

AN EXPLORATORY INVESTIGATION INTO CHEMICAL MANAGEMENT PRACTICES: A
CASE STUDY OF SMALL AND MEDIUM-SIZED ENTERPRISES WITHIN NOVA SCOTIA

by

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Submitted in partial fulfillment of the requirements
for the degree of Master of Environmental Studies

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DALHOUSIE UNIVERSITY

SCHOOL FOR RESOURCE AND ENVIRONMENTAL STUDIES

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ABSTRACT

Chemical pollution has become an environmental and human health concern. Small and medium-sized enterprises are becoming the focus of environmental researchers, as they have been found to collectively contribute a significant amount of the pollution due to improperly managed chemicals. This case study of Nova Scotia small and medium-sized enterprises aimed to collect baseline information regarding environmental and chemical management including what positive practices were in place, what areas required more assistance, what information is being requested and who should be the focus of information programs. Results indicated that there is significant room for improvement in both the environmental and chemical management practices of small and medium-sized enterprises, even though participants indicated they were employing responsible practices. Participants were however, able to provide multiple suggestions regarding information they require in order to improve their business operations and environmental performance, thereby indicating they are aware improvements are needed.

LIST OF ABBREVIATIONS USED

ACGIH	American Conference of Governmental Industrial Hygienists
As	Arsenic
BC	British Columbia
BCSS	British Columbia Statistical Service
BEI	Biological Exposure Indices
BMP	Best Management Practice
BPA	bisphenol-A
CAS	Chemical Abstracts Service
CAW	Canadian Auto Workers
CCOHS	Canadian Centre for Occupational Health and Safety
CEPA	Canadian Environmental Protection Act
CEPA 1999	Canadian Environmental Protection Act 1999
CFIB	Canadian Federation of Independent Business
CHMS	Canadian Health Measures Study
CSR	Corporate Social Responsibility
DDT	dichlorodiphenyltrichloroethane
EEC	Eco-Efficiency Centre
EGSPA	Environmental Goals and Sustainable Prosperity Act
et al.	and other writers
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
Hg	Mercury
ISO	International Standards Organization
MeHg	methylmercury
MSDS	Material Safety Data Sheet
NGO	Non-Governmental Organization
NS	Nova Scotia
PERC	perchloroethylene
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
POP	persistent organic pollutants
PPB	Physician Prescription Behaviour
SEPH	Survey of Employment, Payroll and Hours
SME	Small and Medium-sized Enterprise
TLV	Threshold Limit Values
VOC	volatile organic compounds
WHMIS	Workplace Hazardous Materials Information System
WHO	World Health Organization
CSN	Collision Solutions Network
SSNS	Safety Services Nova Scotia
CFCM	Canadian Finishing & Coatings Manufacturing Magazine
MEA	The Maritimes Energy Association

OTANS	Offshore/Onshore Technologies Association of Nova Scotia
CME	Canadian Manufacturers and Exporters
ESANS	Environmental Services Association Nova Scotia
CCIF	Canadian Collision Industry Forum

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CHAPTER 1 – Introduction

1.1 Problem Statement

Chemical pollution has become an environmental and human health concern (Health Canada, 2010a; Couillard, Macdonald, Courtenay & Palace 2008); particularly, pollution resulting from industrial activities (Kadi, 2009). Chemical pollution has become a focus for environmental researchers (Eco-Efficiency Centre, 2010; Kadi, 2009; Parker, Redmond & Simpson, 2009, Côté, Booth & Louis, 2006; Schaper, 2002; Hillary, 2000). The environmental movement for business began in the 1960's, not until the late 1990's did small businesses environmental activities become a research focus (Tilley, 2000).

Over the past two decades, it has come to the attention of environmental researchers that Small and Medium-sized Enterprises (SME) are likely significant contributors to the overall emissions and releases which are negatively affecting the environment (Battisti & Parry, 2011; Eco-Efficiency Centre, 2010; Waters, 2010; Parker et al., 2009; Côté et al., 2006; Schaper, 2002; Hillary 2000; Tilley 2000). As a result, SMEs are receiving an increased focus from researchers and government agencies (Waters, 2010; Parker et al., 2009; Gadenne, Kennedy & McKeiver, 2009; Côté et al., 2006) with the development of policies, tools, and programs to assist them in decreasing their environmental footprint (Waters, 2010; S. Madsen, personal communication, November 5, 2009). These programs have been developed to reduce water usage, conserve energy, reduce chemical use, reduce waste, improve efficiency, decrease raw material consumption and ensure the

continued sustainability of SMEs (Waters, 2010; Eco-Efficiency Centre, 2010; Revell & Blackburn, 2007; Coté et al., 2006).

SMEs are not well understood and, to date, there has been limited research that increases the current understanding of trends surrounding environmental sustainability and environmental performance (Battisti & Parry, 2011; Parker et al., 2009; Lewis, Massey & Harris, 2007; Haugh & McKee, 2004; Hillary, 2000). Comprehensive research is needed in order to support SMEs and assist them towards a sustainable and environmentally-sound path (Battisti & Parry, 2011; Eco-Efficiency Centre, 2010; Waters, 2010; Parker et al., 2009; Gadenne et al., 2008).

1.2 Research Objectives

In order for SMEs to become more aware of the impacts their business practices have on the environment, this research project initially set out with a very specific research objective to support improved chemical management practices within SMEs by creating a *Chemical Management Tool for SMEs* that would provide a single, easy to use portal for accessing information related to the various aspects of proper chemical management such as provincial and federal regulations, MSDS information, handling and storage practices, health and safety requirements and available chemical alternatives. With the challenges encountered during data collection, further explained in chapter 3, the objective of this research was modified slightly, such that the primary focus shifted and became to increase current understandings of what SMEs know about their chemical use, information

they require/are requesting to aid improved management practices, and how to best access SMEs in order to communicate information to them.

1.3 Research Questions

The major question to be answered by this research is: What is the current level of understanding within SMEs of the various aspects of chemical use and management? The intent of the major question is to then provide better insight as to what, if any, improvements are required to ensure SMEs are using chemical best management practices (BMP) in their day-to-day operations.

To effectively answer the major research question, 4 specific research questions were developed to obtain a better understanding of the situation:

1. What positive practices were already in place within the SMEs,
2. Which areas required more guidance/assistance,
3. What information and/or assistance are SMEs requesting to properly manage their chemicals
4. Who should be the focus of information dissemination programs for new information?

1.4 Organization of Thesis

This thesis is divided into 6 chapters. Chapter 2 is a detailed literature review and background on relevant topics to this research including SMEs, chemical pollution, and knowledge transfer options. Chapter 3 provides a comprehensive overview of the methodological approach taken for the research. As there was some

modification to the study during the course of the research, the justification for this will also be discussed. Chapter 4 presents the results of the research followed by chapter 5, which is a detailed discussion of the results as they pertain to the body of research that already exists as well as an overview of information dissemination techniques. Chapter 6 includes recommendations for future researchers on this topic as well as acknowledges the limitations of this study and emphasizes key elements and contributions of this research.

1.5 Definitions

For the purpose of this research, the following definitions are provided to ensure a common understanding of terms used within this research that commonly have varied definitions. By providing these definitions, it allows for further understanding of the insight gained which will be discussed in chapter 4 and 5.

Small and Medium-sized Enterprises (SME)

Businesses can be defined using several criteria. These criteria include, but are not limited to: sales, value of shipments, annual gross revenue, annual net revenue, size of assets, and number of employees (Industry Canada, 2010). The grouping/classification of businesses can be necessary for a variety of purposes, including eligibility to bid on projects and receive grants. Therefore, it is important to select the most practical or efficient criteria to divide them. Within Canada, there are multiple government agencies and organizations that, in some way, pertain to SMEs. Each of these agencies have their own definition of constitutes a Small and

Medium-sized Enterprises (SME). The Canadian Bankers Association views a small business as one that qualifies for a loan of less than \$250,000 (Industry Canada, 2010), Export Development Canada defines a small or emerging exporter as one with export sales under \$1 million (Industry Canada, 2010), and the Canadian Federation of Independent Businesses describes an SME as one with less than 100 employees (2007).

Statistics Canada may be a more useful source for SME data since it typically lists information in a detailed format so that specific data can be extracted based on the researchers needs. However, in reports published by Statistics Canada, there are multiple and sometimes contradicting definitions. The Small and Medium-Sized Enterprises Data Warehouse provides business demographics and states that SMEs have fewer than 250 employees and less than \$50 million in total revenue (Statistics Canada, 2010a) while the Small Business Profiles' definition is a business having annual revenue between \$30,000 and \$5 million (Statistics Canada, 2010b). Industry Canada uses the number of employees and the industry sector to determine size (Industry Canada, 2010).

These examples demonstrate a lack of consensus as to the most effective criteria to define an SME. The lack of a definition may be attributed to a variety of explanations, including that it is a result of a poor understanding of the importance smaller businesses makes in the bigger picture of employment and economy.

For the purpose of this research, SMEs will be defined according to the Industry Canada guidelines and "refers to all businesses with fewer than 500 employees" (Industry Canada, 2011).

Hazardous Chemicals

In Canada, a substance is deemed toxic, hazardous or harmful, if it enters “or may enter the environment in a quantity or concentration or under conditions that: 1) have or may have an immediate or long-term harmful effect on the environment or its biological diversity; 2) constitute or may constitute a danger to the environment on which life depends; or 3) constitute or may constitute a danger in Canada to human life or health” (Section 64, Canadian Environmental Protection Act, 1999).

For the purpose of this research, the term hazardous will be used to represent substances that fall into any of these three categories.

Hazard

A hazard is an object, substance, or situation that has the potential to cause harm, damage or adverse effects (CCOHS, 2009; CCOHS, 2006).

Risk

A risk, or risk assessment, is the likelihood or probability that a hazard will cause harm, damage or adverse effects and the severity (CCOHS, 2009; CCOHS, 2006). Additionally, a risk assessment should include prevention and mitigation measures for the hazard.

Ecoliteracy

Ecoliteracy is “the understanding of the principles of ecology and the environment and an ability to use these principles to create sustainable business organizations” (Tilley, 2000).

CHAPTER 2 – Literature Review

2.1 Small and Medium-sized Enterprises

For the purpose of this research, Small and Medium-sized Enterprises (SME), as further outlined in section 1.10, are defined as businesses that employ 500 people or less (Industry Canada, 2011). Businesses employing more than 500 people are considered large enterprises and are therefore not the focus of this research.

2.1.1. Importance of SMEs

2.1.1.1. Number of SMEs

SMEs (1-499 employees) make up 99.8% of employer businesses¹ in Canada, with 98% of those businesses employing 100 people or less (Industry Canada, 2011). SMEs contribute to the same aspects of Canadian business as larger businesses (Industry Canada, 2011; Industry Canada, 2010; Industry Canada, 2009; Lewis et al., 2007). This includes, but is not limited to, employment rates, GDP, and pollution.

In 2009, Canada had over 1 million small businesses with a Revenue Canada payroll deduction account; with the province of Nova Scotia contributing just over 30,000 small businesses and almost 550 medium businesses to Canada's total (Industry Canada, 2010; Industry Canada 2009). Between 2009 and 2010, the

¹ Any business with at least one paid employee, has annual sales revenues of \$30,000, or be incorporated and have filed a federal corporate income tax return at least once in the previous three years must have a payroll deductions account with the Canada Revenue Agency (Industry Canada, 2009).

number of Canadian small businesses – employing 99 people or less – grew by almost 60,000 businesses (Industry Canada, 2009; Industry Canada, 2010).

2.1.1.2. Employment Rates

While the number of SMEs in Canada is important, it is equally important to understand how many individuals are employed by these businesses. The Statistics Canada Survey of Employment, Payroll and Hours (SEPH) reported that 5.1 million, or 48%, of Canadians were employed in small private sector businesses and 1.6 million, or 16%, were employed in medium businesses (Industry Canada, 2011). In Nova Scotia, SMEs employ just fewer than 400,000 employees with 36.6% of them being employed in a business employing 99 people or less (Statistics Canada, 2010b). Forty-seven percent of new private sector jobs, created between 2001 – 2010, were created by small businesses.

2.1.1.3. Gross Domestic Product

In terms of productive output in Canada, businesses employing 100 people or less contributed 30% of the national GDP in 2010 (Industry Canada, 2011). As previously outlined in section 1.10, there is not a universal definition of what constitutes a SME. This complicates the process of determining the true importance and impact of SMEs. The British Columbia Statistics Service defines a small business as employing 50 people or less (Industry Canada, 2011). The BC Statistics Service determined that small businesses contribute 28% of Canada's GDP and 25% of Nova Scotia's GDP (Industry Canada, 2011). Small businesses were also responsible for

\$68billion, or 25%, in exports in 2009, with medium-sized businesses addition \$51billion, or 18%, to Canadian exports (Industry Canada, 2011).

2.1.1.4. Enabling Opportunities

SMEs contribute to more than just employment and GDP statistics; they have also been commended for their inclusive and effective family-friendly policies (Dex & Sheibl, 2001). It has been suggested that this contributes to an easier work-life balance and allows for parents to be able to care for children while maintaining their employment status (Dex & Sheibl, 2001). SMEs also allow for entrepreneurial endeavours to come to fruition and succeed since there are financing options available specifically for SMEs/entrepreneurial start-ups (Industry Canada, 2012). This assists individuals who cannot work during standard workweek hours to secure and maintain gainful employment, in addition to those who want to become the owner/manager of their own business (Industry Canada, 2012).

2.1.1.5. Contribution to Chemical Pollution

Revell et al. (2009), found that “there is a positive attitude toward the environment, and SMEs are taking active steps to become more environmentally sustainable through measures such as recycling, energy efficiency, responsible buying and selling and the management of carbon emissions” (as cited in Battisti & Perry, 2011). There is however, no mention of chemicals, chemical releases or chemical management.

SMEs contribute to the environmental impacts resulting from business and industrial operations (Parker et al., 2009; Hillary, 2000) and still, the environmental management practices of SMEs are not well understood or documented including use, releases, and waste disposal methods (Battisti & Perry, 2011; Parker et al., 2009; Lewis et al., 2007; Khanna, Koss, Jones & Ervin, 2007; Coté et al., 2006; Haugh & McKee, 2004; Hillary, 2000). Researchers have suggested that SMEs are liable for “significant proportion of all industrial pollution” (Friedman, Miles & Adams, 2000) including 70% of all pollution in the United Kingdom (Coté et al., 2006), and 70% of all global pollution (Parker et al., 2009) are reportedly attributed to SMEs.

Olsen, Harris, Laird, Perry & Hasle (2010), noted that there is little evidence to suggest that SMEs have a sound awareness of proper management, handling, monitoring or disposal methods for hazardous chemicals. This limited understanding may pose serious threats to both environmental and human health (Mamtani, Stern, Dawood & Cheema, 2011; Mohamed & Al-Thukair, 2009).

2.1.2. Conducting Research with SMEs

2.1.2.1. Limited Research

Arguably, the most significant challenge associated with conducting research regarding the management practices of SMEs is the limited amount of existing, or background, research (Lewis et al., 2007; Coté et al., 2006; Haugh & McKee, 2004; Hillary, 2000). This challenge has resulted in little to no data on the chemical usage and management practices of SMEs, policy/legislation awareness and the perceived

needs and barriers for managing chemicals (Parker et al., 2009; Gadenne et al., 2008; Hillary, 2000).

It has also been suggested that part of the challenge with conducting research focused on SMEs is the lack of a clear and concise definition² (Dundan & Wilkinson, 2009) that is truly representative of the common characteristics of an SME. Current definitions for SMEs only take into consideration the number of employees or sales (Industry Canada 2011; Industry Canada 2010; Canadian Federation of Independent Businesses, 2007; Statistics Canada, 2010b; Statistics Canada, 2010c). The number of employees and/or annual sales may not be the most effective characteristic to classify a business as an SME yet; there is very little insight into other characteristics that may potentially unite this heterogeneous group in a meaningful way (Parker et al., 2009; Haugh & McKee, 2004). As a result, researchers, governments, and non-governmental organizations (NGO) may not be able to effectively communicate with this important group of businesses since it is not understood what they are and what makes them different, or the same (Redmond & Walker, 2009).

Parker et al. (2009), suggests that researchers do not focus on SMEs due to the ease of accessing statistics from large businesses. This is, in part, due to regulated government reporting and their internal human resource capabilities to track emissions, health and safety statistics and other environmentally-relevant information (Parker et al., 2009). Furthermore, accessing detailed data from SMEs, such as specific emissions, releases, and disposal methods of SMEs, is challenging as

² Further outlined in section 1.10

many SMEs do to not analyze and/or document such factors (Eco-Efficiency Centre, 2010; Coté et al., 2006).

2.1.2.2. Willingness to Participate

While research involving SMEs is undertaken, a consistent theme has emerged which identified that SMEs are a difficult population to work with (Eco-Efficiency Centre, 2010; Parker et al., 2009; Lewis et al., 2007; Newby, Watson, Woodliff, 2003; Hillary, 2000). In 2000, Hillary concluded that the SME sector is:

“Largely ignorant of its environmental impacts and legislation that governs it; oblivious of the importance of sustainability; cynical of the benefits of self-regulation and the management tools that could assist it in tackling its environmental performance; and difficult to reach, (mobilize) or engage in any improvements to do with the environment” (pg. 18).

Many researchers would suggest that not much has changed since then (Eco-Efficiency Centre, 2010; Parker et al., 2009; Revell & Blackburn, 2007; Coté et al., 2006).

Lewis et al., (2007) suggest that gaps in legislation relevant to SMEs leads to apathy for research that is designed to improve performance. SMEs are also reported to hold a belief that their business does not have a significant impact on the environment (Parker et al., 2009; Gadenne et al., 2009; Lewis et al., 2007; Revell & Blackburn, 2007; Coté, et al., 2006; Hillary, 2000). Additionally, SMEs have limited resources – time, money, and personnel – and have reported that they find it more useful to focus on day-to-day operations (Revell & Blackburn, 2007; Friedman et al., 2000) rather than participating in research (Gadenne et al., 2009).

2.1.2.3. New Research

The limited body of comprehensive research surrounding SMEs (Lewis et al., 2007; Coté et al., 2006; Hillary, 2000) coupled with their reluctance to participate in research (Eco-Efficiency Centre, 2010; Parker et al., 2009; Revell & Blackburn, 2007; Hillary, 2000) impacts the ease of conducting new research since there are limited precedents, guidelines and advice to guide methodology (Lewis et al., 2007). Research focusing on SMEs is, as previously outlined, limited. Moreover, the research that exists is primarily case study research (Battisti & Perry, 2011; Waters, 2010; Eco-Efficiency Centre 2010; Redmond & Walker, 2009) and not statistically significant cross-sector research that can be broadly applied to further the insight and understanding of SMEs. While some research studies have included large sample populations (Revell et al., 2010), most are typically been specific to one industry or region and therefore not broadly applicable (Olsen et al., 2010; Waters, 2010; Eco-Efficiency Centre, 2010; Lewis et al., 2007).

With limited methodological guidance, further described in chapter 3, each researcher often has to innovate and operate via a 'trial and error' process, which can be time-consuming and costly (Revell et al., 2010; Lewis et al., 2007; Coté et al., 2006; Haugh & McKee, 2004; Hillary, 2000). The inclusion of large businesses, although perhaps a more straightforward and uncomplicated option, was not suitable for this research study since the specific practices of SMEs was the focus and; SMEs are not scaled-down versions of large business (Battisti & Perry, 2011). As a result, an investigation into effective data collection methods for accessing

SMEs was needed (Revell, Stokes & Chen, 2010; Lewis et al., 2007; Coté et al., 2006). The outcome of this investigation will be further discussed in chapters 3 and 5.

2.2 Chemicals and Industrial Activities

As stated, SMEs are responsible for a significant number of businesses, jobs and GDP contributions in Canada (Industry Canada, 2011; Industry Canada, 2010). As a result, there is a need for a significant improvement in the current understanding of the environmental practices and impacts of SMEs, particularly related to hazardous chemicals (Eco-Efficiency Centre, 2010; Waters, 2010; Parker et al., 2009; S. Madsen, personal communication, November 5, 2009; Coté et al., 2006; Hillary, 2000). Chemicals, including hazardous chemicals and metals, are commonplace in today's society, playing a key role in most industrial activities (Mamtani et al., 2011; Kadi, 2009; Mohamed & Al-Thukair, 2009; Pacyna, Pacyna & Aas, 2009; Bargagli, 2008) and can be a hazard if they are not properly managed (CCOHS, 2009; CCOHS, 2006).

2.2.1. Exposure

Exposure to chemicals can occur throughout a chemical's lifecycle including during manufacturing, application/use, and disposal (CCOHS, 2012; Cantelli-Forti, Paolini & Hrelia, 1993). Some chemicals pose little or no risk to the environment or to human health while others are harmful or toxic in minute doses (Mamtani, et al., 2011; Government of Canada, 2007). The risk associated with a chemical largely depends on the type of chemical, method of exposure or release (CCOHS, 2012: Mohamed & Al-Thukair, 2009), the location of the business in proximity to

vulnerable ecosystems and populated areas (Mohamed & Al-Thukair, 2009) as well as the quantity and concentration of the released chemical (Mamtani et al., 2011; Meunier, Koch, & Reimer, 2011). As a result, harmful or potentially harmful chemicals have limits in place, set by individual government agencies as well as through international agreements (CCOHS, 2012; Pacyna, Pacyna & Aas, 2009; Canadian Centre for Occupational Health and Safety Act, RSC 1985, c C-13).

Exposure limits are legislated under the Canada Occupational Health and Safety Regulations and given authority under the Canada Labour Code (CCOHS, 2012). Specific limits are not outlined in either the Act or the regulations, however can be found in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) and Biological Exposure Indices (BEI), which have been largely adopted by Canada (CCOHS, 2012). These limits pertain to the length of exposure and release quantities that are legally not to be exceeded (Kadi, 2009). However, these limits either intentionally or through improper management, can be exceeded and are exceeded thereby causing a risk for environmental and human health (Mamtani et al., 2011; Hamlin & Guillette, 2010).

2.3 Chemicals and Environmental Health Impacts

Chemicals released into the environment, as a result of anthropogenic/industrial activities, have the potential to contaminate soil, water and air, thereby jeopardizing the health and development of the plants and animals of the ecosystem (Mamtani et al., 2011; Kadi, 2009; Mohamed & Al-Thukair, 2009; Pacyna, Pacyna & Aas, 2009; Bargagli, 2008; Swain et al., 2007; Mato et al., 2001).

2.3.1. Effects of Chemicals

Chemical contamination may affect not only the purity of the environment but also the distribution, behaviour and survival of many species (Mamtani et al., 2011; Bargagli, 2008; Couillard, Macdonald, Courtenay, & Palace, 2008; McPherson, Mirza, & Pyle, 2004; Mato, Isobe, Takada, Kaneiro, Ohtake, & Kaminuma, 2001).

An oil spill near Arthur Harbor, Antarctic resulted in the buildup of polycyclic aromatic hydrocarbons (PAH) in the liver and muscles of fish (Bargagli, 2008). At the time of the spill, breeding season was concluding and as a result, several species of large seabirds, including penguins, died and/or were unable to reproduce (Bargagli, 2008). Similarly, mammals, birds and reptiles all over the world who have been exposed to persistent organic pollutants (POP) and other industrial chemicals, such as dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyls (PCB), were found to have birth defects, embryo/egg abnormalities, reproductive failure, and stunted, delayed or altered sexual development (Hamlin & Guillette, 2010).

In Canada, exposure to selenium affected the development of trout, in the early life stages while exposure to endocrine-disrupting chemicals, such as PCBs, altered the migration of salmon, leading to pre-spawning mortality and also affected migration from freshwater to saltwater thereby causing the fish to contract parasites and illnesses as a result of an immature immune system (Couillard et al., 2008).

2.3.2. Nova Scotia Context

2.3.2.1. Halifax Harbour

Halifax Harbour, located in Halifax, Nova Scotia, is Canada's largest eastern harbour (Robinson, Hui, Soo & Hellou, 2009) and "is one of the best deepwater, ice-free ports in the world" (Halifax Regional Municipality, 2012). Due to untreated sanitary-use, wastewater and storm water as well as sewage treatment plant overflows, more than 181,000,000 litres of polluted water enter the harbour every day (Halifax Regional Municipality, 2012). This is further affected by the mismanagement of chemical and industrial waste being improperly disposed of through sewage and wastewater disposal mechanisms including pharmaceuticals, detergents, dispersants, and plasticizers – all commonly found in industrial waste (Robinson et al., 2009).

A study by Sangalang and Jones (2001) found higher occurrences and evidence of hermaphroditism in lobsters, altered sexual development and sex ratios in muscles and masculinization in snails; attributed to the endocrine-disrupting chemicals being released into the harbour (as cited in Robinson et al., 2009). The untreated and unmitigated pollution and contaminants being released into the harbour has led to:

1. "[s]hellfish harvesting [being] prohibited in the harbour;
2. large areas of contaminated sediment exist around some forty separate outfalls;
3. water quality is poor along the shorelines;
4. bacterial contamination is widespread; and

5. aesthetics – along the Halifax/Dartmouth waterfronts [are poor] due to particulates, floatables and odour” (Halifax Regional Municipality, 2012).

This contamination has, as demonstrated, affected the health of the area as well as the economic drivers of the area including tourism and fishing (Halifax Regional Municipality, 2012).

2.3.2.2. Sydney Tar Ponds

The Sydney Tar Ponds, in Sydney, Cape Breton, Nova Scotia, is acknowledged as being one of the largest contaminated sites in Canada (Liu & Bryson, 2009). While the contamination was not caused by or a result of SME operations, it demonstrates the impact of chemical contamination in the same geographical location in which this study took place.

The population of Sydney grew 600% between 1891 and 1911 (MacDonald, 2009) as families relocated to the region for employment at the steel mill. With its inception in 1901, the steel mill and coalmines operated for over 80 years without their environmental impacts being assessed (MacDonald, Laroque, Fleming, & Gherase, 2011; Liu & Bryson, 2009; MacDonald, 2009). The manufacturing of steel produces polynuclear aromatic hydrocarbon (PAH), (Liu & Bryson, 2009), polychlorinated biphenols (PCBs), volatile organic compounds (VOCs), and metals – such as lead, copper and zinc – as byproducts (MacDonald et al., 2011; MacDonald, 2009).

In the 1980’s, lobsters, a significant economic contributor in this region (Nova Scotia Fisheries and Aquaculture, 2010), caught in the Sydney Harbour were

found to contain extremely high levels of polynuclear aromatic hydrocarbon (PAH) resulting from the steel plant and coalmining activities (Liu & Bryson, 2009). Lobster fishing was ceased in this area and families, for both health and economic reasons, had to leave the area (Liu & Bryson, 2009). Multiple multimillion-dollar cleanup efforts have been launched with little to no success, thereby continuing the Sydney Tar Ponds reputation as one of Canada's most contaminated sites (Liu & Bryson, 2009).

While more stringent chemical release/spill regulations at a local level are important, broader international cooperation for chemical management is required as chemicals can be transported throughout multiple environments (Bargagli, 2008).

2.3.3. Chemical Migration and Bioaccumulation

Chemical migration, through ecosystems, is a growing concern (Bargagli, 2008). Chemicals can become airborne or travel through the soil and/or water to contaminate pristine, or previously uncontaminated, environments (Kadi, 2009; Bargagli, 2008). Since chemicals migrate via various biological and physiological mechanisms, chemicals can buildup and bioaccumulate in multiple environments (Bargagli, 2008; Swain, Jakus, Rice, Lupi, et al., 2007) as well as the food chain (Zhao, McGrath, & Meharg, 2010; Bargagli, 2008; Swain et al., 2007)

When chemicals enter the environment they also enter the food chain (Swain et al., 2007). Some chemicals, such as heavy metals and persistent organic pollutants (POP), have been found to bioaccumulate or biomagnify within higher-order species

that serve as the food supply for top predators, including humans (Zhao et al., 2010; Bargagli, 2008). Mercury (Hg), released into aquatic ecosystems, is converted into methylmercury (MeHg). MeHg bioaccumulates in fish and if/when humans unknowingly consume the contaminated fish; MeHg is then introduced their body and begins to bioaccumulate within them causing various health concerns, increasing the risk related to that specific hazard, further discussed in section 2.4 (Swain et al., 2007).

Animal sources of food are however not the only cause for concern. Plant-based food sources, such as rice, absorb contaminants, such as inorganic arsenic (As) released into their environment, during their growth and maturation (Zhao et al., 2010). The rice, or other plant-based food sources, is then harvested for human consumption thereby introducing As into the human's body (Zhao et al., 2010). These chemicals and metals pose a serious threat to the health and safety of humans (Zhao et al., 2010; Swain et al., 2007).

2.4 Human Health Impacts

There is a large body of evidence supporting the belief that exposure to chemicals is contributing to the increase of chronic illness and disease in humans (Mamtani et al., 2011; Hamlin & Guillette, 2010; Beyer & Biziuk, 2009; Kadi, 2009; Lope, Perez-Gomez, Aragonés, Lopez-Abente, et al., 2008; Chung, Chandler & Key, 2008; Swain et al., 2007; Health Canada, 2007; Genuis, 2006). The World Health Organization (WHO) has reported that exposure to and mismanagement of chemicals and metals is responsible for more than 25% of disease and over 8% of

mortality and morbidity around the world (Mamtani et al, 2011).

Researchers and health professionals have linked even short term chemical exposure to: various cancers and carcinogens (Mamtani, 2011; Liu & Bryson, 2009; Lope et al., 2008); irreversible effects on embryos and young children; stunted sexual development (Hamlin & Guillette, 2010; Carpenter, 1998); brain dysfunctions (Mamtani et al., 2011); negative effects on intelligence; short attention spans; poor immune functions (Carpenter, 1998); reproductive and developmental deficiencies (Mamtani et al., 2011; Health Canada, 2011; Hamlin & Guillette, 2010); abnormal neurological development and an increased risk of heart attack (Swain et al., 2007). As a result, there has been a demand for the increase in monitoring chemicals and metals in humans and to determine their health risks (Quinn & Wania, 2012; Mamtani et al., 2011; Hamlin & Guillette, 2010; Kadi, 2009; Health Canada, 2007), specifically within vulnerable populations including children, pregnant women and employees working with chemicals (Mamtani et al., 2011).

2.4.1. Biomonitoring

Recent tests conducted by Health Canada are showing a build-up, or bioaccumulation, of toxins/chemicals in the bodies of Canadians (Health Canada, 2010a). In 2007, Health Canada began the Canadian Health Measures Survey (CHMS), a biomonitoring³ study, which would assist government officials make more informed decisions regarding chemicals as they relate to the health of

³ Biomonitoring is “the measurement of chemical concentrations in blood, urine, or tissue of a large number of individuals to assess the exposure of a population to environmental contaminants” (Quinn & Wania, 2012)

Canadians (Health Canada, 2007). Health Canada had participants complete a questionnaire, as well as tested blood and urine samples, looking for a variety of potentially hazardous chemical including, but not limited to: metals, phthalates, brominated flame retardants, and bisphenol-A (BPA). Complete results are not yet available however chemical build-ups were detected. Health officials now have baseline data that can be used for further monitoring of chemicals within Canadians (Health Canada, 2007).

The industrial activities that contribute to the release chemical contaminants into the environment, do not only affect plants and wildlife, but it also affects humans (Hamlin & Guillette, 2010; Zhao et al., 2010; Kadi, 2009; Swain et al., 2007). Not only are humans being affected from ingesting contaminated food (Zhao et al., 2010), but also by other exposure routes from improperly managed chemicals (Quinn & Wania, 2012). More responsible and effective chemical management practices are needed, at all levels of industry and government, to ensure the protection of the environment and the health of Canadians.

2.5 Legislation in Canada

The regulation of chemicals in Canada is complicated by the fact that no one agency or level of government has exclusive control over the production, release or disposal of chemicals or the safeguarding of the environment from chemical effects (Canadian Centre for Occupational Health and Safety Act, RSC, 1985; Fisheries Act, RSC, 1985; Canadian Environmental Protection Act, 1999). Environment Canada, Fisheries and Oceans Canada, Health Canada, Human Resources & Skills

Development Canada and Transport Canada are some of the government agencies responsible for the various aspects of environmental protection, chemical management and employee safety in Canada.

2.5.1. Environmental Protection

Environment Canada (EC) is responsible for the protection of the environment, the remediation of damaged environments and the prevention of future damage which will ensure Canada is safe, clean and sustainable (Environment Canada, 2012). In 1999, the Canadian government, as part of the EC mandate, repealed the original Canadian Environmental Protection Act (CEPA), developed in the mid-1980s, and replaced it with a new act, referred to as 'CEPA 1999', *Canadian Environmental Protection Act, 1999*. CEPA 1999 was developed to support pollution prevention and sustainable development by protecting the environment and human health (Canadian Environmental Protection Act, 1999). CEPA 1999 requires that all new chemicals produced in or imported into Canada be assessed for their environmental and human health effects (Environment Canada, 2010). *New* chemicals are defined as those, which do not appear on the Domestic Substances List (Environment Canada, 2010). The Domestic Substances List was created in 1994, and consists of 23,000 chemicals (Canadian Environmental Protection Act Environmental Registry, 2006) that were manufactured in or imported into Canada between 1984 and 1986 (Environment Canada, 2010). Chemicals on the Domestic Substances List are not considered new to Canada therefore do not require to be assessed (Environment Canada, 2010). Additionally,

CEPA 1999 sets out restrictions for disposal on land and at sea as well as the 'hierarchy' of waste disposal methods.

There are other EC regulations that also set out waste disposal restrictions. The *Antarctic Environmental Protection Act* (AEPA) was created specifically to protect the Antarctic environment and applies to Canadians, Canadian vessels and aircrafts. The AEPA prohibits the open air burning of waste, disposal of waste in ice-free or freshwater systems, disposal or discharge of any harmful products or substances into the sea, or the introduction of prohibited substances into the Antarctic environment (Environment Canada, 2011).

The *Environmental Enforcement Act* was created to improve the enforcement, fines and sentencing put in place by other legislation. This Act supersedes legislation set out by Environment Canada and Parks Canada Agency including: the Canadian Environmental Protection Act, 1999; the Canada Wildlife Act; the Migratory Birds Convention Act, 1994; the Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act; the Antarctic Environmental Protection Act; the International River Improvements Act; Canada National Parks Act; Canada National Marine Conservation Areas Act; and the Saguenay-St. Lawrence Marine Park Act (Environment Canada, 2009).

The Department of Fisheries and Oceans Canada's (DFO) mandate is to "support sustainable use and development of Canada's waterways and aquatic resources" (Fisheries and Oceans Canada, 2012). The *Fisheries Act* also sets out guidelines pertaining to the protection of fish and fish habitat including the disposal;

more accurately, the restrictions on the disposal of substances that may cause harm to fish and/or fish habitat (Fisheries Act, RSC, 1985).

2.5.2. Employee Protection

Federal requirements pertaining to WHMIS, further explained in section 5.6.1., can be found in the Hazardous Products Act and the Hazardous Materials Information Review Act as well as additional health and safety requirements can be found in the Canada Labour Code, Canada Occupational Health and Safety Regulations, Controlled Products Regulations, and the Ingredient Disclose List (CCOHS, 2012). In Nova Scotia, additional information can be found in the Nova Scotia Occupational Health and Safety Act and the Nova Scotia Workplace Hazardous Materials Information System Regulation (CCOHS, 2012).

In addition to the departments and acts listed above, there are many other Acts and regulations that also pertain to all the areas listed above which provides further evidence that for SMEs to understand legislation they may need assistance.

2.5.3. Nova Scotia Context

While there is no overarching federal regulation that has authoritative jurisdiction over all aspects of chemical management, individual provinces are making strides to improve their sustainability. In 2007, the province of Nova Scotia passed the Environmental Goals and Sustainable Prosperity Act (EGSPA) (Environmental Goals and Sustainable Prosperity Act, S.N.S., 2007) to ensure that

Nova Scotia was the “cleaner, greener and [most] economically sustainable province” by 2020 (Government of Nova Scotia, 2012).

There are eight categories within EGSPA which include: ecosystem protection, air emissions, renewable energy, water quality, contaminated sites, solid waste, sustainable purchasing and, energy-efficient buildings. Each of these categories include a number of goals, totaling twenty-one. While some of the goals do not apply to individual businesses because they require government policy creation, such as the “develop[ment of] regulatory tools to stimulate redevelopment of contaminated land by 2010” found within the contaminated sites category (Nova Scotia Environment, n.d.). There are multiple goals which directly affect industries, individual businesses and their activities. Within the air emissions target, there are goals to reduce GHG emissions, nitrogen oxide emissions, sulphur dioxide emissions, mercury emissions and airborne fine particulate matter (Nova Scotia Environment, n.d.). These goals can only be achieved by individual businesses improving their environmental practices and reducing their emissions.

SMEs must play a role in achieving environmental standards, specifically EGSPA targets. Nova Scotia Environment is committed to furthering these goals and supporting SMEs in their efforts to comply by creating tools, awareness campaigns and, supporting legislation (S. Madsen, personal communication, November 5, 2009). Currently, there is limited data regarding the chemical usage and level of awareness held by SMEs thereby making it increasingly difficult to access their needs (S. Madsen, personal communication, November 5, 2009). A baseline of information, detailing the chemical usage, chemical spill history, and levels of

awareness is required in order for Nova Scotia Environment to assist SMEs to comply with EGSPA targets as well as other legislation (Eco-Efficiency Centre, 2010; S. Madsen, personal communication, November 5, 2009). In order for this to occur, researchers must be able to access SMEs and disseminate information to them (Redmond & Walker, 2009) in order to change the chemical management practices.

2.6 Effective Knowledge Transfer

SMEs play a vital role in the economy and culture of Canada. Canada needs a comprehensive plan for addressing chemical pollution and focus on improving the chemical management practices of businesses. SMEs represent a significant portion of the business community and therefore should receive an individualized focus (Battisti & Parry, 2011; Industry Canada, 2011; Waters, 2010; Parker et al., 2009; Redmond & Walker, 2009). To address the needs of the SME community within Nova Scotia and to assist SMEs meet EGSPA targets (S. Madsen, personal communication, November 5, 2009), educational and outreach programs need to be created to effectively assist SMEs (Redmond & Walker, 2009).

The exchange or transfer of knowledge, gained through trial and error and/or innovation, both within an organization and to others outside the organization, is necessary to ensure the continued success of the business (Nousala & Whyte, 2010). However, it has been found that practical knowledge, such as the learnings that take place within a business setting, is difficult to transfer and use to make new knowledge (Jastroch & Marlowe, 2010).

In the past, when trying to influence behaviour change within a particular sector two primary methods to elicit that change are employed: 1) introducing compliance driven legislative; or 2) supporting voluntary action (CCOHS, 2012; Singh, 2008). However, there have been examples within the business sector where significant shifts in behavior were observed; some were founded on legislative changes and others through voluntary action. For the purpose of this research two different examples of successful knowledge transfer were examined for the purpose of eliciting a better understanding of the characteristics of each that lead to the resulting success. Olsen et al., (2010) also suggest that a multifaceted approach, designed for specific industries, would be most effective.

2.6.1. Legislative Compliance

SMEs are occasionally exempt or excused from environmental legislation and mandatory compliance either because of the number of employees, value of sales, procurement and/or disposal quantities (Industry Canada, 2003). There is also anecdotal information and qualitative data that suggests that legislation imposes a regulatory burden⁴ on SMEs (Calogirou, Stig, Sorensen, Njorn, Stella, et al., 2010; Industry Canada, 2003), which could result in the loss of their business. In Canada, there is limited quantitative research surrounding the costs and burdens associated with legislative compliance for SMEs (Industry Canada, 2003), which creates a challenge for regulators trying to develop comprehensive, yet achievable regulations that could be applied to the SME sector.

⁴ Regulatory burden refers to the costs associated with legislation compliance (Industry Canada, 2003).

Research conducted by Environment Canada found that only legislation that was enforced elicits a behaviour change. In the absence of a penalty for non-compliance, businesses are unlikely to modify their behavior (Huppé, Turgeon, Ryan & Vanasse, 2006). In a Canadian Federation of Independent Business (CFIB) survey, only 28.8% of participants stated that current regulations were motivations for change and only 10.8% said that the fear of more regulations would motivate them to make changes (Canadian Federation of Independent Business, 2007). There has been successful legislation introduced into the SME community.

2.6.1.1. Workplace Hazardous Materials Information System

The Workplace Hazardous Materials Information System (WHMIS) is a successful example of knowledge transfer in Canada, which emerged through legislation. WHMIS has been effectively implemented into all businesses, regardless of size or sector (CCOHS, 2012). Perhaps even more noteworthy is that it is through a combined federal, provincial⁵ and territorial effort, along with multiple government departments at all levels, that WHMIS' success has transpired (Health Canada, 2008). Each jurisdiction has outlined WHMIS-related employer requirements and there are also multiple Acts and regulations that apply to and govern WHMIS, most notably the Hazardous Products Act and the Controlled Products Regulations which are overseen by Health Canada (Health Canada, 2008).

⁵ For more information specific to Nova Scotia and WHMIS, contact the Nova Scotia Department of Labour and Advanced Education. Contact information available from <http://www.gov.ns.ca/lae/>.

WHMIS emphasizes an employee's right-to-know (Health Canada, 2008). Employees have a right-to-know what chemicals are in their working environment, what are the risks of these chemicals and what first aid/medical attention is required should they come into contact with these chemicals (Health Canada, 2010b). As such, WHMIS requires every employer to "ensure that controlled products used, stored, handled or disposed of in the workplace are properly labelled, that MSDSs are made available to workers, and that workers receive education and training to ensure the safe storage, handling, use and disposal of controlled products in the workplace" (Health Canada, 2010b). There is however no governing body which issues WHMIS training or certifications (Health Canada, 2008).

The successful implementation of WHMIS has saved businesses and individuals from experiencing serious injuries, illnesses and potential deaths as well as medical costs, chemical spills and fires (CCOHS, 2012). While specific reports of how individual businesses handled the implementation of WHMIS have not been well documented, a study completed by Saari, Bédard, Dufort, Hryniewiecki & Thériault, (1994)⁶ reported that businesses depended on expert trainers (both internal and external) to deliver WHMIS training to their personnel with varying degrees of success depending on the process. Results suggest that external trainers

⁶ Older research is important to use in this case because WHMIS is now very much common knowledge and therefore looking at recent research would be less effective since older research had a subject pool that were not yet well-versed in occupational health and safety and WHMIS. This is relevant to this current research project since chemical management will be primarily new information for SME owner/managers.

are most effective for general and overarching training and internal trainers are important to maintain behavior and to provide business specific context

While WHMIS is an example of a successful legislated change, there are also voluntary approaches that may prove to be equally effective.

2.6.2. Voluntary Change

Recently, there has been a positive trend detected; SMEs are making voluntary changes to reduce their negative environmental impacts (Battisti & Perry, 2011; Waters, 2010; Khanna et al., 2007; Eco-Efficiency Centre, 2010; Coté et al., 2006). While the specific rationales for these changes vary for each business some reasons suggested include: a) SMEs believe that research and product/process innovations related to environmental performance can help to keep them competitive (Battisti & Perry, 2011; Waters, 2010; Industry Canada, 2007); b) monetary benefits of being more environmentally responsible exist (Waters, 2010; Revell & Blackburn, 2007); c) concern regarding the potential enforcement of legislation (Industry Canada, 2003); d) there is a desire on the part of SME owner/managers to reduce their business's ecological footprint either to respond to market forces or personal attitudes (Battisti & Perry, 2011) or; e) the existence of assistance programs or funding supporting such initiatives motivated them (Waters, 2010; Coté et al., 2006).

Although there are SMEs who are innovative and eco-minded – making changes to their practices and participating in environmental programs voluntarily (Battisti & Perry, 2011; Waters, 2010; Khanna et al., 2007), there are many

businesses that are not willing to make these changes voluntarily (Battisti & Perry, 2011; Hillary, 2000). While SMEs making voluntary environmental improvements is preferably, government legislation may be required to effect this change. In order to assist SMEs to improve the safety and environmentally-responsible operation of their business, government departments and researchers have developed and are developing educational and voluntary compliance programs and guidelines, as well as memorandums of understanding, on various topics (Eco-Efficiency Centre, 2010; S. Madsen, personal communication, November 5, 2009). Physicians, who operate similarly to SMEs, as further described in section 5.6.2., have been voluntarily influenced by pharmaceutical companies (Singh, 2008).

2.6.2.1. New Pharmaceutical Integration into General Practice

Pharmaceutical companies have been successful at altering physician prescription behavior (PPB) through complementary promotional activities, leveraging resources, and positive word-of-mouth references (Singh, 2008). Pharmaceutical representatives are responsible for relaying information to physicians and play a key role in delivering new knowledge to physicians (Wright & Lundstrom, 2003).

Similarly to SME owner/managers, physicians do not have time to keep up with “information explosion” (Hunt & Newman, 1997 found in Wright & Lundstrom, 2003). Various pharmaceuticals and devices are continuously being developed and/or improved upon for the benefit of patients, but often physicians are not familiar or aware of these new options (Singh, 2008). In the past,

pharmaceutical/medical representatives were focused simply on securing a physician's business through incentives however, with new PhRMA guidelines (Hradecky, 2002 found in Wright & Lundstrom, 2003) the willingness of physicians to integrate new products into their practice depends more on the level of trust and the relationship between the representatives and the physician (Wright & Lundstrom, 2003).

When determining how to facilitate behaviour change within SMEs, specifically in regards to environmental performance, researchers and government officials can draw from the experiences of both legislated and voluntary approaches. Further considerations and suggestions regarding effective methods of communication with SME owner/managers will be outlined in section 5.7. However, prior to developing an education program, researchers must determine how to best access SMEs (Redmond & Walker, 2009).

CHAPTER 3 – Methodology

3.1 Review of Methods

A literature review was conducted to determine the most effective research/data collection method for accessing SME owner/managers. Researchers have noted that due to the limited research pertaining to the environmental practices of SMEs (Eco-Efficiency Centre, 2010; Olsen et al., 2010; Parker et al., 2009; Hillary, 2000), it has often been necessary to innovate and operate via a ‘trial and error’ process when commencing a new research project involving SMEs (Revell et al., 2010; Lewis et al., 2007; Coté et al., 2006; Haugh & McKee, 2004; Hillary, 2000). This has led to some debate amongst researchers as to which data collection approach is most appropriate/effective (Eco-Efficiency Centre, 2010; DeJonghe, Dotori-Blass & Rasmusm, 2009; Redmond & Walker, 2009; Urielle & Dudley, 2009; Nadin & Cassell, 2007; Lawrence, Collins, Pavlovich & Arunachalam, 2006; Newby et al., 2003). In order to collect relevant data from SMEs, researchers must first determine how to best reach their particular cohort and access this information (Redmond & Walker, 2009).

3.1.1. Case Analysis

Case studies are a unique research method and while the number of participants typically remains low, they allow for a more specific analysis of the research questions while also enabling more topics to be included (Yin, 2012). Case

studies are best suited for research when the research question or questions include a descriptive or explanatory component (Yin, 2012).

DeJonghe et al. (2009) conducted a case study of two small businesses and distributed mail-out as well as online questionnaires to the employees of each participating business to investigate the origin of their environmental focus. Flybbjerg (2006) suggested that in order to research difficult issues, case study approaches were appropriate since it allows for the context of the information to be explained. Although case studies may not be generalizable across all cases, it is important to understand individual cases. This is especially true of SMEs since they are a heterogeneous group to begin with (Battisti & Perry, 2011). Another benefit of using a case study approach is the ability to utilize multiple data collection methods including mail out questionnaires, telephone interviews, in person interviews and online questionnaires.

3.1.2. Booklet Questionnaire

Redmond & Walker (2009) stated that paper-and-pencil questionnaires were appropriate for exploratory research and implemented this method to investigate the opinions of SME owner/managers regarding environmental education for their business. Although their initial participation was low, an additional mail-out preceded by introductory telephone calls and gaining prior consent, increased participation. Dennis (2003) and Newby et al. (2003), found paper-and-pencil-based questionnaires to be an efficient method of data collection for SMEs as well. Dennis (2003) also noted that there was an increased response rate when

introductory phone calls were made to explain the research and gain consent prior to distributing the questionnaires.

3.1.3. In-person Interviews, Telephone Interviews & Online Questionnaires

Nadin & Cassell (2007) reported that an in-depth qualitative approach would be most effective for researching the effect of psychological contracts in the workplace and conducted face-to-face recorded interviews. Roy & Thérin (2008) completed their research study on *Knowledge Acquisition and Environmental Commitment in SMEs* using only a computerized telephone survey system. Lawrence et al. (2006), used mail-out surveys and telephone follow-ups during the pilot phase, but only mail-out surveys for their study on the current sustainability practices of New Zealand SMEs. Urielle & Dudley (2009) found that an anonymous online questionnaire produce higher response rates especially if dealing with potentially sensitive topics.

3.2 Data Collection

Based on the literature review, a qualitative case study approach was selected to conduct this exploratory research into the chemical management practices of SMEs in Nova Scotia (Yin, 2012; Redmond & Walker, 2009; Nadin & Cassell, 2007). Since there is a well-identified discrepancy surrounding data collection methods for SMEs, all four data collection techniques noted above – mailed booklet questionnaires, telephone interviews, in-person interviews, and

online questionnaires – were offered and/or employed in a consecutive manner⁷. This was to determine how to improve the likelihood of obtaining sufficient responses and to ensure SME owner/manager were able to participate (i.e. if they did not have internet access or they were in a location too remote to be easily accessed).

The research initiated with a mail-out questionnaire. All SMEs have a mailing address and/or PO Box and therefore it was determined that this would be the most inclusionary approach and would allow for the participant to complete the questionnaire at their own pace as to not interfere with their workday requirements. Each new method was introduced only as required to improve the data set.

3.2.1. Booklet Questionnaire

3.2.1.1. Creation

The questionnaire was designed with the intent of being suitable for integration into a larger research program if sufficient response was achieved to be useful. This larger research agenda focused on the creation of a hazardous chemical database and an online chemical management tool and accompanying education program specifically designed for SMEs. As such, the questions included were those intended to gather specific information regarding:

⁷ The process of employing multiple data collection methods is further explained in section 5.1

1) The types and quantities of chemicals used by SMEs in specific industry sectors and their purpose within the operation (Eco-Efficiency Centre, 2010; S. Madsen, personal communication, November 5, 2009);

2) The management practices surrounding the procurement, use, capture and disposal of the chemicals to be able to determine if:

a) SMEs are a significant source of chemical pollution (Parker et al., 2009; Hillary, 2000);

b) Nova Scotia employees are handling chemicals according to industry best practices (Eco-Efficiency Centre, 2010; S. Madsen, personal communication, November 5, 2009; Environmental Goals and Sustainable Prosperity Act, S.N.S., 2007);

c) Chemicals are being procured and disposed of in an environmentally and economically responsible manner (Eco-Efficiency Centre, 2010); and

d) SMEs require assistance when managing and/or disposing of their chemicals (Eco-Efficiency Centre, 2010);

3) Their awareness of relevant programs, legislation and best management practices (BMP) (Waters, 2010; Eco-Efficiency Centre, 2010; Parker et al., 2009; Côté et al., 2006); and

4) To gain insight to the level of effectiveness of the current methods of government-SME/industry-SME communication, whether or not SMEs are familiar with the appropriate legislation/BMP, and the most effective communication method when working with SMEs.

A literature review was conducted to assess the current knowledge of effective methods of encouraging improved environmental performance within SME. Significant gaps were found in the limited research available (Parker et al., 2009; Gadenne et al., 2008; Lewis et al., 2007; Revell & Blackburn, 2007; Coté et al., 2006; Haugh & McKee, 2004; Hillary, 2000). This paucity of information posed a challenge in the creation of the questionnaire. As a result, practitioners and/or experts who work with SMEs and/or hazardous chemicals (such as provincial government officials, academic researchers, members of environmental non-governmental organizations, and business associations) were also consulted. Their opinions on the information needed to be gathered from SMEs and to determine of a chemical management tool for SMEs were used to substantiate a number of the assumptions that underpinned the questions. Officers from the Pollution Prevention Branch, the Contaminated Sites Branch, and the Program Management Division of Nova Scotia Environment; the Director, Manager and researchers with the Dalhousie University Eco-Efficiency Centre⁸; and professors from the School of Business and the School of Resource and Environmental Studies from the Faculty of Management at Dalhousie University were the professionals consulted.

With input from these multiple sources, over 150 questions were compiled to make the initial draft of the questionnaire. After multiple reviews, rewording and eliminations, a 65-question questionnaire was created which included closed, open and semi-open-ended questions.

⁸ More information on the Eco-Efficiency Centre will be explained in section 3.2.1.

3.2.1.2. Pilot Testing

Once the questionnaire was compiled and formatted into a paper-based questionnaire, it was sent to four SMEs, one each from the hospitality, automotive, construction sectors and the food service industry in Ontario. Pilot participants were selected from Ontario to ensure all SMEs in Nova Scotia were able to participate and contribute to the official study. Also, pilot test participants had a prior professional relationship with the lead investigator, which was expected to allow for the sharing of suggestions and critiques for improvement.

Pilot participants were provided the opportunity to provide feedback on clarity, comprehension and difficulty. All four SMEs completed the questionnaire and provided responses for all, or most, of the questions, depending on applicability. Pilot participants reported understanding what was being asked of them, but some indicated that they could not necessarily provide a response or could not guarantee accuracy for each of the questions, as they did not have sufficient information.

The two main recommendations made by the pilot participants were: a) retain the bulk of the chemical related questions as other companies may have the information being sought; and b) to eliminate non-essential questions to reduce the length of the questionnaire. Both recommendations were incorporated in to the development of the final questionnaire. Seventeen questions were eliminated however none of the chemical-related questions were removed. An open section at the end of the questionnaire was kept in order to allow participants to make any final statements they felt were necessary.

3.2.1.3. Questionnaire Implementation

Dillman, Smyth & Christian (2009) provided a list of techniques to create an effective questionnaire as well as to increase participant, primarily relevant to booklet questionnaire. The following techniques suggested by Dillman et al., (2009) were employed in this research:

- Pre-stamped envelopes
- Non-standard envelope size
- Addressed to the individual who consented
- Contact was made (either by phone or e-mail) on Tuesdays and Wednesdays
- Mail-outs were done on Thursdays in order to reach the SME Tuesday or Wednesday
- Questionnaire design was appealing, legible, included colour and was clearly laid out in a sensible order
- Anonymity and confidentiality were guaranteed
- Contact information was provided in case of uncertainty or questions
- Demonstrated a benefit to participation
- Described the importance of the research
- Explained how results will be used
- Thank the participants

3.2.1.4. Selection of Participants

A list of SMEs who had previously sought advice from the Dalhousie University Eco-Efficiency Centre (EEC) was generated. The Eco-Efficiency Centre is a research institution within Dalhousie University created in 1998 to support SMEs (Eco-Efficiency Centre, 2011). The programs and resources provided by the EEC aim to improve the sustainability of SMEs in Nova Scotia while reducing the negative impacts their businesses have on the environment⁹. The list of potential participants was divided by industry sectors. Four sectors were selected for participation: automotive, hospitality, electronics manufacturing, and chrome and coating operations, based on their chemical requirements.

To finalize the list of applicable Nova Scotia businesses, an additional online business search, using *www.Canada411.ca*, was completed. For example, a search was conducted using the parameters of “automotive/Nova Scotia” “hotel/Nova Scotia” and a list of 20 businesses in each of 5 industry sectors from all over Nova Scotia was compiled. Phone calls were then placed to those businesses with the caveat that when 10 businesses had consented in a sector, no further businesses from that sector would be contacted.

They were contacted via telephone to receive an initial introduction into the project and to gain consent to then send out the questionnaire. Calls were placed to the main telephone number and a request was made to speak to the General Manager (hospitality), Owner (automotive), or the Floor/Operations Manager (electronics manufacturing and chrome & coating). After the research was

⁹ For more information on the Dalhousie University Eco-Efficiency Centre, please visit their website: <http://eco-efficiency.management.dal.ca/>

explained, the owner/manager was asked if they were the most appropriate person to respond to these types of questions or if there was someone within the business who was more familiar with the chemical management practices of the business. Due to interest from within the initial set of potential participants, the plastics and packaging sector was added.

3.2.2. Online Questionnaire

3.2.2.1. Creation

Revell et al., (2010) suggested that mailing questionnaires followed by alternative data-gathering methods such as follow-up phone calls and soliciting participants to complete online questionnaires, would likely improve the overall participation. As such, participants who received the booklet questionnaire were also offered the option of completing the questionnaire over the phone or in person.

In addition to the original booklet questionnaire, an online questionnaire was created (Urielle & Dudley, 2009; Dillman et al., 2009). Dillman et al., (2009) found that by decreasing the questionnaire length, thereby reducing the time it took to complete, participants would be more likely to complete the questionnaire. Questions eliminated from the online version included: all identification questions (except industry-sector identification) related to the business and the individual, questions regarding ISO certifications, corporate social responsibility and mission

statements, leaks and/or spills incidents, chemical alternative inquiries, and certain information dissemination questions¹⁰.

3.2.2.2. Selection of Participants

The online questionnaire was sent to all business contacts of the Eco-Efficiency Centre as well as any contacted businesses that had requested an online version of the questionnaire. One industry association, who had a previous relationship with the Eco-Efficiency Centre, was approached and asked if they would be willing to e-mail the questionnaire to their businesses. All declined.

3.3 Content Analysis

The literature suggests that in order to support the development and integration of sustainable behaviors within SMEs there must also be an understanding of the knowledge transfer dynamics, which permit the uptake of information that leads to behavior change (Battisti & Perry, 2011; Eco-Efficiency Centre, 2010; Waters, 2010; Redmond & Walker, 2009). While this study included questions meant to generate data regarding effective knowledge transfer methods¹¹ for facilitating behavior change within SMEs (specifically related to chemical management information), the literature reviewed identified successful initiatives that have previously been used to introduce new information and/or facilitate behaviors change within businesses from different perspectives. The successful

¹⁰ See Appendix 1 (Booklet Questionnaire) and Appendix 2 (Online Questionnaire) for a complete comparison.

¹¹ Knowledge transfer will be discussed further in section 5.6

implementation of the Workplace Hazardous Materials Information System (WHMIS) into all workplaces (CCOHS, 2012; Saari et al., 1994), and the approach taken by pharmaceutical companies to introduce innovative products to physicians and influence physician prescription behaviour (PPB) (P. McGrath, personal communication, December 16, 2010; Wright & Lundstrom, 2003) may help to shed light on techniques that could be successful and applicable within the context of this research. As such, a more complete investigation of pertinent literature was completed and will be further discussed in chapter 5.

3.3.1. Workplace Hazardous Materials Information System

The Workplace Hazardous Materials Information System (WHMIS) became legislation in 1987 and is a system of information, including labels, material safety data sheets and employee training surrounding the use of hazardous materials (CCOHS, 2012) in an effort to reduce serious injuries, illnesses, medical costs and potential deaths as well as chemical spills, fires and remediation expenses related to the improper handling of hazardous materials (CCOHS, 2012). Through inter-governmental department cooperation and the founding of Occupational Health & Safety committees (CCOHS, 2012; Coté et al., 1998) WHMIS was implemented into all Canadian businesses, including SMEs (CCOHS, 2012), in a reasonably short period of time. WHMIS is a good example of proper policy implementation and as such, is of interest in the context of introducing new information into SMEs. This successful implementation along with the approaches taken to implement the required changes will be further discussed in section 5.6.1.

3.3.2. Altering Physician Prescription Behaviour

As an alternative to policy initiatives that command change through legislation, voluntary changes within businesses and enterprises have been found to occur when there is an intrinsic or extrinsic motivation to change (Battisti & Perry, 2011; Waters, 2010; Khanna et al., 2007; Deckers, 2001). The medical industry, specifically physicians who own and operate their own practice, are very similar to SMEs in that they have few employees and have complete say over the brands and types of products and pharmaceuticals used (P. McGrath, personal communication, December 16, 2010; Singh, 2008). Pharmaceutical companies have been able to influence physicians' prescription behavior (PPB) through complementary promotional activities, leveraging resources, and positive word-of-mouth references (Singh, 2008). The potential for voluntary change within SMEs will be further discussed in section 5.6 and will offer an alternative to legislative change, such as the WHMIS approach.

3.4 Data Analysis

The reason for analyzing data is to turn seemingly unorganized data into meaningful information (Dibley, 2011). Qualitative data can provide even more of a challenge when it comes to the analysis of the results (Jirwe, 2011) since it can involve multiple topics, sensitive information and can involve a significant volume (Dibley, 2011; Jirwe, 2011). Coding qualitative data into themes is standard practice for qualitative researchers (DeCuir-Gunby, Marshall & McCulloch, 2011). Open

thematic coding is the process in which qualitative data is divided into distinct themes based solely on the information obtained during the research (DeCuir-Gunby, et al., 2011); meaning no predefined themes created to analyze the data. Data from this research was coded openly, by hand, into themes and evaluated for trends.

3.5 Ethical Considerations

An ethics application was prepared to be submitted to the Dalhousie University Board of Ethics in June 2010. Upon consultation with the Director of Research Ethics, Patricia Lindley, she reviewed the questions and determined that ethics approval was not required as the questions focused on collecting data that the participants would be expected to provide as part of their professional capacity.

3.6 Study Limitations

As a case study, the results of this research should not be interpreted as representative of all SMEs (Yin, 2012). SMEs are a heterogeneous group and the results of this study should be interpreted as providing initial insight into a greater and complex picture of chemical management practices within Nova Scotia SMEs. Further limitations will be discussed in chapter 6.

CHAPTER 4 – Results

4.1 Research Questions

To identify the areas in which SMEs require information, support and guidance in order to operate their businesses in a sustainable and safe manner, participants were given a questionnaire regarding chemical management practices. The questions were:

1. What positive practices were already in place within the SMEs,
2. Which areas required more guidance/assistance,
3. What information and/or assistance are SMEs requesting to properly manage their chemicals
4. Who should be the focus of information dissemination programs for new information?

Broadly, it was found that not all participants employed best management practices (BMP) in all areas, nor were there any areas in which all participants employed BMPs. However, there were certain aspects of operational practice related to chemical management where the majority of participants adhered more closely to BMPs than others.

4.2 Case Study Participants

To be eligible to participate in this study, businesses must have their head office located in Nova Scotia, employ 500 people or less and use chemicals on a daily

basis. Eight Nova Scotia SMEs, from 5 industry sectors – Autobody/Collision/Automotive Repair (3), Electronics Manufacturing (1), Plastics/Packaging Manufacturing (1), Hospitality (2), Industrial Coating (1) – were included in this case study; six were consider small businesses (less than 99 employees) and two were medium-sized (100-500 employees) (Industry Canada, 2011). Figure 1 shows the size of each of the participating SMEs.

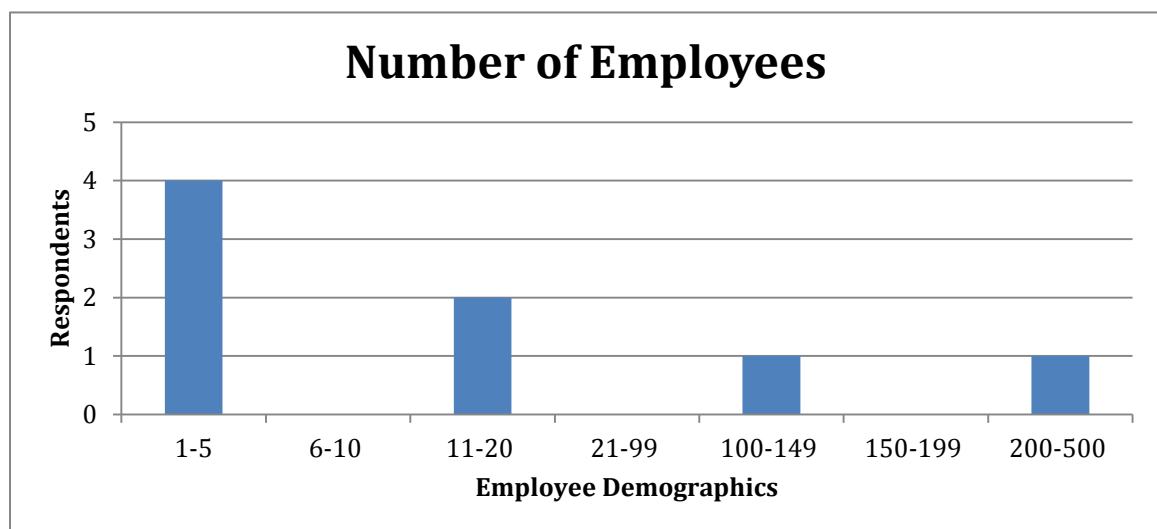


Figure 1 - Number of Employees

As noted in section 3.2, participants were offered different options for participating in the study ranging from in-person interviews to responding via an anonymous on-line questionnaire. As can be seen in Figure 2, only booklet and on-line questionnaires were selected. All participants declined to partake via in-person and telephone interviews. As a result of the anonymity of the online participants, the geographical distribution of all participants is unknown. Booklet participants were primarily from rural communities. One participating SME was located in a

community of more than 26,000 people while the remaining were from communities small than 26,000, including three participants form communities with fewer than 4,000 people.

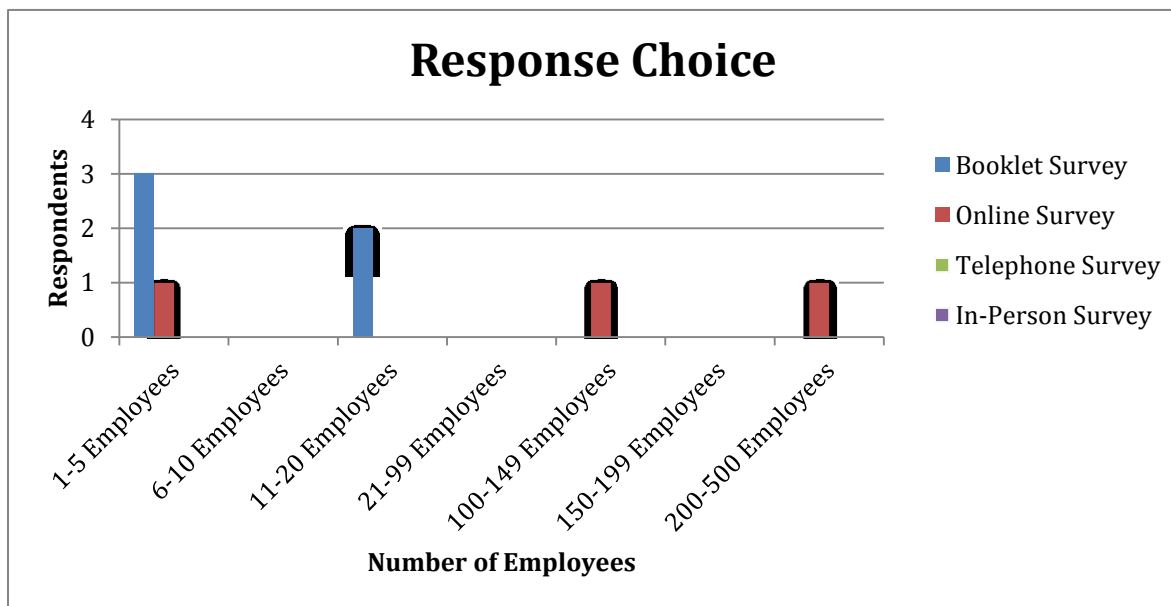


Figure 2 – Choice of Response Method

4.2.1. Employee Roles and Responsibilities

Each participant was asked to identify the position(s) (job title) of the person (or people) responsible for the management of chemicals, their department and the chemical-specific responsibilities. Participants indicated that primarily, the owner/manager was responsible for chemical management within the business. The two medium-sized businesses listed multiple positions and departments responsible for different aspects of chemical management and were the only participants to outline the responsibilities of the positions identified.

4.3 Identified Deficiencies with Current Management Practices

When asked to describe the company and the processes that required chemicals, the responses from the participants suggested in each case that their operations did have at least one individual who had a reasonable understanding of the chemical processes used within that particular SME. However, when they were asked to provide or at least describe their value/mission statement(s), formal CSR statements, or any chemical management protocol, none were able (or willing) to do so. One did include copies of the applicable MSDS sheets for the chemicals used within their operation, but beyond that, most simply emphasized the fact that they had never had a chemical leak or spill. One participant acknowledged having a chemical leak and they self-determined that it was a 'minor' leak. Schedule 1 of the CEPA, 1999 is a list of toxic substances and at what amount/concentration reporting of a leak or spill must be reported to agency authorities outlined in section 95 of the Act (CEPA, 1999). All participants indicated that no remedial action had ever needed to be taken although no quantitative descriptions pursuant to the Act were given.

4.3.1. Management Plans

Management plans are used to outline and solidify a business' procurement, storage, use and disposal policies. Participants were asked whether their business had ever created a pollution prevention and/or environmental management plan. Only two of the participants indicated that they did have an environmental management plan in place. The first stated that the plan had been created in 2005

by senior management and operations staff and was still in place. They reported that it contains guidelines for pollution prevention, waste management, chemical management, chemical spill and preventative spill measures. The second participant stated that the plan was created in 2002, revised in 2004, and is still in place, being updated regularly to reflect new chemicals, new regulations and new recycling opportunities. The plan was created by management and employees and contains specifications for sustainable procurement, pollution prevention, waste management, energy efficiency, water conservation, chemical management, chemical spills, preventative spill measures and chemical reuse/recycling opportunities.

Additionally, participants were asked if their business held any International Standards Organization (ISO) certifications, such as ISO 14001, but all reported that they did not.

4.3.2. Chemical Use

In order to better understand the potential importance of improved chemical management within NS SMEs, participants were asked to provide a comprehensive list of all chemicals used during business operations. All participants, with the exception of one, provided, at minimum, a partial list of chemicals. Participants should have had access to the list of all chemicals present within their workplace if they were in compliance with current legislation. For example, under WHMIS¹² businesses must have a Material Safety Data Sheet (MSDS) for all controlled

¹² WHMIS will be further explained in chapter 5.

products within their workplace and it is to be readily accessible (Workplace Hazardous Materials Information System Regulations, NS Reg 196/88). Only two were able to provide a complete list.

Interestingly, those two participants, who did provide a self-identified complete list of chemicals, were the same participants who had a management plan in place. These findings suggest that a relationship may exist between the existence of a management plan and better operational standards. This further supports the idea that providing guidance and assistance in order for SMEs to develop a management plan may contribute to improved practices (Eco-Efficiency Centre, 2010; S. Madsen, personal communication, November 5, 2009).

4.3.3. Disposal

4.3.3.1. Unused Chemicals

One of the primary foci of this research was to determine how chemicals were being handled within SMEs. Unused chemicals, including expired and surplus chemicals, are of concern since they, by nature, are not consumed by the regular business practices for which they were intended.

Participants were asked how they disposed of unused chemicals. All participants provided a disposal method, although responses did vary. There was consensus among participants that, when necessary, unused chemicals were disposed of using a hazardous waste disposal firm. Participants also included other methods of disposal for unused chemicals that were utilized instead of, or prior to, contacting a hazardous waste hauler. Alternative disposal methods include

chemicals being: “reserved for experimental, non-critical uses”, “purchase...as needed”, “out of date chemicals extended following assessment of their continued suitability for use in our application” “given to a company that can use it”, “recycle any unused” and “use for energy recovery or heat generation”.

4.3.3.2. Chemical Waste

Chemical waste and potentially hazardous effluents can be harmful if released. It is important to understand how these chemicals are dealt with in order to identify gaps in the application of appropriate practices and thereby support shifts in SMEs’ chemical management activities. As such, questions were included to permit further exploration of this aspect of the companies’ chemical management practices.

In contrast to the responses provided to questions related to unused chemicals, responses pertaining to chemical waste were much more varied and lacked a common theme or consensus. Similar to the experience with other lines of questioning, the two participants who had created an environmental management plan provided more detailed/comprehensive responses; in addition their responses indicated a greater degree of alignment with BMPs. One participant in particular indicated a very comprehensive understanding and management approach related to chemical waste. “[Chemical waste is] retained in secure location periodically removed for disposal by disposal firm. Waste water from specific areas retained and passed through settling tanks. Sludge collected and removed by waste disposal firm annually. Vacuum system for [re]moving powders operates with filter system”.

The remaining participants were more general in their responses. “[A]ll chemical disposal goes through the engineering department, to ensure the proper waste stream is utilized” was the response from one participant. Others simply indicated that they contracted a disposal firm when chemicals needed to be disposed of and they followed provincial guidelines.

However, the majority of participants however did not provide responses, which indicated BMPs were not in place. Statements indicating they did not know what was done with the chemicals or that waste was sent to landfills were common, suggesting minimal understanding or experience with the proper handling of such materials. This was particularly noteworthy as the individuals to whom these statements were attributed were those individuals identified by their organizations as the person who ‘should’ know the answer to such questions. Based on results, SME owner/managers require more information and guidance around what constitutes chemical waste and how chemicals are to be disposed of.

It was observed within this group of businesses that SMEs with environmental management plans have more promising chemical disposal methods than SMEs that did not. Based on the results of this research and the trends that have emerged, it is hypothesized that the process of creating the plan may have required research into proper disposal methods and options thereby increasing the level of ecoliteracy of the owner/manager and improving the SMEs practices (Williams & Schaefer, 2012; Battisti & Perry, 2011; Redmond & Walker, 2009). The creation and implementation of a management plan is important and will be further discussed in chapter 5. Research should be conducted to determine whether

creating a plan improves BMPs or whether the SME was already practicing BMPs and the creation of the plan was to facilitate knowledge transfer/dissemination throughout the SME employees.

4.4 Positive Practices

There are areas within SME business practices that require improvements; however, it was found that participants are implementing and employing promising practices in some areas.

4.4.1. Environmental Considerations

Participants reported that the environment had been taken into consideration and/or included in business decisions indicating that the business was committed to being green and use less harmful products when possible. The main reason identified by participants that the environment had been taken into consideration was due to views and beliefs of the owners/managers, who encouraged the inclusion of the environment into the decision-making process. Participants also indicated that consumer pressure plays a role in their internal valuation of the environment; however, all participants stated that their competitors did not influence their decisions. Understanding the reasons why SMEs incorporate environmental aspects into their decision-making processes as well as what encourages or does not encourage change will play a key role in the development of training and information sessions further discussed in chapter 5.

4.4.2. Chemical Alternatives

More benign alternatives exist for many chemicals commonly found in a number of industries. The utility of the alternatives will depend on the industry sector and/or processes used by the SME. Participants were aware of initiatives within their broader industry sector to introduce chemical-free and/or less toxic processes and materials. Most participants noted that alternatives had been investigated for their business including: less toxic chemical alternatives, chemical-free processes, chemical exchanges, more environmentally sound disposal options and recycling options. Figure 3 reflects the level of response regarding each of the alternatives explored

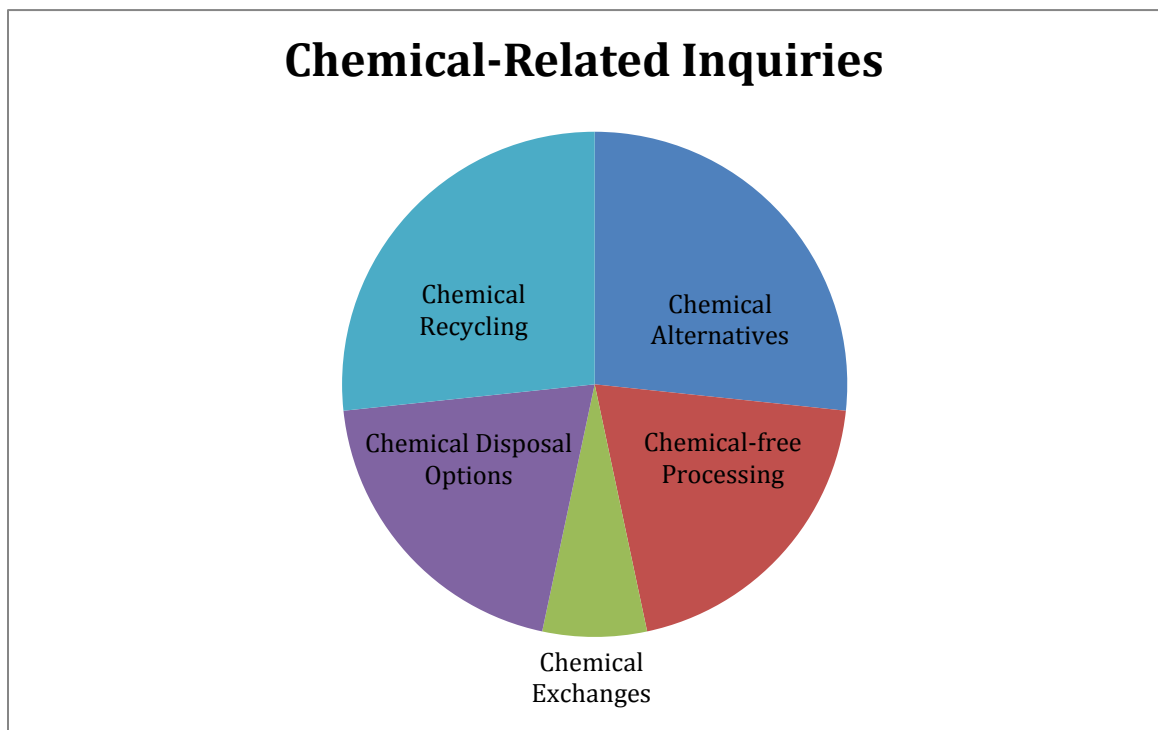


Figure 3 – Chemical-Related Inquiries

4.5 Barriers to Change

There were challenges identified when considering incorporating the environment into business decisions and practices as well as when participants were contemplating switching to chemical alternatives. Figure 4 further outlines the frequency of the barriers perceived by SMEs. All participants indicated they considered the environment in their business decisions at some level as well as generally being willing to transition to less toxic alternatives if they were available. Cost was the barrier most often indicated with time also being highlighted for both topics while personnel, suppliers, and the effectiveness of the alternatives were also indicated.

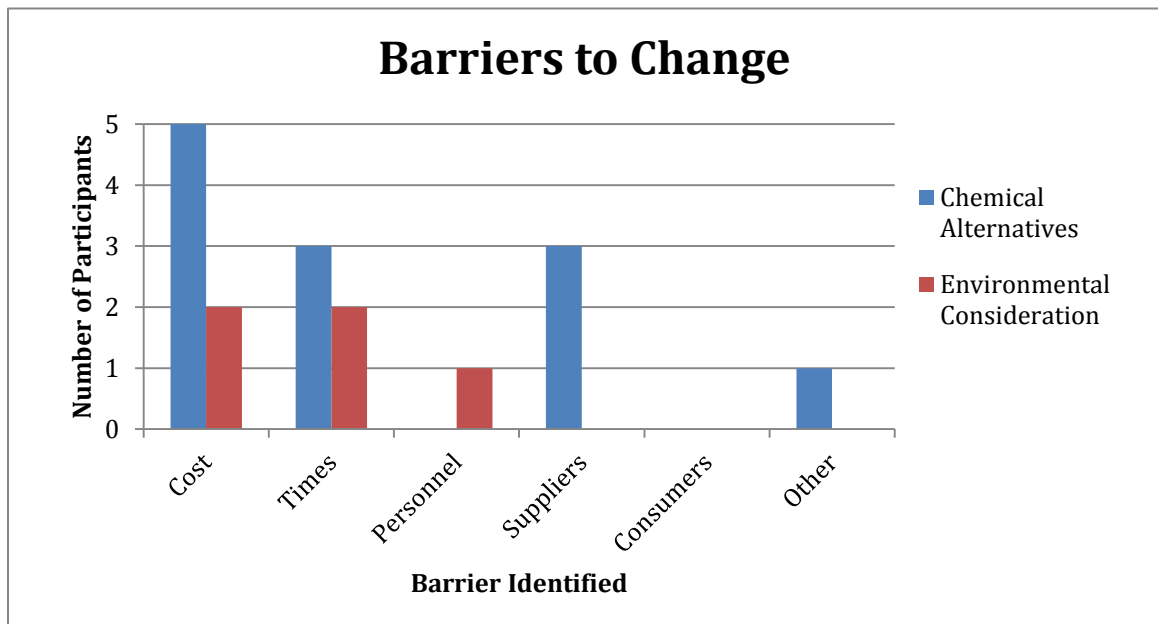


Figure 4 – Perceived Barriers to Change

4.5.1. Cost & Time

Cost was the most frequently identified barrier when considering switching to chemical alternatives as well as to include the environment into their business' decision-making process. SMEs typically do not have additional money available for unplanned expenditures, as they must devote their resources to their day-to-day operations (Eco-Efficiency Centre, 2010; Revell & Blackburn, 2007; Friedman et al., 2000). This shortage of resources makes it difficult, even for environmentally minded SME owner/managers to implement changes. Time is another resource in short supply for SMEs (Revell & Blackburn, 2007; Friedman et al., 2000) and was also identified as a barrier by the participants of this research. It takes a significant amount of time to research and investigate potential alternatives and BMPs regarding chemical management. Information must be easily accessible by SMEs and written in a manner they will be able to comprehend no matter their level of ecoliteracy (Battisti & Perry, 2011; Redmond & Walker, 2009; Tilley, 2000). This will be further explained in chapter 5.

4.5.2. Suppliers & Effectiveness

The effectiveness of the alternative was identified as a barrier/concern. The Eco-Efficiency Centre (2010) also found that SMEs in Nova Scotia were unable to find effective/as effective alternatives to the chemicals they use. This may also refer to the availability of the alternatives, as suppliers were also identified as a barrier. Onasch, Shoemaker, Nguyen & Roelofs (2011) found similar results in their study of drycleaners who were reluctant to make the switch to less hazardous chemical

processes. However, with first-hand observations of how the process change would work and the real benefits experienced by like-businesses and tailored training, SMEs were willing to reduce their chemical use and make environmentally responsible changes to their operations.

4.5.3. Staff/Personnel

While designing this study, staff was included as a potential barrier in the question pertaining to implementing chemical alternatives in terms of a shortage of personnel to carry out additional research and/or implement the changes (Eco-Efficiency Centre, 2010). Participants did not view staff as a barrier to implementing alternatives however staff was perceived to be a barrier when taking the environment into consideration. Based on these findings, while staff may resist or oppose changes within the business, it appears that once a change has been made, owner/managers do not find that the staff negatively impacts the implementation of process change.

4.5.4. Achievements & Marketing

None of the participants viewed their consumers as a barrier for switching to chemical alternatives or including the environment into their decisions, although, as further discussed in section 5.5.2., public perception was identified as a barrier to general chemical management. Additionally, the majority of participants stated that they would not market their environmental improvements to their stakeholders nor would they value being recognized by a third party for their environmental

achievements. The disconnect between SMEs perceiving the public as a barrier while not being willing to advertise/market their achievements will be further discussed in chapter 5 however, it further supports the literature, which describes the complicated nature of SMEs and the ineffectiveness of a 'cookie-cutter' solution to SME concerns as they are a heterogeneous group (Williams & Schaefer, 2012; Battisti & Perry, 2011; Eco-Efficiency Centre, 2010; Waters, 2010; Redmond & Walker 2009, Hillary, 2000).

4.6 Chemical Management Tool & Support Information

Research has been conducted surrounding BMPs of SMEs, including those related to chemical use (Eco-Efficiency Centre, 2010; Waters, 2010). In order to facilitate the availability of this information for SMEs, the Nova Scotia Department of Environment is investigating the benefit of developing a chemical management tool and/or information package (S. Madsen, personal communication, November 5, 2009). This tool/information package would include information SMEs require to properly procure, store, use, and dispose of the chemicals they use within their operations. In order to determine the level of interest in the proposed tool, participants were asked if such a tool would be useful for their business and to outline what type of information it should include. Most SMEs indicated that the tool would be beneficial to their business and provided a list of suggestions regarding information that should be contained within the tool.

Participants requested that the tool contain information regarding the chemical content in products, chemical storage practices, general handling

information, and health and safety requirements surrounding chemical use. They also requested Material Safety Data Sheets (MSDS). These requests highlight a major concern. First, the request for information regarding chemical content, storage, and handling is all information that is contained within the MSDS documents for each chemical. Therefore, if SMEs have been provided with MSDS they have this information readily at their disposal. This ties into the second major concern; chemical suppliers are required by law to provide MSDS documents for each chemical to the purchaser. If SMEs are not receiving these documents, and therefore do not have the information contained within them as suggested by the participants request for information, then the enforcement division of the government agency/agencies responsible must be notified and further investigation would be required. A different explanation is that SME owner/managers do not understand what is contained within the MSDS documents and how it affects their business. Additionally, participants indicated that there were more chemicals used than what they had listed. Readily available MSDS documents should have served as the list as SMEs are required to have MSDS for the chemicals on site.

Participants also requested the Chemical Abstracts Service (CAS) listings and government classifications to be included in the tool. This information is available on federal government websites. Suggesting this information be included in a tool signifies that SMEs are likely not aware this information is available and/or they do not have the time or resources to search for, or access, this information (outlined in Appendix 3). Participants also indicated that information on usage reporting, and chemical waste treatment and disposal should be included in the tool. Again, this

information is available on government websites further indicating that SMEs are not aware of its existence and/or do not have the time to search out the details.

It was encouraging to discover an interest in information related to chemical alternatives, life extension possibilities, recycling options, and chemical exchange program options as the tone of the responses up to this point had been that altering current business practices was not on their agenda. While it was noted earlier that SMEs were considering the environment and had looked into chemical alternatives, most had not implemented significant change and many barriers were also identified indicating systemic changes were unlikely. With these suggestions, it is more likely that SMEs simply do not have the time and/or money to research these options and implement change without support and assistance.

Seen below (Figure 5, pg. 65) is a *Wordle*. A *Wordle* is a web-based text-graphic tool, created in 2008, which allows researchers to code the frequency a word appears in a participants transcribed verbal or written responses by the size of the text (McNaught & Lam, 2010; Viégas, Wattenberg & Feinberg¹³, 2009). *Wordles* have been used in research during the initial data analysis as a way to immediately identify trends and differences in subgroup response patterns (McNaught & Lam, 2010). In this study, it is used to present a visual guide to the number of times various terms were expressed by participants when responding to what information should be included in a chemical management tool and/or information session on cost-effective environmental opportunities.

¹³ Jonathan Feinberg is the creator of *Wordle* (McNaught & Lam, 2010)

4.7 Information Dissemination

It has been found that typical information being requested by SMEs is information that should already be readily available; either it is material that they should have on-site or is in the public domain from government sources. The fact that SMEs do not appear to be familiar with these materials suggest that government must do a much better job in ensuring such information, in particular information related to legislation or regulatory issues where without it, SMEs may be non-compliant with legal requirements. As such, better insight into the types and mechanisms for information dissemination will be important if the aim is to improve SMEs management practices and behaviours where hazardous chemicals are concerned.

4.7.1. Current Dissemination Channels¹⁵

4.7.1.1. Conferences

Industry driven conferences and sector-focused information sessions are a key mechanism for relaying new and important information to businesses. These dissemination channels also provide networking opportunities for businesses to share tips about alternative management practices and to troubleshoot common areas of concern (Severt, Fjelstul & Breiter, 2009). In Nova Scotia, conferences are held each year, with additional events being held more frequently, by associations such as the Maritimes Energy Association (previously referred to as the Offshore/Onshore Technologies Association of Nova Scotia or OTANS), which serves

¹⁵ These questions were only asked to booklet participants.

Eastern Canada's energy industry (MEA, 2012) and the Canadian Manufacturers and Exporters (CME) which is responsible for assisting all Canadian manufacturing and exporting businesses (CME, n.d.). However, the majority of participants stated they did not attend such events; neither did their employees. Two participants indicated they did attend conferences including: the Environmental Services Association of Nova Scotia (ESANS), CME, Safety Services of Nova Scotia (SSNS), Canadian Collision Industry Forum (CCIF) and the Collision Solutions Network (CSN).

4.7.1.2. Publications

An alternative information source for businesses comes in the form of industry-specific journal(s) and/or magazine(s), which most participants indicated they subscribed to. As the industry sectors varied, none of the participants identified a common publication and it is unlikely that there is one publication common to all where information related to chemical management could be disseminated. However, the emerging theme in the publications listed was that they were included regional industry publications, such as the Canadian Finishing and Coatings Manufacturing Magazine (CFCM), and process-specific publications, such as Collision Repair Magazine.

The Canadian Gazette, published by Integrated Services Branch of Public Works and Government Services Canada, is the official publication of the Government of Canada since 1841 (Government of Canada, 2011). The Gazette provides updates and information regarding current laws and regulations relevant to Canadians (Government of Canada, 2012). For example, the Gazette published

the implementation and implications of WHMIS in volume 122, issue 6 on August 6, 1988 (Library and Archives Canada, 2008). All of the participants indicated that they did not receive the Canadian Gazette and only one participant indicated that they were aware that the Gazette included information relevant to their business.

The *Gazette* publishes “formal public notices, official appointments, proposed regulations, regulations and public Acts of Parliament from government departments and agencies. It also contains miscellaneous public notices from the private sector” as government agencies are required to publish in the Gazette (Government of Canada, 2011). If governments are relying on the Gazette to relay information to SMEs (Government of Canada, 2011) and if industry groups are relying on conferences and workshops (Severt et al., 2009) then there is a communication breakdown since SMEs are not being accessed by current methods. More effective methods of disseminating information and accessing SMEs are required.

4.7.2. Options for Improving Dissemination

In order to better understand how one may more effectively access SMEs and relay information, participants were asked if they would be willing to attend information sessions covering cost-effective opportunities to improve the environmental performance of their SME. Cost-effective opportunities refer to a change in practices or management that would result in financial savings either short-term or long-term, and/or would not require a significant financial contribution without eventual savings.

Participants were asked to provide suggestions on what could/should be included in an information session geared to SMEs, in a similar fashion to what should be included in an educational tool. Not surprising, the suggestion mirrored those items outlined in section 4.4, namely: an overview of provincial and federal chemical and waste regulations; environmental and waste disposal options; waste reduction opportunities; proper handling procedures; recycling alternatives; cost reduction techniques; and safety options. This also provides further confirmation that most SMEs are not aware of the relevant information that currently exists and is readily available, if sought.

Finally, most participants indicated that they would attend such sessions; however, this contradicts previous statements, which indicated that the majority does not attend such events (section 4.5.1). This would suggest that a better understanding of SME motivations around these matters is necessary in order to facilitate a change in business practices and/or behaviours.

4.8 Key Themes

There were a few key trends that emerged from this study of Nova Scotia SMEs. First, contrary to previous findings (Parker et al., 2009; Hillary, 2000) participants generally believe they are operating in an environmentally responsible way and properly managing their chemicals. Second, while SMEs do face a number of real and significant barriers when seeking to implement change, there are promising practices being employed. The drivers behind these promising practices, primarily the values of the owner/manager, must be the principal focus when trying

to implement change within SMEs. The major underlying trend detected throughout all the responses, is that SMEs require more information regarding their environmental impacts and chemical management BMPs. In light of the requests made by participants regarding what to include in a chemical management tool and information sessions, information must be readily available and easy to access as well as being specifically directed to and tailored for SMEs. Chapter 5 will provide further insight into the results of this study, the contributions this research has on the existing body of literature as well as information and knowledge dissemination techniques that have proven to be successful in the past for SMEs.

CHAPTER 5 – Discussion

5.1 Research Design Approach

5.1.1. Data Collection Methods

Ultimately, a multi-method data collection approach, coupled with the sequential implementation of each method, was necessary for the purpose of ensuring an adequate level of detail was collected from a sufficient number of businesses. Had only one method of data collection been utilized, there would have either been a significant reduction in the number of businesses willing to participate in this study, or significantly less data collected from each of the participants. Five chose to respond via booklet questionnaires and three via the online questionnaire, both the booklet questionnaire (Appendix 1) and booklet questionnaire (Appendix 2) were very comprehensive; although the online version was slightly shorter than the booklet, which contained 9 additional in-depth exploratory questions. Ultimately, SMEs refused to be engaged on this topic using telephone or in-person interviews.

As noted in section 3.2.1., initially booklet questionnaire were mailed out to potential participants. Each mail-out was preceded by introductory phone calls. Both Redmond & Walker (2009) and Dennis (2003) have identified this method as a valid research approach for both exploratory research and research conducted with heterogeneous SME participants. The research was exploratory and designed to obtain baseline data from Nova Scotia SMEs and included both open and closed

questions. This allowed participants to include formal statements and additional documents, such as the MSDSs.

While a high level of detail about each participant was obtained through this approach, response was limited. This was not completely unexpected (Revell et al., 2010; Lawrence et al., 2006). In accordance with literature recommendations, additional methods of data collection were presented to the potential participants (Revell et al., 2010; Lawrence et al., 2006). For example, during the aforementioned introductory phone calls potential participants who indicated they would need assistance completing the questionnaire, did not have the required knowledge to complete a questionnaire pertaining to chemical management or did not use chemicals¹⁶ were offered telephone or in-person 'meetings' in order to assist them with the survey and answer any questions they may have had. Both Nadine & Cassell (2007) and Roy & Thérin (2008) had success with this approach; however, in this case, all declined the offer for these alternative formats.

To further address the data collection challenges experienced up to this point, an online questionnaire was employed. This version of the questionnaire was slightly shorter and could be completed anonymously in an effort to address potential barriers to participation (Urielle & Dudley, 2009; Dillman et al., 2009). These additional responses were invaluable as they provided alternative insight and changed the tone of the overall impression of SMEs. This insight did not only apply

¹⁶ It should be noted that only SMEs whose sector requires the use of chemicals were contacted.

to the participant's from whom the responses were provided but also helped to give context to the responses received from other participants.

Despite these challenges (which will be further discussed in chapter 6), relevant and insightful data was collected which contributed to the expanding body of knowledge regarding SMEs' behaviour in this context, both locally (Waters, 2010; Eco-Efficiency Centre, 2010; Côté et al., 2006) as well as on a larger global scale (Battisti & Perry, 2011; Parker et al., 2009; Hillary, 2000).

5.1.2. Participation Enhancement Efforts

From the outset, this research took into account the findings of other researchers in order to improve participation. The case study approach was selected to gain an in-depth understanding of SME behaviour (Yin, 2012; Nadin & Cassell, 2007), rather than using a more quantitative approach that used a much shorter survey aimed at gathering statistically relevant, yet much 'higher level' data.

Gaining prior consent via introductory phone calls (Redmond & Walker, 2009; Dennis, 2003) was advantageous. While it is unknown if the SMEs who did participate via booklet questionnaire would have still participated without the initial phone call, based on the overall limited interest of SMEs to participate as well as the unreturned questionnaires from SMEs who had agreed to participate, the introductory phone call is understood to have assisted in obtaining consent and completed questionnaire. Additional efforts, further outlined in chapter 2, believed to have increased participation include the use of pre-stamped, self-addressed

return envelopes, non-standard envelopes addressed to the individual who consented and the use of colour-printed questionnaires with a clear design (Dillman et al., 2009).

The use of participation enhancement techniques was helpful; nevertheless, encouraging SME engagement was still a challenge and reflects the experiences typically in studies involving SMEs (Parker et al., 2009; Hillary, 2000). Future researchers should continue to utilize participation enhancement techniques as they were found to be beneficial but should continue to investigate additional opportunities to increase SME participation. Researchers should also seek out tangible incentives and rewards to provide participants in order to enhance participation (Dillman et al., 2009). The budget of this research did not allow for such incentives.

5.1.3. Anonymity of Participants

Not all of the participants were anonymous. The booklet questionnaire asked for the name of the business in order to develop a list of potential invitees to any information sessions that were developed out of this research; all provided this information. Online participants were not asked for any identifying information during the questionnaire. There was an opportunity at the end of the questionnaire to provide an e-mail address, which would not be linked to their results, in order to receive a copy of the final report. Two participants did provide an e-mail address. Concerns regarding the lack of anonymity, despite the confidentiality of their identity being assured, may have played a role in SMEs not returning the booklet

questionnaire even though prior consent had been obtained. For the purpose of this research, it was initially determined that participants should not be anonymous in order to invite them to future information sessions. However, during the creation of the online questionnaire, the decision to add a layer of anonymity to the questionnaire (Dillman et al., 2009) was ultimately made. A similar number of questionnaires were received from anonymous participants versus non-anonymous participants. As such, it is unknown whether the added anonymity of the online questionnaire encouraged participation or if the online link simply reached SMEs that had not been previously accessed by the telephone calls.

Should similar research be continued (i.e. additional case studies), it is recommended that the online questionnaire ask for the business name and location of the participant to be voluntarily provided. Should participants elect to not complete that section, it would provide insight into the importance of anonymity when conducting research with SMEs. However, for participants who did include contact information; further details could be collected to assist in bridging information gaps related to their responses. For example, in this research, further explanation regarding chemical disposal for participants who indicated 'depends' and/or 'disposed of according to provincial regulations' could have been obtained. Additionally, participants who indicated they had a chemical management plan but did not submit a copy could have been contacted to obtain the key components of the plan. A larger scale research project with a similar focus, may find the identification of participants unnecessary since the number of participants and

amalgamated responses would likely provide sufficient detail in order to bridge such gaps.

5.2 Acknowledging Promising Management Practices

5.2.1. Motivations

This research provides further evidence that SMEs do take some aspects of the environment into consideration when making business-related decisions. The driving force(s) behind this is varied, ranging from the personal attitudes of the owners/manager to meeting the expectations of consumers. Although previous studies have concluded that SMEs are not concerned about the impact their operations have on the environment (Parker et al., 2009; Lewis et al., 2007; Hillary, 2000), emerging research that has focused on the values and eco-literacy of the owner/manager suggests a trend whereby SMEs are implementing environmentally-responsible changes based on their knowledge and understanding, not necessarily on a shift in environmental consciousness (Williams & Schaefer, 2012; Battisti & Perry, 2011).

Interestingly, the majority of participating SMEs in this study indicated that they would not value being recognized for their environmental achievements; environmentally positive changes would not be marketed to their stakeholders. This attitude has also been noted, albeit anecdotally, by the Dalhousie University Eco-Efficiency Centre (P. Slight, personal communication, May 2010). Each year the Eco-Efficiency Centre (EEC) holds an event to recognize and award SMEs in Nova Scotia that have made significant environmental improvements within their

company. The SMEs must self-nominate for the award and the EEC has found that Nova Scotia SMEs are either modest regarding their achievements or do not value being recognized, or potentially both. This suggests that, while it is important to recognize SMEs and their positive environmental improvements, doing so may not encourage other SMEs to make similar changes in hopes of being recognized in the future. This observation was supported by the results in this study as participants indicated that their competitors' behaviours in this regard did not influence their decisions when addressing environmental considerations.

5.2.2. Willingness to Change

The majority of participants indicated they would be willing to switch to chemical alternatives although they did note a few barriers they anticipated facing if they were to implement a changeover. These barriers were further explained in section 4.5 and there is evidence to suggest that they are largely related to limited levels of eco-literacy by SME owner/managers and access to information (Williams & Schaefer, 2012; Battisti & Perry, 2011, Redmond & Walker, 2009; Tilley, 2000).

5.3 Improving Chemical Management within SMEs

5.3.1. Management Plans

A pattern of behavior emerged revealing SMEs that have developed a chemical management plan were more likely to have a proactive approach to their overall chemical management practices. Participants with management plans were found to have more responsible and transparent disposal methods had sought

chemical alternatives/substitutions and were able to provide more insightful recommendations on what to include in a chemical management tool and the information session (further discussed in section 5.5).

Additionally, while all participants identified at least one position that was responsible for the management of chemicals within the business – which was typically the owner/manager – only companies with a chemical management plan had formalized the role and outlined specific responsibilities associated with the position. The lack of a management plan also coincided with the participants' knowledge – or lack of knowledge – surrounding the business' handling, use and storage protocols for chemicals, as only participants with a management plan provided a comprehensive list of chemicals used on site along with specific disposal methods. Participants without a formal plan did not provide such information at any meaningful level of detail, either because they were unwilling or unable to do so.

These findings are consistent with results from another study conducted with SMEs in Nova Scotia. In 2010, Dalhousie University's Eco-Efficiency Centre (EEC) conducted a survey to determine which chemicals SMEs were using and what, if any, information was required by the SMEs to reduce their chemical use. Results showed that SMEs with management plans, including verbal/undocumented plans, were more likely to have investigated chemical alternatives, to have implemented substitutions, to dispose of chemicals responsibly and were more interested in attending an information session on best practices for chemical management (Eco-Efficiency Centre, 2010). However, it was more common for participants to not have a chemical management plan in both this study and the EEC study.

The findings of this research as well as those that emerged from the Eco-Efficiency Centre (2010) study indicate a relationship between the existence of a management plan and more rigorous chemical management practices within SMEs. This correlation would suggest the importance of ensuring SMEs have a chemical management plan in place as part of the foundation for improving their internal practices. Such a basic level of understanding of the chemicals found in the workplace and chemical management protocols would support compliance with their regulatory obligations, for example those expected under WHMIS (s.59 Occupational Health and Safety Act, SNS, 1996; s.4 Workplace Hazardous Materials Information System Regulations, NS Reg 196/88; s.5 Workplace Hazardous Materials Information System Regulations, NS Reg 196/88). Additionally, management plans should include a risk assessment portion to ensure the prevention and/or mitigation of risk or damage of the hazards present in the workplace (CCOHS, 2009; CCOHS, 2006).

5.3.2. Disposal Methods

Questions regarding chemicals and chemical waste disposal were left open-ended as to not lead the participant into making an inaccurate and/or a 'socially desirable'¹⁷ response. It was found that disposal methods utilized by the participating SMEs varied significantly. While most SMEs provided an acceptable

¹⁷ Socially desirable responding is when a participant responds the way they think they should respond and not necessarily identifying what is actually occurring. This is done in order for participants to ensure they are regarded and presented in a positive way and therefore may result in participants lying or misleading the researchers (Holbrook, Green & Krosnik, 2003).

method of disposal for their unused and expired chemicals, the majority of participants reported disposal methods for chemical wastes and effluents were much more ambiguous. Table 1¹⁸ compares the responses provided for the disposal of unused and expired chemicals compared to chemical waste and effluents. This demonstrates the different treatment these two like-products receive. Further comparative information is provided in Table 1.

Business Size	Unused and Expired Chemicals	Chemical Waste and Effluents
Small	Retained in secure location periodically removed for disposal by disposal firm. Out of date chemicals extended following assessment of their continued sustainability for use in our application. Small quantities reserved for experimental, non-critical uses.	Retained in secure location periodically removed for disposal by disposal firm. Waste water from specific areas retained and passed through settling tanks. Sludge collected and removed by waste disposal firm annually. Vacuum system for moving powders operates with filter system.
Small	Don't have any unused	Dried stripped coatings in landfill
Small	Hazardous Waste Disposal	???
Small	We recycle any unused paint/construction materials; purchase cleaning supplies as needed	Do not have much toxic waste
Small	Removed by Hazardous Waste Disposal/Recycle company	Captured and either recycled or disposed of according to provincial guidelines
Small	Used up	Depends on item

¹⁸ Spelling and grammar errors were corrected.

Business Size <i>(cont'd)</i>	Unused and Expired Chemicals <i>(cont'd)</i>	Chemical Waste and Effluents <i>(cont'd)</i>
Medium	Depending on the chemical and reason for disposing. Where possible they're given to a company that can use it, sent for recycling or used for energy recovery or heat generation.	All chemical disposal goes through the engineering department to ensure the proper waste stream is utilized.
Medium	Disposal service is contacted to pick up chemicals that are past expiry date or that no longer have a purpose.	By not letting unused or expired chemicals sit around the shop to potentially cause an environmental event, the disposal service is contacted immediately when chemicals need to be disposed of.

Table 1 – Comparison of Disposal Methods for Unused and Expired Chemicals versus Chemical Waste and Effluents.

Some participants appear to not understand what ‘chemical wastes’ meant, while others indicated that the disposal process used depended on a number of factors but did not provide further information. Another responded that they “do not have much toxic waste”; thereby suggesting they have no disposal plan in place. Such responses are cause for concern given that the participants came from industry sectors known to use chemicals on site and/or in their processes. This ambiguity suggests a lack of due diligence regarding proper disposal of such material. Of similar concern were the responses that suggested the participant did not actually know what happened to such material including “...disposed of according to provincial guidelines” but it was unclear whether the participant actually knew what the guidelines were. This is also a concern since the individual who filled out the questionnaire was the person identified by the owner/manager of the business as having the most knowledge of the chemical management practices

within the company. However the individual either could not or did not provide specific details, instead suggesting someone else looked after it, "...all chemical disposal goes through engineering department..."

It is interesting to note that another Nova Scotia study on the hazardous waste disposal processes of SMEs found that the majority of participants indicated using a hazardous waste hauler in the province to dispose of their chemicals although not all could provide the name of the company when asked (Eco-Efficiency Centre, 2010). The reason(s) for this could be varied. For example, it is possible that the participants in the current study were unclear about what was meant by some of the terminology or the intent of the question. However, opportunities to gain further clarification were offered but not taken up. Secondly, the SMEs queried in the 2010 study were familiar with the researchers at the EEC and had a relationship with them as a result of participating in business greening programs the EEC provided. As such, it is possible that the EEC results reflected a different demographic within the SME sector. For example, the participants in the EEC study may be more proactive in properly disposing of their chemicals as a result of their participation in the business greening program. Alternatively, in this study the lack of relationship with the researcher and the assurance of anonymity¹⁹, may not have allowed participants to accurately express their business' lack of disposal plans. The EEC study did acknowledge the potential for socially acceptable responses bias given that the participants might not have wished to disappoint the researcher by acknowledging their lack of a plan, or being concerned about the confidentiality of

¹⁹ Online participants were anonymous; booklet participants self-identified.

their answers given the perceived relationship between the EEC and the NS Department of Environment at the time (Eco-Efficiency Centre, 2010).

These results suggest that the SMEs participating in this study could have benefitted from even a basic chemical management plan; one that contains specific information regarding the processes used for the disposal of all chemicals since even small amounts that need to be disposed of in a safe and responsible manner. While the disposal method utilized may depend on the chemical, disposal methods should be clearly outlined within a management plan as well as in a risk assessment document.

5.4 Engaging SMEs

5.4.1. Chemical Management Tool

In 2009, the Nova Scotia Department of Environment's Pollution Prevention Branch suggested that a chemical management tool could be designed as a mechanism to improve SME performance in this area (S. Madsen, personal communication, November 5, 2009). As such, part of this research queried participants as to whether such a tool would be considered useful. While only a vague explanation of the tool was provided, the majority of participants indicated that their business would benefit from the proposed tool. This is significant since, as noted in chapter 2, most literature has found that SMEs are not willing to change (Hillary, 2000; Parker et al., 2009) and do not care about their chemical management and environmental impacts (Gadenne et al., 2009; Lewis et al., 2007; Revell & Blackburn, 2007; Coté, et al., 2006; Friedman et al., 2000; Hillary, 2000).

The collective suggestions provided by participants regarding what information that should be included in the proposed chemical management tool was very similar to what had been envisioned by Nova Scotia Environment (S. Madsen, personal communication, November 5, 2009) and the EEC (Eco-Efficiency Centre, 2010; P. Slight, personal communication, May 2010). Their recommendations included general handling practices for chemicals, chemical storage practices, health concerns surrounding chemicals, chemical waste handling, treatment and disposal, chemical recycling opportunities, industry-specific practices, and consolidate MSDS information with government information including: CAS listings, provincial and federal government classifications and required reporting.

Contrary to the notion that SMEs are not interested in their environmental impact (Parker et al., 2009; Hillary, 2000), the findings from this study support the supposition that at least a portion of SMEs are interested in taking responsibility for their environmental impacts, or at the very least improving their chemical management practices (Battisti & Perry, 2011; Eco-Efficiency Centre, 2010; Waters, 2010). For example, one participant stated “[w]e have a good system in place, but there is always room for improvement, we would like to be good environmental ambassadors and ensure we are using the most environmentally friendly disposal techniques and chemical management plans.” In other instances, while their environmental impacts were not reportedly their top priority, participants did express concern about the proper management of their chemicals stating they would like information regarding “proper handling process/procedures, disposal and recycling alternatives” for chemicals.

5.4.2. Information Sessions

Understanding how to best access and engage SMEs in order to relay new, changing or important information is a key component to facilitating behavior change (Redmond & Walker, 2009). Government agencies, researchers and NGOs, need an effective method of facilitating knowledge transfer to SMEs, specifically to the decision-makers within the business.

The majority of SMEs reported being willing to attend an information session on cost-effective environment management opportunities. This is somewhat contradictory as the majority indicated that they do not attend events such as conferences and workshops where this information may already be available. However, it may be that participants perceive 'conferences' as something separate from 'information session'. A conference or workshop may be viewed as something more theoretical or academic in nature, whereas the term 'information session' suggests something more practical and/or applied. Nevertheless, understanding the reasons that may preclude participation in such events may provide further guidance on how to ensure SMEs do attend. For example, perhaps they are not the targets and/or focus of either the content or the marketing/advertising of such events (Redmond & Walker, 2009) and therefore the information may not apply to them, or at least is perceived as not being applicable.

Such sessions should specifically target SMEs by explicitly inviting them to attend as well as ensuring the information being provided is relevant to SMEs. In particular, the cost-effectiveness of such opportunities appeared to be important,

making the case for presenting environmental opportunities as a business case (Battisti & Perry, 2011; Revell & Blackburn, 2007). Revell & Blackburn (2007) noted that governments presenting environmental improvements as simply a *win-win* scenario could be ineffective since there are costs involved. However, if the costs incurred from making environmental improvements are presented as a valid business expenditure with a favorable return on investment, then this may be the type of business case SMEs could respond positively to. Results from the study conducted by the Eco-Efficiency Centre (2010) supported this idea, but it also found that SMEs would pass on such opportunities, noting busy schedules and time constraints even though they were interested. This suggests that information sessions delivered off-site, requiring an employee to take time away from the business would create additional barriers to participation.

Waters (2010) conducted a study to determine the drivers for SME participation in environmental improvement programs. Results found that primarily, SMEs wanted to know if they were compliant with legislation and to determine if there were cost-share opportunities. Understanding what motivates SME participation will be critical in order to create a program that will be accessed by SMEs.

Participants in this study provided suggestions for the type of content an information session should contain. These included clarification of applicable provincial and federal regulations, proper handling and safety requirements, waste reduction options, recycling alternatives, waste disposal methods and third party disposal services (Table 2).

Information Session Topic	Discussion Details
Government Regulations	Chemical Regulations Transportation Regulations Waste Regulations Disposal Regulations Health & Safety Regulations Environmental Regulations
Proper Handling and Safety Requirements	WHMIS/GHS Requirements Procurement Storage Use
Waste Reduction Options	Partnerships Sustainable Procurement Reuse & Recycling
Recycling Options	Energy Recovery Reuse
Waste Disposal Methods	Industry/chemical specific
Disposal Services	Local Disposal Companies Hazardous Waste Depot

Table 2 – Description of Suggested Topics for Information Sessions

5.5 Drivers and Barriers within SMEs

It should be noted that not all participants were questioned on issues surrounding the drivers and barriers to chemical management and environmental change. Participants who responded via the online questionnaire were not presented these questions since it was felt that it made more sense to minimize the time commitment being asked of the participant by focusing on chemical use-related questions.

5.5.1. Barriers to Broad Environmental Considerations

Finite resources, such as money and time, were (as expected) identified as

barriers for taking the environment into consideration; however, staffing limitations were unexpectedly identified as a barrier.

5.5.1.1. Cost & Time

Tilley (2000) noted that the 'ethics system' in which SMEs operate frequently cause environmental policies to become a liability since the system is profit-driven and has a limited understanding and outlook on environmental issues, not realizing that many environmentally-driven policies have a beneficial economic output. The perception is that SMEs who take initiatives to implement environmental-policies may suffer financial strain and no longer be competitive within the system, which solely promotes self-interested companies (Battisti & Perry, 2011). It is therefore important to demonstrate to SMEs that the implementation of sustainable business practices is not simply an added cost. These changes can benefit their company and could save them money both short-term and long-term (Parry, 2012; Battisti & Perry, 2011; Waters, 2010; Eco-Efficiency Centre, 2010; Côté et al., 2006).

5.5.1.2. Staff Limitations

The implication behind staff being a barrier to environmental considerations was that should owner/managers want to make operational/process changes but receive significant backlash from employees, upholding the status quo might appear to be the best solution. This may provide further support for the need to impose legislative changes on SMEs in order to have them make environmentally responsible changes (Tilley, 2000).

Due to the nature of SMEs, their employees would also make up a portion of their customer base; although this would not be the case for all industry-sector SMEs (i.e. plastics and packaging). For example, for automotive service centre, it stands to reason that their employees would also have their vehicles serviced at this location. As a result, the employees have a unique position in that they would understand what their customers want from them since they are also customers. Therefore, if customers were encouraging more environmentally sustainable business practices, employees, at least a subset of them, would also feel that way. Instead, as indicated in this study, employees were indicated to be a barrier.

5.5.1.3. Recognition

While not specifically identified as a barrier, recognition, in the form of third party awards, as well as the marketing of environmental achievements was not seen as a driver for the majority of participants. Being recognized for environmental improvements is an excellent opportunity to market a business' progress to their stakeholders/customers (Parry, 2012). However, as indicated earlier, the majority of SMEs did not see their consumers as drivers for change and participants appear to not value, or not recognize the value of marketing and promoting their environmental changes and achievements. This is further supported by the observations of the EEC outlined in section 5.2; SMEs are reluctant and/or unwilling to self-nominate for an award and as further demonstrated by the participants in this study, are not willing to promote their improvements and achievements to their stakeholders/consumers.

5.5.2. Barriers Specific to Chemical Management

5.5.2.1. Public Perception

Public perception was identified as a barrier for SMEs to improve the management of their chemicals. While not all areas of chemical management would be negatively affected by public perception (i.e. complying with legislation would result in a positive public opinion), areas such as the general use of hazardous chemicals and the improper disposal of chemicals and waste would be more prone to draw criticism from the public. An inherent disconnect exists with the SMEs understanding/value of marketing and recognition (section 5.5.1.) and the perception of negative public opinions regarding chemical management.

Marketing is a powerful tool for all businesses and with customers becoming more aware of environmental issues, value-added marketing and/or promoting a business' environmental responsibility may help them become and/or remain competitive as well as potentially gaining market shares (Parry, 2012; Battisti & Perry, 2011). If SMEs feel that public perceptions were negatively impacting their business practice, a positive marketing message – demonstrating their improvements and achievements – could assist in informing the public of the responsible business practices being employed within the SME (Parry, 2012; Resnick, Cheng, Brindley & Foster, 2011). With the availability of online and social media marketing campaigns, this can be achieved at little or no cost to the SME (Bulearca & Bulearca, 2010; Constantinides, 2008).

Additionally, none of the participants had a Corporate Social Responsibility (CSR) policy in place. CSR is the positive incorporation of social and environmental actions into business activities and with stakeholders while simultaneously reducing negative impacts (European Commission, 2001 as cited by Battaglia, Bianchi, Frey & Iraldo, 2010; Perrini, Russo & Tencati, 2007). The absence of a formal CSR policy does not necessarily mean an implicit policy does not exist (Battaglia et al., 2010), as SMEs may not use the terminology CSR or classify their actions as CSR (Russo & Tencati, 2009; Perrini et al., 2007). Parry (2012) stated that the creation of formal policies has been found to enhance the legitimacy of actions taken.

5.5.2.2. Chemical Alternatives

A second barrier was specifically related to chemical substitutions. Although the majority of participants indicated they would be willing to switch to chemical alternatives, they again identified cost, time, suppliers and effectiveness as potential barriers to a successful changeover. In a study conducted in the same geographical location, results were similar stating that the availability of alternatives and/or chemical substitutions was the reasons SMEs were not making environmentally sustainable changes (Coté et al., 2006). These results further substantiate the notion that SMEs do have/may have low levels of ecoliteracy (Tilley, 2000) and/or access to relevant environmental information (Battisti & Perry, 2011; Schaper, 2002).

Schaper (2002) found a correlation between the amount of environment-related information available to the owner/manager and the number of environmental-related activities practiced by the SME. In order for the information to be deemed available, or accessible, it would need to be relevant, be business/industry specific, quickly obtainable and presented in a way that is easy to comprehend and apply/implement (Schaper, 2002). Reduced or restricted access to information was attributed to lower uptake and implementation of environmental activities within SMEs. SME owner/managers may not understand the impact their business has on the environment (Parker et al., 2009; Gadenne et al., 2009; Lewis et al., 2007; Revell & Blackburn, 2007; Coté, et al., 2006; Hillary, 2000) and therefore need to be informed of this impact and larger environmental issues, as well as be provided information which will guide them and advise them on how to implement environmentally-sustainable changes (Schaper, 2002). Low levels of awareness coupled with low levels of ecoliteracy have been found to require SME owner/managers to have no alternative but to await guidance, information and tools they required from governments, researchers and NGOs (Williams & Schaefer, 2012; Battisti & Perry, 2011; Redmond & Walker, 2009; Tilley, 2000).

5.5.2.3. Chemical Storage Facilities

As noted in chapter 4, another barrier noted by participants was knowledge related to chemical storage and storage facilities; however, information regarding proper and safe storage practices for chemicals is currently available. Chemical

suppliers and product labels are required to provide information regarding the safety requirements for storing specific chemicals (Workplace Hazardous Materials Information System Regulations, NS Reg 196/88) although, comments discussed in section 4.6 and 4.7 suggest that SMEs cannot readily access these materials. This could be the result of a systemic breakdown and suppliers are not providing the information they are required, by law, to provide upon delivery of a chemical to a businesses. Other information is available online from government and NGO resources related to the regulatory requirements for the storage of chemicals, although results indicated that typically SMEs do not know where or how to access this information. This therefore interferes with the effective development of policies (Redmond & Walker, 2009; Schaper, 2002; Tilley, 2000).

There have been a multitude of programs created to assist SMEs in becoming more sustainable within the region (Waters, 2010; Parker et al.; 2009; Côté et al., 2006), yet SMEs within the same geographical location as these program offerings allege to not have access to this information and/or know how to obtain the information they themselves have identified as necessary to manage their chemicals (Waters, 2010; Côté et al., 2006). Therefore, researchers must re-evaluate how they engage with and relay information to SMEs as well as the effectiveness of the tools and guidance information they are providing (Battisti & Perry, 2011).

5.5.3. Overcoming Barriers in SMEs

In order to encourage SMEs to make environmentally sustainable changes, there will need to be a sufficient incentive in order to encourage and motivate

change (Parry, 2012). Prior to effectively introducing new information into the SME community, researchers must first understand how SMEs operate (Battisti & Perry, 2011; Redmond & Walker, 2009), their motivations for change (Parry, 2012; Battisti & Perry, 2011; Waters, 2010; Coté et al., 2006), the techniques required to manage through change and, their capacity for creativity and innovation in the workplace (Parker et al., 2009; Boan, 2006). Large businesses are better understood and have been the primary focus of most government policies, environmental agencies and researchers up to this point (Battisti & Perry, 2011; Parker et al., 2009; Coté et al., 2006; Hillary, 2000). As such, in order to encourage change within SMEs, creators of information sessions and guidance tools must understand what motivates change within SMEs if they are to facilitate minimizing barriers and enhancing the drivers for such change (Parry, 2012; Waters, 2010; Redmond & Walker, 2009). Tilley (2000) and Parry (2012) stated that SMEs have not received the motivations they require in order to make environmentally sustainable changes. With the importance of SMEs becoming more understood, more comprehensive research is needed, in every aspect of SME operations, if they are to be supported and guided onto a more sustainable and environmentally responsible path (Waters, 2010; Parker et al., 2009).

5.5.3.1. Motivating Change

Awareness campaigns and information sessions are important as they provide information, which may elicit internal/intrinsic change within the SMEs owner/managers regarding environmental importance (Battisti & Perry, 2011).

External factors, such as incentives, cost reductions opportunities, recognition and awards, as well as other tangible benefits, are equally, if not more important as they are likely to have a greater impact on behaviour modification/change (Battisti & Perry, 2011; Parker et al., 2009; Boan, 2006; Deckers, 2001).

The personal views and values of SME owner/managers are often directly responsible for the direction and change within the business (Parry, 2012; Williams & Schaefer, 2012; Battisti & Perry, 2011). The likelihood of an external factor being perceived is dependent upon the level of the motivation, attractiveness of the benefit(s), likelihood of success and amount of effort required (Parry, 2012; Deckers, 2001). Therefore, it is important to understand the values of SME owner/managers and what motivates them on an individual level in regards to their business practices (Parry, 2012; Battisti & Perry, 2011; Waters, 2010; Redmond & Walker, 2009).

Further analysis of the literature suggests that the barriers perceived by SMEs may be a result of a lack of understanding and/or knowledge regarding the potential for improved business practices and cost reductions opportunities related to better chemical management practices (Battisti & Perry, 2011; Waters, 2010; Schaper, 2002; Tilley, 2000). This ties back to a lack of ecoliteracy and/or access to relevant information for SME owner/managers. For example, an SME may believe that time and a required capital expenditure is preventing them from implementing BMPs, not realizing that in many cases, by implementing a more effective chemical management process, they could save both money and time as a result of the

increase in efficiency and resource management (Battisti & Perry, 2011; Eco-Efficiency Centre, 2010; Waters, 2010; Redmond & Walker, 2009).

5.6 Effective Knowledge Transfer: How to Reach SMEs

“Sustainability is not a destination for business organizations to reach, but an ongoing learning process. Educators need to build the capacity of business and industry to address sustainability issues at a more systemic level, and to collaborate with multiple stakeholders for their resolution”

(Tilbury et al., 2005, p.8 as cited in Redmond & Walker, 2009)

The exchange or transfer of knowledge gained through trial and error and/or innovation is necessary to ensure the continued success of the business (Nousala & Whyte, 2010). This exchange can occur within the organization or within a network to which the organization belongs. However, practical knowledge such as learning that takes place within a business setting is difficult to transfer and use to make new knowledge (Jastroch & Marlowe, 2010). Therefore, an understanding of previously effective knowledge transfer methods can be very helpful in the introduction of new knowledge.

This section will include a discussion of the mechanisms used by two knowledge transfer approaches that were successfully implemented to facilitate the transfer and uptake of new knowledge to SMEs. By teasing out the successful characteristics of these programs/processes, it is suggested that patterns may emerge that could be employed to support successful knowledge transfer of environmental and chemical management practices within SMEs. The first involves

legislated change; the second is largely based on a voluntary process that is strongly supported through externally applied pressure.

5.6.1. Legislated Behaviour Change: WHMIS

The Workplace Hazardous Materials Information System (WHMIS) is a successful example of legislated change in Canada as it was effectively implemented into all businesses that use, store and/or handle controlled products, regardless of size or sector (Workplace Hazardous Materials Information System Regulations, NS Reg 196/88). The intent of WHMIS has been to reduce serious injuries, illnesses, medical costs and potential deaths as well as chemical spills, fires and remediation expenses related to the improper handling of hazardous materials (Canadian Centre for Occupational Health and Safety, 2012; Coté et al., 1999). WHMIS is considered to be a successful program. As such, it is worth further investigating the components of its implementation, as legislation alone normally will not account for the level of successful knowledge transfer that occurred within this initiative.

5.6.1.1. Notification of Change

Information on how businesses were notified of WHMIS and the implications it had on their business practices is limited. The Canadian Centre for Occupational Health and Safety (CCOHS) stated that the public was notified of the changes via media coverage and advertising (P. Hughes, personal communication, May 31, 2012). Media also played a role in the initial demand for WHMIS. Canadian Auto Workers (CAW) took part in a work refusal at McDonnell Douglas and DeHavilland

aircraft plants as a result of employees wanting information regarding the health implications and hazards of the chemicals they were working with (Stoffman, 2012). After this work refusal became national news, provincial and federal governments, along with industry groups began the process of creating and implementing WHMIS (Stoffman, 2012).

Information related to WHMIS and its implications was also disseminated to individual businesses through industry groups, unions and business associations. A number of these groups and associations would have also been part of the consultative and creation process for WHMIS (P. Hughes, personal communication, May 31, 2012; WorkSafe BC, 2007). In the case of small business, the Canadian Association for Independent Business would have provided information to their members in order to reach small businesses (P. Hughes, personal communication, May 31, 2012). Since WHMIS regulations fall under both federal and provincial jurisdictions (CCOHS, 2012; Workplace Hazardous Materials Information System Regulations, NS Reg 196/88), companies would have received information from both levels of government once the regulations were put into effect as well.

5.6.1.2. Training

Training is arguably the most important aspect of implementing new information, including regulations and/or policies into a business setting (Onasch et al., 2011; Kogi, 2010; Redmond & Walker, 2009; Burke, Sarpy, Smith-Crowe, Chan-Serafin, Salvador & Islam, 2006). WHMIS training is not tracked provincially or federally and it is therefore up to individual employers to ensure their staff is

properly trained for the hazards present in their workplace and the risks associated with those hazards (S. Greguldo, personal communication, September 7, 2012). Additionally, there is no list of certified or preferred trainers. The requirements to administer WHMIS training are that the individual is competent and knowledgeable on the subject matter (S. Greguldo, personal communication, September 7, 2012).

There are various training methods that have been used to relay information and impart knowledge in business settings; some strategies may be more appropriate for SMEs than others. Training and teaching methods can be engaging, moderately engaging or not engaging and be taught in person or via technology, such as computer-based training (Burke et al., 2006). As defined by Burke et al. (2006), an engaging training method involves multiple phases of learning where the trainees are required to actively participate in hands-on behaviour modeling, a moderately engaging training method allows for the trainees to provide feedback by informing them of the results and enabling them to change/correct their actions while the least engaging training method does not allow trainees to participate in any capacity and is solely a one-way information dissemination channel.

A study conducted by Burke et al. (2006) reviewed health and safety training methods, engagement levels and duration of training from 95 different studies. The study examined the knowledge acquisition and the overall change in behaviours – reduction of workplace illness and injury – after participating in training that fell into one of the three training methods previously mentioned. The not engaging or least engaging approach involved lectures, pamphlets and videos, while the moderately engaging training had programmed instruction and feedback

interventions and the engaging training method included modeling – role playing and acting out scenarios – and hands-on training methods. This study found that while all training resulted in improved performance, the engaged training approach had three times the positive effect than the not engaged approach. The moderately engaged training method, while not as effective as the engaged approach, resulted in more positive changes than did the not engaged group. As a result, health and safety professionals as well as any government agencies and academics creating training programs should ensure that there are hands-on and engaging modules to improve knowledge acquisition, retention and behaviour change.

Also noted by Burke et al. (2006), was that two-way feedback and/or dialogue is imperative to foster *action-focused reflection* – the process in which trainees discuss what they have learned or have done with the trainers in order to reflect on their successes and/or failures and plan for future situations. This process was found to assist in knowledge acquisition and retention, as it required active involvement from the learners and their interpretation of the information being presented.

Kogi (2010) found similar results to Burke et al., (2006), when the focus was on small businesses and their occupational health practices. Participatory action-oriented programs were most effective, even if there were resource limitations. Kogi (2010) also notes that local adaptations of checklists and tools are most effective as they can more accurately reflect the individualities of the businesses and regional differences as well as local knowledge while keeping in line with provincial and federal regulations.

These studies reflect an important consideration that trainers should be aware of the fact that more and more training, including Health and Safety programs such as WHMIS, are being offered via online learning techniques with no in-class component. As such, while knowledge may be acquired and positive changes implemented, research suggest that engaged instruction approaches that also allow for two-way dialogue will be the most effective for knowledge acquisition, retention and implementation of positive changes (Kogi, 2010; Burke et al., 2006).

5.6.1.3. Enforcement

WHMIS is enforced federally through the Labour Branch of Human Resource and Skills Development Canada²⁰ and is regulated provincially by respective government agencies (Centre for Canadian Occupational Health & Safety, 2012; Ontario Ministry of Labour, 2011). In Nova Scotia, the Occupational Health & Safety Division of Nova Scotia Labour and Advanced Education regulates WHMIS²¹ (Centre for Canadian Occupational Health & Safety, 2012).

Government inspectors conduct site visits and inspections of businesses to enforce WHMIS. Citations and/or fines can be issued for non-compliance (Ontario Ministry of Labour, 2011). Generally, if a government inspector in verifying a business' WHMIS compliance they look for employee training records, the qualifications of the trainer, MSDS documents, proper labels, personal protective

²⁰ More information regarding the federal responsibilities for WHMIS can be found at: http://www.hrsdc.gc.ca/eng/labour/health_safety/index.shtml

²¹ More information regarding Nova Scotia's WHMIS regulations can be found at: <http://www.gov.ns.ca/lae/ohs/>

equipment and emergency response plans (S. Greguldo, *personal communication*, September 7, 2012). Enforcement is an expensive and time-consuming undertaking for all government departments and agencies and therefore the inspection and enforcement of all legislation is impossible and impractical. It is up to individual businesses to ensure they are compliant. Small businesses can therefore fall through the cracks since larger businesses are the priority for inspectors.

5.6.2. Facilitating Voluntary Behaviour Change: Modifying Physician Prescription Behaviour

Physicians are similar to SME owner/managers as they have almost exclusive control over the management of their practice, the products/pharmaceuticals used/prescribed and their office, or practice, typically have very few employees (P. McGrath, *personal communication*, December 16, 2010). As such, pharmaceutical companies have developed training and engagement processes to ensure and increase a physicians' use of their products (Singh, 2008).

It is a significant challenge for pharmaceutical companies to ensure doctors are familiar with the most up to date compounds and treatment options. In order to ensure the continued evolution of physician prescription behavior (PPB) through ongoing knowledge transfer related to new options, medical suppliers have employed a variety of techniques, such as complementary promotional activities and developing strong networks to ensure positive word-of-mouth references (Singh, 2008). In the past, pharmaceutical/medical representatives were focused simply on securing a physician's business through the employ of standard

salesmanship and related techniques, such as the provision of incentives, and gift-giving (Singh, 2008). However, with new PhRMA²² guidelines restricting such things (Hradecky, 2001 as cited by Wright & Lundstrom, 2003), Wright & Lundstrom (2003) reported that the physician's perceptions of individual representatives values and personal characteristics played an important role. This suggests that trust in the 'source' of the knowledge that is being delivered is important if the knowledge is going to result in a shift in behavior (Redmond & Walker, 2009; Wright & Lundstrom, 2003). As further supported by Singh (2008), the amount of information available and being marketed to physicians and patients makes trusting of the source of information, particularly when referring to pharmaceuticals, a very critical consideration. This supports the idea put forth by Notarantonio & Cohen (1990) who stated "[t]he salesperson's most basic activity during [a sales] exchange is communication" (as cited in Lyon & Mirivel, 2011)

Lyon & Mirivel (2011) noted that pharmaceutical-related communication research was focused around three separate areas. The first, impression management – such as altering voice and appearance of the pharmaceutical representative helped persuade the physician to purchase their product. This is not really applicable to the SME context. The second aims to cultivate communication skills/styles that are most effective – such as whether open, friendly, dominant, precise or dramatic communications would positively affect PPB more. The last deals with developing 'compliance-gaining' message strategies, i.e. where the

²² PhRMA is the Pharmaceutical Research and Manufacturers of America and is an organization that represents the leading pharmaceutical research and biotechnology companies (PhRMA, n.d.)

physician's openness to incorporating the representative's suggestions (in this case, purchase of the representative's products) would be based on how much the physician liked the pharmaceutical representative and the relationship they had developed.

Pharmaceutical representatives are not the only source of information available to physicians, including SMEs. They are both limited on resources, specifically time, and suffer budget constraints (Singh, 2008). As a result, they require accurate information delivered quickly and efficiently from a source that is considered trustworthy. Developing a better understanding of the style(s) of communication and dissemination which produces information quickly and efficiently while still being regarded as true and trustworthy by the recipient (as seen within the doctor/representative context), could be a useful focus for future SME research along with a variation of compliance-gaining messaging. Developing a trusting relationship between the researcher and the business, as in PPB, could positively influence the SMEs uptake of environmental practices and/or process change (Redmond & Walker, 2009).

Relationships and trust are highlighted in both legislated and voluntary changes as key elements for success (Centre for Canadian Occupational Health & Safety, 2012; P. Hughes, personal communication, May 31, 2012; Lyon & Mirivel, 2011; Redmond & Walker, 2009; Singh, 2008; WorkSafe BC, 2007). For example, a lack of trust and a damaged relationship brought about the demand for WHMIS (Stoffman, 2012), yet the many partnerships and cooperative consultative processes

were responsible for the creation and successful implementation of WHMIS (Centre for Canadian Occupational Health & Safety, 2012). The successful integration of WHMIS into businesses was also based on the relationship and level of trust with those responsible for its dissemination into the workplace (P. Hughes, personal communication, May 31, 2012). Trusting relationships established between pharmaceutical representatives and physicians directly influenced the patterns of behavior on the part of the physicians (Lyon & Mirivel, 2011; Singh, 2008).

When creating information packages and tools for SMEs, such information/insight can be applied. It suggests that it is important that SMEs and industry groups are part of the creation of the programs and are consulted regarding their needs and expectations for these tools. Such partnerships can also aid in establishing trust on the part of the SMEs regarding the information being provided; for example that the information and suggestions are there to guide and help them in ways that will not impact them negatively, either in terms of competitiveness or financially (Parry, 2012; Redmond & Walker, 2009). On a very broad level, this research posed the question *'What do SMEs need?'* Participants provided suggestions on what they believed they needed to be included in both an information session and in the creation of a chemical management tool.

5.7 Opportunities for SME-specific Information and Training

The findings of this research support the notion that there is a lack of understanding and implementation of proper chemical management practices within SMEs. This research has also revealed that there are SMEs who want to

implement safer practices and are willing to make environmentally responsible changes. Some participants, in their own way, are already making these changes and are looking for guidance, support and further suggestions. Educational and awareness programs could be designed to include the topics that were highlighted by the participants of this study and be implemented through professional partnerships between governments, researchers and industry groups/business associations, similar to WHMIS and PPB.

5.7.1. Current Opportunities

After years of research, WHMIS is being remodeled and enveloped into what will be known as the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) (CCOHS, 2012). The new model will permit the Canadian government to incorporate their own specific requirements for WHMIS under GHS legislation (CCOHS, 2012). As such, requirements such as the creation and implementation of a chemical safety plan/policy and annual participation in chemical management courses or training seminars could be integrated into the new WHMIS regulations.

This impending revision presents an opportunity to revisit the consultative process that began this program and collect new information from academia, government, industry and businesses, including SMEs. This information could then be used in order to develop new information and training to be delivered to all Canadian businesses, including SMEs. Training and education, based on the current

literature and best practices, should be offered as part of the support system for assisting SMEs to comply with the amended legislation.

5.7.2. Curriculum

One of the foci of this research was to better comprehend the current understanding/awareness level of NS SMEs with regards to their chemical management practices. The objective was to then use this insight to offer direction regarding the creation of an educational plan/tool that would be practical and effective in supporting SMEs. It was found in this research, coupled with the analysis of previous research that NS SME owner/managers have limited awareness related to the impacts of their business on the environment. In addition, it became clear that they may not have an adequate understanding of relevant legislation and regulations, best management practices, and current opportunities available to them. Based on the outcomes the following is proposed as a starting point for a SME-centred initiative:

- 1) Participating SMEs identified a number of informational elements²³ that they would like to see in an informational package. As such, as a minimum these should be included in a manner that is easily accessed and understood by SME owner/managers (Redmond & Walker, 2009).
- 2) The CCOHS released a guidebook for Canadian businesses in March 2012 titled *“Implementing a Chemical Safety Program”*. The book, while remaining generic for all provinces and industry sectors, does provide a baseline of

²³ The elements were discussed at length in section 4.6 and will not be repeated here.

information surrounding: legislation, chemical purchasing and inventory, hazard identification systems, understanding hazards, understanding labels and MSDSs, storage, safe work practices, emergency spill response and first aid, waste storage and disposal and training (CCOHS, 2012). A Nova Scotia specific guidebook with specific information, legislations and waste haulers should be created (Redmond & Walker, 2009). This book could be amalgamated with information from industry groups and/or NGOs to present a 'one stop shop' that, in addition to the information previously mentioned, it could include recycling options, best management practices, alternative processes methods, and any additional information identified in the consultative process as important. Further details regarding a potential tool and information session can be found in section 4.6.

5.7.3. Chemical Management Tool

The information required to develop the tool and information session/guide being discussed currently exists. The complication is that the information does not exist all in one place and it is time intensive to find it, learn it, understand it and then teach it to the staff and implement the new information into daily work activities. By creating a user friendly guide, that contained specific information for the region and/or industry sector (Redmond & Walker, 2009), SME owner/managers would not be overloaded with non-essential information but would have all the information required to operate their business in the safest and most sustainable manner possible.

To augment such a guide, a more detailed chemical management tool could be developed which would expand on the information provided in the information sessions and serve as software, or a software-like program. The tool would enable SMEs to input the chemicals they use and have purchased, as well as the purchase date and quantity. This would assist with a chemical inventory as well as reduce the amount of chemicals that are unused and/or expire as a result of over-purchasing. As the chemicals are inputted into the system, the relevant and required information from their jurisdiction would be generated including: best management practices for storage, handling and usage, legislation surrounding storage, transportation, disposal requirements, health and safety information for exposure limits and hazards, first aid specifications and environmental hazards as well as additional information including Material Safety Data Sheets, employee training requirements, spill procedures and waste haulers and disposal site locations.

5.7.4. Implementation

The training program should be based on BMPs and involve two-way dialogue and actively engaged participation as was found to be most effective (Kogi, 2010; Burke et al., 2006). While the literature has demonstrated that the most effective training methods involve engaged in-person dialogue (Burke et al., 2006) and is action-oriented and locally specific (Kogi, 2010), any program implementation is better than none (Burke et al., 2006).

Creating a sales force like that of the pharmaceutical industry is not possible in this context however, governments were effective in spreading the word about

WHMIS through federal-provincial government cooperation, government-industry partnerships, consultative processes which included industry and business organizations, and media campaigns (Centre for Canadian Occupational Health & Safety, 2012; P. Hughes, personal communication, May 31, 2012; Ontario Ministry of Labour, 2011; WorkSafe BC, 2007). A similar approach could be taken to notify businesses of this program while also taking into account that the Internet is a much more effective tool today than it was in 1988. Social media, industry-specific newsletters, e-mail blasts, viral videos, etc. could all be effectively used to introduce, market, promote and notify businesses of these developments/changes (Parry, 2012; Battisti & Perry, 2011). Greater media exposure in general has been linked to a greater understanding of issues related to the environment (Williams & Schaefer, 2012).

It is important that this tool and any education plans are created specifically for SMEs in order to assist the SMEs to make immediate changes to their business practices and plan for long-term sustainability practices (Redmond & Walker, 2009).

CHAPTER 6 – Conclusion

6.1 Study Limitations

As a case study, the results of this research may not be reflective of all SMEs. Only a small subset of the SME population was accessed, although various attempts were made to ensure maximum inclusion. The difficulties experienced during the course of this research project further supports the literature in that SMEs are a difficult population to work with and engage with (Eco-Efficiency Centre, 2010; Parker et al., 2009; Lewis et al., 2007; Newby, Watson, Woodliff, 2003; Hillary, 2000).

Participation in a voluntary research studies may produce skewed results since the results are subject to both a response bias and/or a non-response bias. This study relied solely on self-reported responses from the participants and additional fact checking was beyond the scope of this research. Self-reported questionnaires may result in response biases including socially desirable responding and under-reporting (Maclennan, Kypri, Langley & Room, 2012). Additionally, the potential for a non-response bias does exist as the behaviours and practices of SMEs who were either not aware the study was taking place or chose to not participate for any number of reasons cannot be accounted for (Eggers, O'Dwyer, Kraus, Vallaster, Guldenberg, 2012). Response bias and non-response bias may affect this research in, at least, 2 ways. In order to appear to be 'doing the right thing', participants may have provided a more socially acceptable response and/or under-reported their negative practices, particularly concerning the disposal of

chemical waste and their willingness to make environmentally responsible changes. Additionally, the SMEs who chose to not respond, either during the initial introductory phone calls, after receiving the booklet questionnaire, once sent the link to the online questionnaire, or were not accessed and made aware of the research may differ significantly from those who were willing to share their current practices. SMEs who did not participate may have done so as they felt environmental responsibility is not of their concern and is not important to them (Parker et al., 2009; Hillary, 2000). As such, the perceptions emerging from this research that SMEs are trying to be environmentally responsible and would implement chemical alternatives and/or use a chemical management tool may be over-represented either as a result of socially desirable responding and/or SMEs who did not participate would not be willing to make changes. While the results outlined in chapter 4 and the discussion in chapter 5 should be interpreted with the understanding that a response bias may exist, the results are valuable, as they appear to represent at least a small subset of the SME population in Nova Scotia. This research was to develop a preliminary baseline of information and the results are consistent with current and emerging literature.

6.2 Contributions to the Literature

Participants in this study have made environmentally responsible changes and most are willing to continue to improve their business practices to become more sustainable. They do however require information and/or assistance to make the necessary changes. While SMEs did not appear to know where or how to access

information that is currently available, which could help them improve their chemical management practices, they were able to provide a list of suggestions for the information they require in order to become more environmentally responsible.

The contradictions found throughout the results of this study highlight the challenges of working with, and assisting, SMEs. Not only were differences noted between business sizes and industry sectors but also within responses provided by individual SMEs. SMEs currently operating without a management plan could see an improvement or benefit to implementing a plan as SMEs with a plan appeared to have more rigorous chemical management practices which were also more in line with best management practices.

These are promising findings. Researchers have previously stated that SMEs are not willing to change and do not care about the environment. While that may be the case for some SMEs, it should not be assumed that all SMEs fit this description.

6.3 Future Considerations

Future research should continue to investigate the chemical management practices of SMEs. Researchers ought to continue seeking out advice from SME owner/managers to determine what information they require to improve their practices. A larger research study is recommended in order to identify cross-sector trends in Canadian SMEs.

From previous personal research conducted involving SMEs within a specific industry sector, future researchers should consider approaching industry

associations and have them send out correspondence informing their membership of the research project and that their participation is valued and important in order to improve the assistance able to be provided to them. SME researchers should be prepared to offer their questionnaire in a variety of formats in order to obtain detailed information from SMEs.

Additionally, although jargon was avoided, the literature suggests that SMEs may react negatively to environmental programs/research because they don't think they impacts are significant, they don't believe they can make a difference and/or they do not know enough about the environment to make necessary changes (Waters, 2010; Parker et al., 2009; Hillary, 2000). Therefore, instead of using terms such as 'environmental management' and 'environmentally responsible', there could be more direct closed-ended questions that may offer further insight such as 'do you have a spill kit?' and 'have you received training on how to dispose of the chemicals you use?'

Further research is required to determine if SMEs continue to believe they do not have an impact on the environment and if there is a key methodological approach that is effective for SMEs. However, the creation of a chemical management tool and associated information sessions, as outlined by the participating SMEs, should be created and disseminated to SMEs.

6.4 Conclusion

SMEs are not small large businesses (Lewis et al., 2007). As such, they require tools and information sessions created specifically for them (Redmond &

Walker, 2009). As the old adage says “you cannot manage what you do not measure”. As such, and as supported by this research, businesses who are currently trying to manage their chemicals in accordance with best management practices, are the most appropriate population to seek out to determine what information is required, missing, or unavailable.

This study was conducted to assess the level of chemical management in Nova Scotia SMEs. The positive practices identified, including the incorporation of the environment into decision-making processes and the willingness to use alternative processes²⁴, as well as the areas requiring improvement, such as the creation of management plans and improved chemical disposal practices, were established by the responses provided by the participants to a number of questions. The information SMEs required by SMEs was specifically determined by participant requests regarding to tool and information sessions as well as the areas in which their responses demonstrated a limited understanding. Finally, the individual(s) who should be the focus of information dissemination efforts was determined to primarily be the owner/manager of the SME based on responses to questions regarding drivers and barriers to change and the individual(s) identified as responsible for chemicals within the business (either during the introductory phone call or by the participant in the survey). Although this research is a case study, the results are supported by and provide further support for current literature on SMEs

²⁴ Such as garment cleaners switching from perchloroethylene (PERC) solvent-based dry cleaning methods to water-based processes referred to as wet cleaning (Onasch et al., 2011).

and environmental management (Battisti & Perry, 2011; Eco-Efficiency Centre, 2010; Waters, 2010; Parker et al., 2009; Lewis et al., 2007; Côté et al., 2006; Hillary, 2000).

More research is required in all areas related to SMEs environmental compliance and chemical management behaviours. SMEs are known to be a challenging population to conduct research with however; they are a significant factor in Canadian business and pollution. They require and are requesting information and support. As such, they deserve the focus and attention of researchers and government to assist them make environmentally responsible changes and to improve their chemical management practices in order to become more sustainable.

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Appendix 1

Booklet Questionnaire

Environmental Management Practices
of Small and Medium-sized Enterprises within Nova Scotia
Statement of Consent

By returning the completed questionnaire booklet, you are indicating that you understand the information contained in the cover letter and consent to participate in the study. You may be assured of complete confidentiality. Since all responses are aggregated and analyzed anonymously, you will not be identified by name/company.

Should you be interested in receiving the final report, please include your business card or e-mail address and an electronic copy will be made available to you. Your participation is voluntary and you may withdraw your participation in the study at any time.

If you have any questions regarding this study at any time, please contact, Victoria Thomas, Lead Investigator, victoria.thomas@dal.ca or Dr. Michelle Adams, Supervisor, michelle.adams@dal.ca.

Signature

Date

General Business Practices Support for SME's

Please provide details regarding the company and the processes that require chemicals:

(should you require more space for any of the questions, please attach additional pages with reference to the section and question number)

Participant Information

Name:

Number of years employed with the company:

Position title:

Are you part of the management team?

Yes

No

Company Information

Company Name:

Number of Employees:

Industry sector:

Autobody/Collision Repair

Electronic Manufacturing

Chrome & Coating

Hospitality

Plastics/Packaging

Other: _____

Where is the company's head office?

Is the company:

- Independently Owned
- Branch Office
- Please explain: _____

Are the company's decisions, regarding policies and daily operations, made locally?

- Yes
- No

Are chemicals used on a weekly basis?

- Yes
- No

How often: _____

Chemicals

1. Who/What department oversees/tracks the use of chemicals within the company? (please list as many as apply)

Position Title	Department

2. What happens to unused chemicals?

3. How are potentially toxic wastes/effluents managed?

4. Has the company ever inquired about:
Chemical Alternatives

- Yes
- No

Chemical-free Processes Yes No

- Yes
- No

Chemical Exchanges Yes No

- Yes
- No

Chemical Disposal Options Yes No

- Yes
- No

Chemical Recycling Yes No

- Yes
- No

5. Has the company sought other chemical-related advice?

- Yes
- No

a. Who/what agency/department was contacted?

6. Has the company conducted additional chemical-related research?

- Yes
- No

Please explain: _____

7. Please list all chemicals used by the company throughout the year. (please provide as much information as possible)

Chemical/Product Name	Purpose of Chemical/Use	Frequency of Use

8. Has the company ever had a chemical leak or spill

Yes

No

If yes, was it/were they considered to be a: (check all that apply)

Minor Spill _____ Minor Leak _____

Medium Spill _____ Medium Leak _____

Major Spill _____ Major Leak _____

9. Has the company ever needed to take remedial action as a result of the use of toxic chemicals?

Unsure

Yes

No

Alternatives

1. Are there any barriers for managing the chemicals used by the company?

Yes

No

Please explain: _____

2. Have alternative chemical-free processes been investigated for this industry?

Unsure

Yes

No

Please explain: _____

3. Have less toxic chemicals been investigated for this industry?

Unsure

Yes

No

Please explain: _____

4. If less toxic alternatives/more beginning processes were available, would the company be willing to switch?

Yes

No

5. What barriers would the company anticipate?

Costs

Yes

No

Time

Yes

No

Personnel

Yes

No

Suppliers

Yes

No

Consumers

Yes

No

Other: _____

6. Has the company ever incorporated environmental considerations into decisions and/or process/operational changes?

Yes

No

Please explain: _____

6a. What were the drivers for this/these change(s)?

Owner(s)

Management

Consumers

Competitors

Other: _____

6b. What were the barriers for this/these change(s)?

- Management
- Consumers
- Money
- Time
- Other: _____

6c. If environmental considerations were incorporated into decisions and/or process/operational changes in the future, would they be advertised/marketed to stakeholders?

- Yes
- No

Management Plans

1. Does the company have a formal value/mission statement?

- Yes
- No

Brief Overview:

(if possible, please attach the statement(s))

2. Does the company have a formal statement of Corporate Social Responsibility (CSR)?

- Yes
- No

(if possible, please attach the statement(s))

3. Does the company hold:

- ISO 9000-series certification
- ISO 14000-series certification
- ISO other: _____

4. Has the company ever created a Pollution Prevention and/or Environmental Management Plan or Program?

- Yes
- No

IF NO, PLEASE MOVE ON TO THE NEXT SECTION

5. Who were the main creators of this plan/program?

- Owner(s)
- Senior Management
- Management
- Operations
- Employee Representatives
- Employees
- Other: _____

6. When was it created?

7. Did it include specific measures for?

- Sustainable Procurement
- Pollution Prevention
- Waste Management
- Energy Efficiency
- Water Conservation
- Toxic Chemical Management
- Chemical Spills
- Preventative Spill Measures
- Chemical Reuse/Recycling
- Other: _____

8. Was it implemented

- Yes
- No

9. When was it implemented?

10. Is it still in place?

- Yes
- No

11. How often is it updated?

- Monthly
- Annually
- Occasionally
- Has not been updated

12. What information would you like to see in a future version?

13. How is the success of the plan measured?

If possible, please attach the plan(s)

Information & Support for SME's

1. Would the company value being recognized by a third party/company for their environmental achievements?

- Yes
- No

a. Would this achievement be marketed to your stakeholders/consumers?

- Yes
- No

2. If a Chemical Management Tool was created specifically for SME's, would it be useful to the company?

- Yes
- No

a. What should it include?

3. Does the company receive the Canadian Gazette?

- Yes
- No

a. If yes, how often?

b. Has the Gazette ever included a submission that pertained directly to the company or industry?

Yes

No

Please explain:

4. Do you, or any employees, attend industry-specific conferences?

Yes

No

If yes, which ones?

If no, are you aware of any?

5. Do you receive industry-specific journals or magazines?

Yes

No

If yes, which ones?

If no, are you aware of any?

6. Would you be interested in attending a seminar on cost effective Environmental Management for SME's?

Yes

No

7. Should these seminars be geared towards (check all that apply):

- Owners/CEO's
- Senior Management
- Operational Managers
- Chemical Managers
- Financial Managers
- All of the above
- Others (please explain): _____

8. What information should be included in these seminars that would maximize the interest of the company?

Any final remarks regarding environmental management, chemicals or knowledge dissemination as it pertains to the company or this research?

Thank you for participating in Victoria Thomas' Masters research project "Environmental Management Practices of Small and Medium-sized Enterprises within Nova Scotia".

At the conclusion of the study, should you be interested, an electronic copy of the final report will be made available to you.

This research study will contribute new knowledge to the area of Environmental Management Practices, specifically Toxic Chemical Management, of Nova Scotia SME's. This area of research has previously been understudied and with more current and accurate information, government departments as well as environmental organizations will be able to provide SME's with the tools they require to be both competitive and environmentally aware.

Questions

Should you have any questions regarding this study at any time, please contact, Victoria Thomas, Lead Investigator, victoria.thomas@dal.ca or Dr. Michelle Adams, Supervisor, michelle.adams@dal.ca.

Dalhousie University, School for Resource & Environmental Studies
6100 University Ave, Suite 5010, Halifax, Nova Scotia, B3H 3J5.

Appendix 2

Online Questionnaire

Consent Form

1. I, Victoria Thomas, am a Master's student in the School for Resource and Environmental Studies at Dalhousie University.

As partial fulfillment of the requirements for my program, I am conducting a research project, which has been designed to examine management practices and policies regarding environmental issues of small and medium-sized enterprises within Nova Scotia.

All responses are anonymous and therefore confidential. Should you be interested in receiving the final report, please include your contact information at the end of this survey. Your contact information will be separate from your survey responses.

Your participation is voluntary and you may withdraw your participation at any time.

If you have any questions regarding this study at any time, please contact, Victoria Thomas, Lead Investigator, victoria.thomas@dal.ca or Dr. Michelle Adams, Supervisor, michelle.adams@dal.ca.

I CONSENT TO PARTICIPATING IN VICTORIA THOMAS' MASTER'S RESEARCH PROJECT

- Yes
- No

Demographic Information

Should you need to exit the survey and wish to continue completing it at a later time, you may 'save' your progress and follow the instructions. You will then receive a link so you may return to your survey.

2. The company can be most accurately placed in the following industry sector:
(please select all that apply)

- Autobody/Collision Repair
- Chrome & Coating
- Dentistry
- Electronics Manufacturing

- Electroplating
- Farming/Agriculture
- Food Processing
- Furniture Manufacturing/Woodworking
- Hairstyling/Spa Services
- Hospitality
- Plastics/Packaging Manufacturing
- Textile Manufacturing
- Tourism (General)
- Other _____

3. The company's head office is located in:

- Alberta
- British Columbia
- Manitoba
- New Brunswick
- Newfoundland & Labrador
- Northwest Territories
- Nova Scotia
- Nunavut
- Ontario
- Prince Edward Island
- Quebec
- Saskatchewan
- Yukon

4. Your branch office (office you work out of) is located in:

- Alberta
- British Columbia
- Manitoba
- New Brunswick
- Newfoundland & Labrador
- Northwest Territories
- Nova Scotia
- Nunavut
- Ontario
- Prince Edward Island
- Quebec
- Saskatchewan
- Yukon

5. Number of Employees

- 1 - 5

- 6 - 10
- 11 - 20
- 21 - 50
- 51 - 99
- 100 - 149
- 150 - 199
- 200 - 500

Chemical Usage

For the purpose of this research project, the chemicals of interest are only those that are an integral part of the company's purpose. (i.e. manufacturing processes, machinery maintenance, day-to-day operations)

6. How often are chemicals used?

- Multiple Times A Day
- Every Day
- Few Times A Week
- Once A Week
- Few Times A Month
- Once A Month
- Few Times A Year
- Once A Year
- Never

7. Who/What department oversees/tracks the use of chemicals within the company? (please list as many as apply)

Position Title	Department	Responsibilities

8. Please list all chemicals used by the company throughout the year. (please provide as much information as possible)

Chemical/Product Name	Purpose of Chemical/Use	Frequency of Use

9. Are there more chemicals used that have not been listed above?

- Yes
- No

10. Please continue to list all chemicals used by the company throughout the year.
(please provide as much information as possible)

Chemical/Product Name	Purpose of Chemical/Use	Frequency of Use

Management Plans

11. Has the company ever created an environmental management plan or environmental program?

- Yes
- No

12. Has the company ever created any of the following plans or programs? (please select all that apply)

- Pollution Prevention
- Chemical Management
- Environmental Management
- Waste Reduction
- Other _____

13. Who were the main creators of this plan/program

- Owner(s)
- Sr. Management
- Management
- Operations
- Employee Representatives
- Employees
- Other _____

14. When was it created?

--

15. Please check all the measures the company's plan/program included

- Sustainable Procurement
- Pollution Prevention
- Waste Management
- Energy Efficiency
- Water Conservation
- Toxic Chemical Management
- Chemical Spills
- Preventative Spill Measures
- Chemical Reuse/Recycling
- Other _____

16. Was it implemented?

- Yes
- No

17. Is it still in place?

- Yes
- No

Chemical Management

A key component of chemical management is disposal techniques. Please answer the following questions as accurately as possible.

Definitions:

Unused Chemicals include: Excess chemicals; chemicals past their 'best before' date; chemicals that can no longer be used for their intended purpose; mislabelled or unlabelled chemicals; chemicals in deteriorating or damaged containers; residuals in chemical containers

Used/Spent Chemicals include: Chemicals used for their intended purpose
Wastes/Effluents include: off-spec chemical products; chemical material or substances that are generated either intentionally or unintentionally that are no longer wanted; debris containing chemicals; runoff containing chemicals.

18. What is done with unused chemicals?

19. What is done with used/spent chemicals?

20. How are potentially toxic wastes/effluents managed?

Information Sharing

As part of the outcome of this research, a chemical management tool may be created. The anticipated purpose of this tool is to help small and medium-sized enterprises properly purchase, store, use, manage, and dispose of the chemicals they use. This tool will only be useful if it meets the needs of the companies it is being designed for.

21. If a Chemical Management Tool was created specifically for Small and Medium-sized Enterprises, would it be useful to the company?

- Yes
 No

22. What information or support could be provided, regarding chemical management that would be helpful to your company?

Information Sharing

It is important that when new information is available, it is relayed to you and the company in the most effective way.

23. Do you, or any employees, attend industry-specific workshops, information sessions and/or conferences?(please list)

- Yes
 No

24. Do you, or any employees, receive industry-specific journals or magazines?
(please list)

- Yes
 No

25. Would an information session about cost-effective environmental opportunities for your business be of interest to you?

- Yes
 No

26. What information should be included in these seminars that would maximize the interest of you or the company?

Final Remarks

27. Any final remarks you would like to make regarding environmental management, chemicals, or information sharing as it pertains to the company or this research?

Thank you for participating in Victoria Thomas' Masters research project "Environmental Management Practices of Small and Medium-sized Enterprises within Nova Scotia".

This research study will contribute new knowledge about opportunities within SMEs for improved environmental management, in particular toxic chemical management. Better understanding of current practices and challenges will permit for the development of tools and informational programs to assist companies gain a competitive advantage by reducing environmentally costs related to activities such as waste management and disposal.

Should you have any questions regarding this study at any time, please contact, Victoria Thomas, Lead Investigator, victoria.thomas@dal.ca or Dr. Michelle Adams, Supervisor, michelle.adams@dal.ca.

If you would like to receive an electronic copy of the final report, once this study is concluded, please provide your e-mail address. Please note that your e-mail address will not be linked to any of the responses you've given. Your responses are and will remain completely anonymous and your e-mail address will remain confidential and not shared with anyone.

Appendix 3

Compiled Resources for Small and Medium-sized Enterprises Related to Chemicals, Legislation, Training and Support

Chemical Information

Website Name	Organization	Content	Website Address
CANLabel ²⁴	CCOHS	Online tool to improve chemical safety by creating compliant product labels.	http://ccohs.ca/products/canlabel/ http://ccohs.ca/products/canlabel/five_easy_steps.pdf
Chemical Substances	Government of Canada	The Government of Canada works with multiple stakeholders to manage and reduce pollution and waste and to maintain and improve the health of Canadians.	http://www.chemicalsubstanceschimiques.gc.ca/index-eng.php
CHEMinfo ²⁴	CCOHS	Comprehensive, practical occupational health and safety information on chemicals.	http://www.ccohs.ca/products/cheminfo/ http://ccinfoweb.ccohs.ca/cheminfo/search.html
CHEMpendium ²⁵	CCOHS	Provides essential chemical hazard information for your workplace and the environment.	http://www.ccohs.ca/products/chempendium/ http://ccinfoweb.ccohs.ca/chempendium/search.html
Material Safety Data Sheet (MSDS)	Health Canada	Overview of MSDS information, guidelines, and requirements.	http://hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/msds-fs-eng.php
Material Safety Data Sheets (MSDS)	CCOHS	Instant access to more than 320,000 MSDSs provided directly from manufacturers and suppliers.	http://www.ccohs.ca/products/msds/ http://ccinfoweb.ccohs.ca/msds/search.html
National Pollutant Release Inventory (NPRI)	Environment Canada	Canada's legislated, publicly accessible inventory of pollutant releases (to air, water	http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=4A577BB9-1

²⁵ Membership fees may be associated with this tool.

		and land), disposals and transfers for recycling.	
Registry of Toxic Effects of Chemical Substances ²⁴ (RTECS)	CCOHS	Critical toxicity data on more than 174,000 chemical substances in the Registry of Toxic Effects of Chemicals.	http://www.ccohs.ca/products/rtecs/ http://ccinfoweb.ccohs.ca/rtecs/search.html
Toxics Use Reduction Institute	University of Massachusetts	Provides resources and tools to reduce the use of toxic chemicals, protect public health and the environment, and increase competitiveness of businesses.	http://www.turi.org/

Legislation

Website Name	Organization	Content	Website Address
Canadian Employment Legislation	CCOHS	Employment legislation by jurisdiction.	http://ccohs.ca/employment/
Canadian enviroOSH Legislation plus Standards ²⁴	CCOHS	All the health, safety and environmental legislation you need in one convenient location.	http://www.ccohs.ca/products/legislation/legislation.html http://www.ccohs.ca/legislation/
Canadian Legal Information Institute	Federation of Law Societies of Canada	Database of all federal and provincial legislation, regulations and key court cases.	http://www.canlii.org/en/
Canada Consumer Product Safety Act Quick Reference Guide	Health Canada	The purpose of the Canada Consumer Product Safety Act is to protect the public by addressing or preventing dangers to human health or safety that are posed by consumer products in Canada.	http://hc-sc.gc.ca/cps-spc/pubs/indust/ccpsa_refer-lcspc/index-eng.php
Environmental Goals and Sustainable Prosperity Act (EGSPA)	Nova Scotia Environment	Legislation to assist Nova Scotians become environmentally and economically sustainable.	http://www.gov.ns.ca/nse/egspa/
Quick Reference Guide to the Hazardous Products Act	Health Canada	Consumer Product Safety of Health Canada establishes and enforces safety standards for consumer products.	http://hc-sc.gc.ca/cps-spc/pubs/indust/reference_guide-consultation_rapid/index-eng.php

Regulations Listed by Act	Nova Scotia Department of Justice	Lists regulations associated with Acts applicable in Nova Scotia.	http://www.gov.ns.ca/just/regulations/regsxact.htm
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Training/Information

Website Name	Organization	Content	Website Address
Canadian Gazette	Government of Canada	Formal public notices, official appointments, proposed regulations, regulations and public Acts of Parliament from government departments and agencies. It also contains miscellaneous public notices from the private sector.	http://www.gazette.gc.ca/index-eng.html
Occupational Health & Safety Facts	CCOHS	An information service provided by the CCOHS whose mandate it is to promote improvements in occupational health and safety by providing practical information to answer workplace concerns.	http://www.ccohs.ca/oshanswers/
Occupational Health & Safety References	CCOHS	Global, authoritative OSH literature coverage in one powerful, easy-to-search collection.	http://www.ccohs.ca/products/oshreferences/ http://ccinfoweb.ccohs.ca/bibliographic/search.html
Environmental & Workplace Health	Health Canada	Information and advice on some of the most common environmental factors that affect human health: air, noise, soil and water pollution, climate change, environmental contaminants, occupational health and safety, pest control and radiation.	http://hc-sc.gc.ca/ewh-semt/index-eng.php
Industry & Health Professional Consumer Product Safety	Health Canada	Guides, publications and reports on product safety for industry and health professionals.	http://hc-sc.gc.ca/cps-spc/pubs/indust/index-eng.php
Canadian Centre for Occupational Health & Safety (CCOHS)	CCOHS	Serve Canadians with credible and relevant tools and resources to improve workplace health and safety programs. This site contains training, guidebooks and	http://www.ccohs.ca/ http://www.ccohs.ca/products/catalogues.html

		resources for businesses concerning many aspects of health and safety.	
Business Fact Sheets	Dalhousie University Eco-Efficiency Centre	The Eco-Efficiency Centre has developed and published many fact sheets regarding many facets of sustainable business practices.	http://eco-efficiency.management.dal.ca/Publications/Business_Fact_Sheets.php
Health & Safety	Nova Scotia Labour and Advanced Education	Contains legislation and training to ensure the health and safety of Nova Scotia employees.	http://www.gov.ns.ca/lae/healthandsafety/
Workplace Hazardous Materials & Information System (WHMIS) – Official National Site	Health Canada	Overview of WHMIS and contains the key elements of the system including labelling of containers, the provision of material safety data sheets (MSDSs) and worker education and training programs.	http://www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php

Small Business Resources

Website Name	Organization	Content	Website Address
Atlantic Canada Opportunities Agency (ACOA)	Atlantic Canada Opportunities Agency	Helping businesses become more competitive, innovative and productive, by working with diverse communities to develop and diversify local economies, and by championing the strengths of Atlantic Canada	http://www.acoa-apeca.gc.ca/Eng/Pages/Home.aspx
Canada Business Network	Government of Canada	Provides business resources to assist with grow, including a wide range of information on government services, programs and regulations.	http://www.canadabusiness.ca/eng/