type of information requested will vary, depending on the PRTR’s requirements. Figure 4 shows a sample U.S. Emergency Planning and Community Right-To-Know Act (EPCRA) Section 313 reporting threshold worksheet for a specific facility.

Figure 4. Sample EPCRA Section 313 Reporting Threshold Worksheet

Source: US EPA, 2000, Table 3-6.

Facility Name: ABC Textile Finishing, Inc.
 EPCRA Section 313 Chemical or Chemical Category: Methyl ethyl ketone
 CAS Registry Number: 78-93-3
 Reporting Year: 1999

Date Worksheet Prepared: May 1, 2000
 Prepared By: A.B. Calloway

Amounts of the chemical manufactured, processed, or otherwise used.

Mixture Name or Other Identifier	Information Source	Total Weight (lb)	Percent TRI Chemical by Weight	TRI Chemical Weight (lb)	Amount of the EPCRA Section 313 Chemical by Activity (lb):		
					Manufactured	Processed	Otherwise Used
1. Mixture A	Purchasing records, MSDS	25,000	50%	12,500	---	12,500	---
2. Mixture B	Purchasing records, MSDS	110,000	20%	22,000	---	11,000	11,000
3.							
4.							
Subtotal:					(A) 0 lb.	(B) 23,500 lb.	(C) 11,000 lb.

Exempt quantity of the chemical that should be excluded.

Mixture Name as Listed Above	Applicable Exemption (de minimis, article, facility, activity)	Fraction or Percent Exempt (if applicable)	Amount of the EPCRA Section 313 Chemical Exempt from Above (lb):		
			Manufactured	Processed	Otherwise Used
1. None					
2.					
3.					
4.					
Subtotal:			(A₁) 0 lb.	(B₁) 0 lb.	(C₁) 0 lb.

Amount subject to threshold: (A-A₁) **0 lb.** (B-B₁) **23,500 lb.** (C-C₁) **11,000 lb.**

Activity threshold quantities²: **25,000 lb.** **25,000 lb.** **10,000 lb.**

Compare to threshold for EPCRA Section 313 reporting.

If any one of these thresholds is exceeded, reporting is required for all activities. [Do not submit this worksheet with your EPCRA Section 313 report; retain it for your records.]

Current Limitations and Reporting Challenges

Companies and facilities face a number of limitations to expanding PRTRs, such as the following:

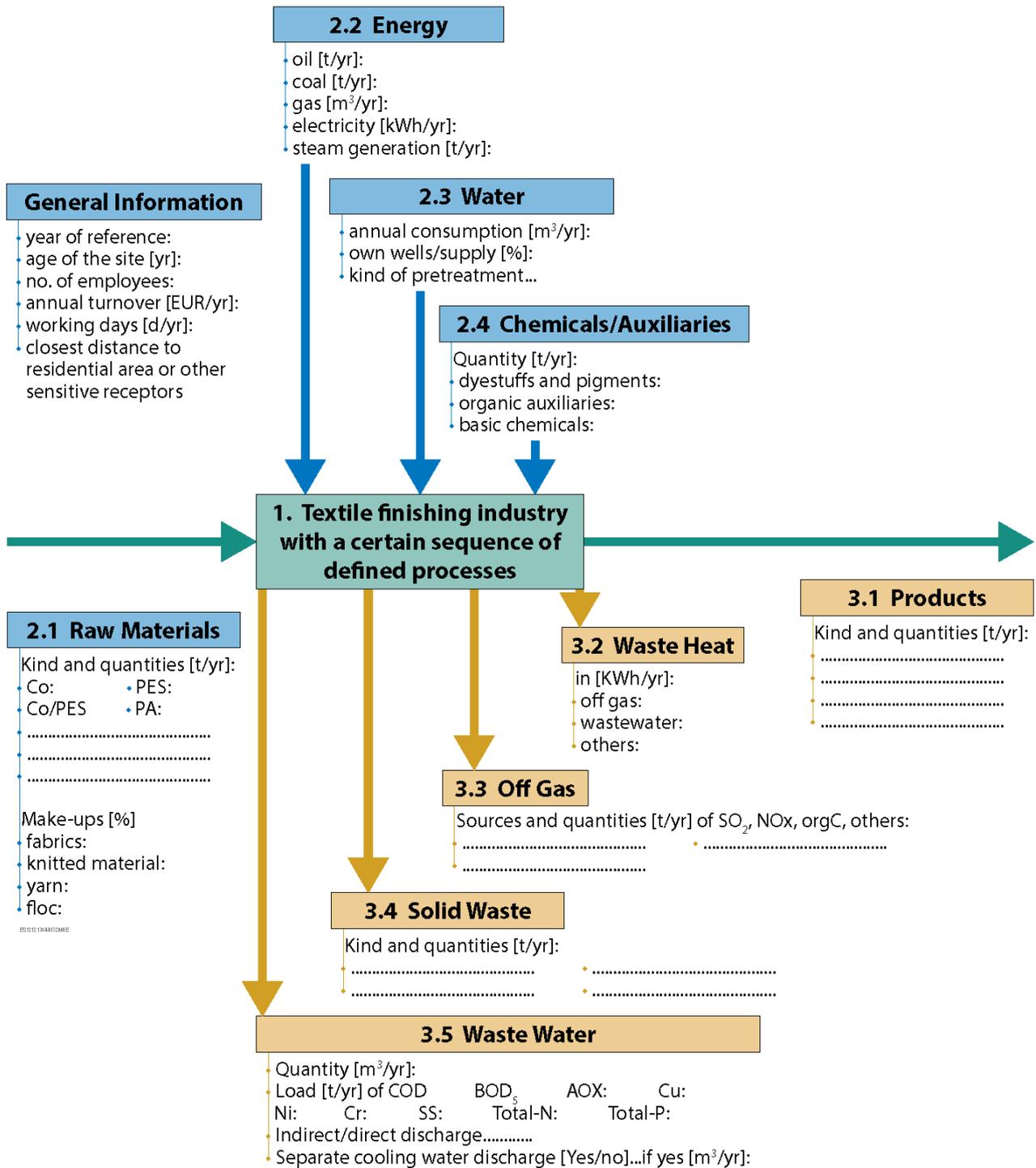
1. One of the biggest limitations is the absence or the very slow development of PRTR laws and regulations. This is especially true in developing countries in which industries create greater pollution because of lax environmental regulations and poor enforcement of existing regulations.
2. PRTRs are normally government driven and legally required and since the process develops slowly, the challenge is to implement a company-driven system with non-regulatory disclosure of information. Many facilities are not necessarily ready to voluntarily disclose existing environmental information or data, such as chemical pollutant releases, required by PRTRs.
3. The nature of the information available (that is, raw data such as the number of kilograms per year of release of chemical Z by Facility ABC) is a limitation. For the layperson, such data alone do not provide context or quantify effects such as their impacts on health and the environment. Moreover, it is

extremely difficult to draw conclusions regarding the effects discharged chemicals have on health and the environment given the complexity of the science required to estimate and attribute effects.

4. Information disclosed needs to be based on reliable data and sound science so that conclusions drawn from the data allow the selection of reasonable, measured actions and make the best use of limited available resources.
5. The public has a relatively low awareness of, and interest in, access to this type of information. Awareness surveys jointly conducted by the Queensland Environmental Protection Agency/Australia University (2007) in 2001, 2002, 2006, support this lack of consumer knowledge and indicate low levels of interest in the general population:
 - a. 2001 environment student survey found that just 27% of respondents had heard of the National Pollutant Inventory (NPI) (33 respondents)
 - b. 2002 telephone survey found 6% of the public had heard of the NPI (582 respondents)
 - c. 2006 telephone survey found 13% had heard of the NPI but less than 5% actually knew what it was (84 respondents)
6. Reporting under a PRTR requires time and money.
7. Though proactive facilities and companies might see reporting as an opportunity to demonstrate good chemical and overall business management, managers might perceive data collection and reporting as a threat to their business if the disclosed information is potentially damaging.
8. Chemical suppliers may not provide comprehensive enough documentation about their products. Available information in Material Safety Data Sheets (MSDSs) that accompany a commercial chemical mixture may not enable facilities to calculate and estimate chemical releases based on concentration ranges and operations flowcharts (such as the annual input/output overview example provided in Figure 5).
9. Companies with little or poor capacity/resources, for managing commercial chemical mixtures and their ingredient substances, may lack available guidance on the types of chemical inputs used and effluent/discharge via wastewater treatment or other methods.
10. Intellectual property issues and confidential business information may restrict the types of information that can be publicly disclosed or reported, which would compete with implementation of the RtK principle.

Figure 5. Scheme for the Textile Industry Annual Input/Output Overview at Site Level

Source: European Commission, 2003, Figure 4.1: Scheme for annual input/output overview at site level (179, UBA, 2001).



Reducing Limitations and Improving Reporting

To overcome PRTR limitations and achieve a quality reporting programme, consider:

- Improving PRTR-responsible staff communication and reporting tools and methodology training.
- Gathering and employing user feedback to improve the reporting system.
- Incorporating the U.S. Environmental Protection Agency (US EPA) Toxic Release Inventory (TRI) recommendations by collecting the following basic information items (US EPA, 2000, "Step 1 - Identify

Which EPCRA Section 313 Chemicals or Chemical Categories are Manufactured (Including Imported), Processed, or Otherwise Used”):

- MSDSs
 - Facility purchasing records
 - Inventory records
 - Air and water discharge permits
 - Individual manufacturing/operating functions
- Collecting additional information to facilitate quality reporting. For example, China includes production as discharge coefficients specified by the China industry association (Zhipeng et al., 2009).
 - Building capacity across the supply chains to elevate manufacturers’ capabilities for managing chemicals and monitoring their effluents/discharges. Such capacity building would increase the coverage of chemical discharge data disclosure and improve data quality.
 - Release estimation techniques (RETs) and other methods of determining the quantities of chemical releases are routinely used and are, in some cases, available for facilities involved in textile manufacturing. The use of a PRTR approach would allow the development of RETs that could then be applied consistently across the sector. This would allow a good comparability of results from location to location and better demonstrate the advantages from using improved wastewater cleanup technologies.
 - Principle 10 of the *Rio Declaration on Environment and Development* recommends stronger public participation.¹ Involving the local public in dialogue prior to the design and implementation of the Rtk information disclosure could assist in helping facilities overcome the challenge to release data not legally required when a competitor may chose to withhold that information. Increased participation by an informed public also can bring pressure to bear on polluters and has been linked to reduced pollution (Queensland Environmental Protection Agency/Australia University, 2007).
 - Proactive facilities and companies could view reporting as an opportunity to demonstrate good chemical and overall business management, which would allow brands the opportunity to promote and influence supply chain buy-in.
 - Instituting a scheme for an annual input/output overview at the facility level (an example of which is presented in Figure 5). The scheme could demonstrate a continuous reduction of the facility’s discharges of chemicals and improve communications between management and technical engineers. This could result in implementation of additional environmentally friendly technologies and in cost savings from items such as waste stream material recycling.
 - Addressing facility disclosure reluctance through enforcement and by monitoring or sampling parameters and reported data.
 - The Protocol is the first legally binding international instrument on pollutant release and transfer registers. Its objective is "to enhance public access to information through the establishment of coherent, nationwide pollutant release and transfer registers (PRTRs)." PRTRs are inventories of pollution from industrial sites and other sources.

Table 1 lists potential data sources for release and other waste management calculations.

¹ “States shall facilitate and encourage public awareness and participation by making information widely available.” (United Nations Conference on Environment and Development, 1992).

Table 1. Potential Data Sources for Release and Other Waste Management Calculations

Source: US EPA, 2000, Table 4-2.

<p>Monitoring Data:</p> <ul style="list-style-type: none"> • Air permits • Continuous emission monitoring • Effluent limitations • Hazardous waste analysis • Industrial hygiene monitoring data • National Pollutant Discharge Elimination System (NPDES) permits • Outfall monitoring data • pH for acids and bases • Publicly owned treatment works (POTW) pretreatment standards • Resource Conservation and Recovery Act (RCRA) permit • Stack monitoring data • New Source Performance Standards • Clean Air Act Title V permit data 	<p>Mass Balance:</p> <ul style="list-style-type: none"> • Air emissions inventory • Hazardous material inventory • Hazardous waste manifests • MSDSs • Pollution prevention reports • Spill event records • Supply and purchasing records <p>Emission Factors:</p> <ul style="list-style-type: none"> • US EPA AP-42, <i>Compilation of Air Pollutant Emission Factors</i>, chemical-specific emission factors • Facility or trade association-derived <u>chemical-specific</u> emission factors <p>Engineering Calculations:</p> <ul style="list-style-type: none"> • Facility <u>non-chemical-specific</u> emission factors • Henry’s Law • Raoult’s Law • Synthetic Organic Chemicals Manufacturing Industry (SOCMI) or trade association non-chemical-specific emission factors • Solubilities • Volatilization rates
--	---

7 Conclusions

Reporting on the discharge of chemicals is one way to implement the RtK principle and to demonstrate improvement in chemicals management in and by the supply chain. Currently, PRTRs are one of the most established methods for implementing RtK and have been clearly demonstrated as an effective tool for driving pollution reduction. The World Bank reports that: “A number of countries around the world have in recent years implemented environmental performance rating and public disclosure programs, and, where evidence is available, these programs have been shown to induce pollution reduction” (World Bank, 2011). The application of PRTRs as a voluntary mechanism can be debated, but their potential is clear. Currently, the OECD is working towards harmonising pollutant lists and reporting guidance.

One of the most established methods for implementing RtK, the development and use of PRTRs have steadily been improving. Their use would benefit global supply chains and their interconnected economies with increased awareness of environmental problems and by demonstrating improvements. Although PRTR data currently are only posted on websites and their use has been limited, these datasets are being used to inform various activities (such as local and global chemical impact assessments and facility programs to improve chemical and operations management). A good example of this expanded use is the German Thru.de portal for transparent and freely accessible information on the environment from industrial plants as well as emissions from diffuse sources (such as transport, households and agriculture) (Thru.de, 2013). The database for this PRTR is programmed completely with Open Source software and the PRTR developers encourage external use of the data to help enhance the software and share their results (*PRTR Germany and Open Source Software*).

Academic research has shown that further chemical compliance enforcement may improve PRTR performance. According to Mol et al. (2011), in China: “Implementation of the Environmental Information Disclosure Decree is improving but is still far from widespread, full and effective. The lack of enforcement and the ambiguity of some clauses in the decree give provincial environmental agencies great discretion to avoid disclosure and discourages enforcement of company environmental information disclosure.”

While our research shows PRTR as an effective methodology to implement the RtK principle, the ZDHC Group recognises the time scale involved to establish a credible platform. Therefore as an intermediary step, the ZDHC Group's first priority in RtK must be to establish a system to prevent intentional use of hazardous chemicals in the manufacturing process.

8 Works Cited

- Ahmed, Kulsum. 2012. *Getting to green: a sourcebook of pollution management policy tools for growth and competitiveness*. Washington D.C. The World Bank.
<http://documents.worldbank.org/curated/en/2012/01/16565836/getting-green-sourcebook-pollution-management-policy-tools-growth-competitiveness>.
- Australian Government, Department of Sustainability, Environment, Water, Population and Communities. 2013. *National Pollutant Inventory (NPI) Home Page*. <http://www.npi.gov.au/>.
- Environment Canada. 2013. *National Pollutant Release Inventory (NPRI) Home Page*. <http://www.ec.gc.ca/inrp-npri/>.
- Estados Unidos Mexicanos, Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). 2013. *Registro de Emisiones y Transferencia de Contaminantes (RETC)*. <http://app1.semarnat.gob.mx/retc/index.html>.
- European Commission. 2003. *Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques for the Textiles Industry*. July 2003.
http://eippcb.jrc.ec.europa.eu/reference/BREF/txt_bref_0703.pdf.
- European Environment Agency (EEA). 2013. *E-PRTR, The European Pollutant Release and Transfer Register Home Page*. <http://prtr.ec.europa.eu/>.
- European Environment Agency (EEA), European Pollutant Release and Transfer Register (E-PRTR). 2013. *Industrial Activity*. <http://prtr.ec.europa.eu/IndustrialActivity.aspx>.
- Global Automotive Declarable Substance List (GADSL). 2013. *GADSL Home Page*. <http://www.gadsl.org/>.
- Global Reporting Initiative (GDI). 2013. *Global Reporting Initiative Home Page*.
<https://www.globalreporting.org/Pages/default.aspx>.
- Government of Japan, Ministry of the Environment. 2013a. *Flowchart of Japanese PRTR System*.
- Government of Japan, Ministry of the Environment. 2013b. *PRTR Information Plaza Japan*.
<http://www.env.go.jp/en/chemi/prtr/prtr.html>.
- Institute of Public and Environmental Affairs (IPE). 2008. *The Green Choice Alliance for Responsible Supply Chain Management*. <http://www.ipe.org.cn/En/alliance/gca.aspx>.
- Institute of Public and Environmental Affairs (IPE). 2013. *IPE Environment and Health*.
<http://www.ipe.org.cn/en/environment/index.aspx>.
- Mol, Arthur P.J., Guizhen He, and Lei Zhang. 2011. "Information Disclosure in Environmental Risk Management: Developments in China." *Journal of Current Chinese Affairs* 3/2011: 163-192.
<http://journals.sub.uni-hamburg.de/giga/jcca/article/view/458>.
- Organisation for Economic Co-operation and Development (OECD). 2012. *Global Pollutant Release and Transfer Register, Proposal for a Harmonised List of Pollutants*. Environment Directorate Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology. Series on Pollutant Release and Transfer Registers No. 13. ENV/JM/MONO(2012)9. 11 April 2012.
<http://www.oecd.org/env/ehs/risk-management/globalpollutantreleaseandtransferregisterproposalforaharmonisedlistofpollutants.htm>.
- Organisation for Economic Co-operation and Development (OECD). 2013a. *Application, Use and Presentation of Pollutant Release and Transfer Registers (PRTR) Data*. Environment Directorate Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology. Series on Pollutant Release and

Transfer Registers No. 14. ENV/JM/MONO(2013)1. 07 January 2013.
[http://search.oecd.org/officialdocuments/displaydocumentpdf/?cote=env/jm/mono\(2013\)1&doclanguage=en](http://search.oecd.org/officialdocuments/displaydocumentpdf/?cote=env/jm/mono(2013)1&doclanguage=en).

Organisation for Economic Co-operation and Development (OECD). 2013b. *OECD activities to assist PRTR implementation*. <http://www.oecd.org/env/ehs/risk-management/oecdactivitiesstoassistprtrimplementation.htm>.

Organisation for Economic Co-operation and Development (OECD). 2013c. *Publications in the series on Pollutant Release and Transfer Registers*. <http://www.oecd.org/env/ehs/risk-management/publicationsintheseriesonpollutantreleaseandtransferregisters.htm>.

Organisation for Economic Co-operation and Development (OECD). 2013d. *Global Pollutant Release and Transfer Register: Proposal for a Harmonised List of Reporting Sectors*. Environment Directorate Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology. Series on Pollutant Release and Transfer Registers No. 15. ENV/JM/MONO(2013)5. 27 February 2013.
[http://search.oecd.org/officialdocuments/displaydocumentpdf/?cote=env/jm/mono\(2013\)5&doclanguage=en](http://search.oecd.org/officialdocuments/displaydocumentpdf/?cote=env/jm/mono(2013)5&doclanguage=en).

Organisation for Economic Co-operation and Development (OECD). 2013e. *Pollutant Release and Transfer Register (PRTR)*. <http://www.oecd.org/chemicalsafety/risk-management/pollutantreleaseandtransferregisterprtr.htm>.

PRTR: Learn. 2013. *PRTR Initiatives Map*. <http://prtr.unitar.org/en/prtr-initiatives-map>.

PRTR Germany and Open Source Software.
<http://www.unece.org/fileadmin/DAM/env/documents/2010/pp/MoPP-1-HLS/statement-Heidemeier.pdf>.

Queensland Environmental Protection Agency/Australia University. 2007. *Quantifying Community Use of Pollutant Inventories*. <http://www.epa.gov/ttnchie1/conference/ei16/session6/thorning.pdf>.

Thru.de. 2013. *Thru.de Home Page*. <http://www.thru.de/thrude/>.

Toxic Use Reduction Institute (TURI). 2013. *Who We Are: Making Massachusetts a Safer Place to Live and Work*. http://www.turi.org/About/Who_We_Are.

United Nations Conference on Environment and Development. 1992. *Rio Declaration on Environment and Development*. Meeting in Rio de Janeiro from 3 to 14 June 1992.
<http://www.unep.org/Documents.Multilingual/Default.asp?documentid=78&articleid=1163>.

United Nations Economic Commission for Europe (UNECE). 1998. *Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention)*. Done at Aarhus, Denmark. 25 June 1998. <http://www.unece.org/env/pp/treatytext.html>.

United Nations Economic Commission for Europe (UNECE). 2003. *Protocol on Pollutant Release and Transfer Registers*. http://www.unece.org/fileadmin/DAM/env/pp/prtr/Protocol%20texts/PRTR_Protocol_e.pdf.

United Nations Economic Commission for Europe (UNECE). 2013. *Welcome to PRTR.net*.
<http://www.prtr.net/>.

U.S. Environmental Protection Agency (US EPA). 2000. *Emergency Planning and Community Right-To-Know Act Section 313 Reporting Guidance for the Textile Processing Industry*. EPA 745-B-00-008. May 2000.
<http://www2.epa.gov/sites/production/files/documents/2000textiles.pdf> from <http://www2.epa.gov/toxics-release-inventory-tri-program/guidance-textile-processing-industry>.

U.S. Environmental Protection Agency (US EPA). 2013. *Toxics Release Inventory (TRI) Program*.
<http://www2.epa.gov/toxics-release-inventory-tri-program>.

World Bank. 2011. *World Bank Development Research Group Environment and Energy Team Design and Implementation of Environmental Performance Rating and Public Disclosure Programs A Summary of Issues and Recommendations Based on Experiences in East Asian Countries*. January 2011.
<http://elibrary.worldbank.org/content/workingpaper/10.1596/1813-9450-5551>.

World Bank. 2012. *Getting to Green: A Sourcebook of Pollution Management Policy Tools for Growth and Competitiveness*.

http://siteresources.worldbank.org/ENVIRONMENT/Resources/Getting_to_Green_web.pdf.

Zero Discharge of Hazardous Chemicals (ZDHC). 2013. *Roadmap to Zero Discharge of Hazardous Chemicals*.

<http://www.roadmaptozero.com/joint-roadmap.php>.

Zhipeng, Tang, Fu Xue, and William Xiaojun Wei. 2009. "Research on Identifying Important Coefficients in Chinese Sectors with High Industrial Wastewater Discharge." *Asia Pacific Business Review*. Vol. V, No.2, April–June 2009.