

A survey of attitudes and perceptions towards CXY, Brandon: environmental and safety issues

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Abstract: The primary objectives of this study are to determine public perception and attitudes toward CXY Chemicals, in Brandon, Manitoba; to examine the regulatory bodies that govern activity at CXY; and to examine their remediation efforts. Four hypotheses are tested to determine the differences in awareness about activities at CXY within the public and the employees of the plant. In general, the results indicate that the public is aware of CXY but unaware of remediation; employees of CXY were found to be significantly more knowledgeable than the public. Results also indicate that the majority of the public believes that advertising is the best way to be educated about issues at CXY. Remediation efforts by CXY through the efforts of the Steering Committee and Community Advisory Panel are exemplary. The study suggests that further research should incorporate a more in-depth questionnaire, working groups, objective scientific research, and an employee history of the plant to analysis the evolution of workplace safety in connection with the environmental movement.

Introduction

The Canadian Chemical Industry is the fourth largest industry in the country in terms of sales (CCPA 1995). The products of this industry are essential components of everyday life, but emissions from these plants can have serious adverse effects on human health and the environment. The areas of concern within the chemical industry include air, water and soil pollution. Chemicals of concern are benzenes, cyclohexanes, chlorinated solvents, polychlorinated biphenyls (PCB's), chlorofluorocarbons (CFC's), oxides of nitrogen (NOx), butanes, hexanes, chlorine, and nitrogen gas emissions (Wilson 1996). Public concern over safety in the chemical industry

peaked in 1984 with the Bhopal, India disaster. Two thousand people died and an additional 300,000 people were injured when the Union Carbide pesticide plant leaked a massive amount of methyl isocyanate into the air. Many people are still suffering from exposure to this toxin and have continuing health problems (Earth Base 1994-96). There is evidence that this disaster was a direct result of lack of safety training as well as faulty operation of the plant. As a result, many studies on industrial safety were commissioned both in Canada and internationally. The Bhopal accident led to the development of the Responsible Care program by the Canadian Chemical Producers Association (CCPA 1995).

CXY Chemicals is a member of the CCPA and participates fully in its Responsible Care program. The responsibilities involve adherence to the six codes of conduct which are (i) community awareness and emergency response (CAER); (ii) research and development; (iii) manufacturing; (iv) transportation; (v) distribution; and (vi) hazardous waste management. The company is responsible to ensure that these codes are strictly complied to. This study focuses on the first code of Responsible Care, which stresses the importance of informing the public of the hazards and risks associated with operating the plant.

There is extensive literature regarding numerous aspects of the chemical industry. In order to understand issues pertaining to CXY, a brief literature review concerning perception and attitudes, public opinion, risk perception and remediation is presented. In addition, the regulatory bodies that are applicable to the chemical industry are examined. The remainder of this paper presents the history of CXY in Brandon and their current efforts of remediation; the methodology of the study and survey results; and finally, the concluding remarks will discuss implications of the study.

Perceptions and Attitudes

Disasters such as the Bhopal accident have tainted the image of the chemical industry, and the media has played a critical role in society's perceptions (Williamson 1994). People have become concerned about living near or being exposed to chemicals, even

though it has been noted that chemical sources are one of the lowest causes of cancer and other health related problems (Greenberg 1986; Williamson 1994).

Numerous studies have examined how subjective perception of reality is confused with objective reality (Tuan 1975; Yalow 1995; Hendee 1995). This confusion is perpetuated through a distrust of science. Perception of risk is commonly dependent on knowledge, opinions of trusted individuals, cultural heritage or our physical environment (Hendee 1995). Ignorance can therefore, be a source for fear about an unknown; this factor was demonstrated in a study of construction workers at a pulp plant (Kovac 1993). In this investigation it was revealed that these workers viewed themselves at a higher risk to gas exposure than did regular employees of the same plant. There have been numerous other studies on the subject of risk and risk perception, some of which have involved surveys of the public as well as employees of the chemical industry (Viscusi and O'Connor 1984; Slovic 1987; Farid and Lirtzman 1991). For the most part perceived risk is understood to be much higher than actual risk (Williamson 1994; Hendee 1995).

Regardless, public attitude is a driving force for change. Widespread public concern and action can cause changes in legislation and influence the environmental behavior of a company (Wilson 1996). Research indicates that attitudes are linked to an individual's social experience (Converse, 1987). For example, if a person has health problems because of chemical exposure this is likely to influence their attitude toward the chemical industry.

This study of CXY was initiated to determine what the residents of Brandon knew about CXY, and to see where they may have received their information. If they had negative views of the industry was this formulated because of the media? Was it because of the *image* of the chemical industry? Were their perceptions based primarily on lack of information?

Public Opinion and Risk Perception

Public opinion is a force that has the potential to influence change in our society. It is founded on attitudes, perceptions and the flow of information. This is important because, in most cases, a person's risk perception represents an emotional response rather than a reasoned one. For example, many people are afraid to fly even though statistics indicate that flying is safer than driving a car (Taczanowski 1992). When a risk arises concerning human health, people may blame industry despite the fact that some studies indicate that the health risks from industry are lower than cigarette smoking (Hong 1992; Williamson 1994). It has also been demonstrated however, that people tend to accept a high degree of risk rather than change their behavior (Macdonald 1992).

Risk perception is influenced by three factors: (i) the current state of knowledge of authorities; (ii) how this information is passed on to the public through media, and; (iii) how credible these authorities are to the public. The media plays an important role in educating the public, but it can also sensationalize and induce mass hysteria (Taczanowski 1992).

Thus, the attitudes and perceptions of the communities in Brandon are invaluable to determine public opinion towards CXY. The media's role in educating the public about CXY is crucial and cannot be underestimated.

Remediation

Remediation projects are an important dimension of the modern chemical industry. This often includes bioremediation, or the relocation and excavation of hazardous dump-sites (Board 1996). Remediation is a controversial issue. Some suggest that remediation can positively affect the environment and can help improve production, company profits, and public image (Green 1994; Williamson 1994; Wilson 1996), while others argue that the cost of cleaning-up is too great and cuts profits (Walley and Whitehead 1994). This latter view is especially evident when out-of-date plants

need to be upgraded to comply with stricter environmental emission regulations.

The Super Fund plan in the United States was set up by the Environmental Protection Agency (EPA) to regulate remediation and hazardous waste cleanup operations (EPA 1998). Critics of the program state that this has been a costly venture without resolution (Hong 1992). In Canada remediation has been voluntary, except in a few cases where legislation has forced companies to upgrade.

Remediation efforts at CXY Chemicals began in June 1995, when it signed a Memorandum of Understanding (MOU) with the provincial government. This voluntary initiative was one of the first of its kind in Canada. Remediation has resulted in the cleanup of various toxic sites within the plant boundary and will be discussed later in this paper.

Regulation

There are many institutions that regulate the activities of the chemical industry in Canada. Environmental legislation, both federal and provincial, involves bodies such as the Canadian Environmental Protection Agency (CEPA) and the Canadian Council of Ministers of the Environment (CCME). The Canadian Chemical Producers Association (CCPA) also plays an important role. Internationally, organizations such as the Organization for Economic Cooperation and Development (OECD), the United Nations Environment Program (UNEP), and the European Union (EU) regulate and recommend procedures for safety and for protection of the environment (Bisset 1993). The International Standards Organization (ISO) is an environmental management system standard that also acts as a regulator for its members. ISO 9000 is primarily concerned with production quality and ISO 14000 involves the implementation of an environmental policy. All of these organizations have provisions and requirements for membership. Although voluntary, membership in these organizations gives industry a certain status and demonstrates a desire to protect the environment. Environmental legislation, on

the other hand, is not voluntary and outlines the procedures that industry must abide by or risk prosecution.

Canadian Federal Legislation

The Canadian Environmental Law Guide (Wilson 1996) outlines the major Canadian environmental regulations. It points out that Canadian environmental legislation is mainly compiled in the Canadian Environmental Protection Act (CEPA), enacted in 1988. CEPA consists of 26 regulations and provides for the identification, assessment and management of toxic substances. The Act authorizes regulations controlling the discharge of these substances into the environment. CEPA is divided into several sections including toxic substances, environmental quality objectives, guidelines and codes of good practice, international air pollution, and ocean dumping. Part II of CEPA has the greatest potential implications for the chemical industry. This section covers the classification and regulation of toxic substances and sets up a "cradle-to-grave" system of controls for listed toxins.

Every year the Federal ministry publishes a National Pollutant Release Inventory (NPRI). This inventory is a current listing of toxic substances. Industries which use, manufacture or process listed toxins must report to the Ministry. For instance, in 1995 there were 176 substances on the list that were considered a threat to human health or the environment.

CEPA also requires mandatory reporting of a release and remedial action in the case of spillage of a toxic chemical. A company (which includes manufacturers, processors, importers, retailers, or distributors) may also be required to give notice of any dangerous substance to the public, manufacturer, processor, importer, retailer, or distributor of the substance. CEPA has been criticized however, due to its failure to address issues related to environmental emergency management, and some have suggested that CEPA should be amended to allow for this important issue (Bisset 1993).

Manitoba Provincial Legislation

In Manitoba, health concerns related to pollution were originally dealt with under the Public Health Act and this stood until 1935, when the Prevention of Water Pollution Control Act was enacted. This was the beginning of pollution control in Manitoba. In 1968 the Clean Environment Act was passed, issuing orders to limit and control pollution. Throughout the 1970s regulations were developed under this act to control and regulate pollution (Province of Manitoba 1981).

The Environmental Management Division and the Manitoba Environment Council were also governing bodies during the 1970s. The Environmental Management Division was responsible for such areas as air monitoring, solid waste and water systems, and water quality. The purpose of the Manitoba Environment Council was to advise the ministry of environmental problems and issues of concern to Manitobans (Keleher 1974).

During the late 1980s and the early 1990s many provincial acts were passed; chief among these was the implementation of the Manitoba Environment Act (1988), which replaced the Clean Environment Act. The goal of the Manitoba Environment Act is to prevent environmental damage and to protect Manitoba's environment for future generations. It covers the issuing of permits as well as environmental assessments. Under the Act a State of the Environment Report must be published every two years in order to keep the public informed of government progress. Fines under the act range from \$100,000 for an individual to \$1,000,000 for a corporation (Manitoba Environment 1991). The following section will present the history of CXY Chemicals and examine their remediation efforts.

CXY Chemicals CXY Chemicals

CXY Chemicals is located approximately 7 km east of Brandon, on Richmond Avenue (Figure 1). The plant was built in 1968 by Dryden Chemicals Ltd. At that time the plant produced chlorine, caustic soda, sodium chlorate, hydrochloric acid, and soda ash.

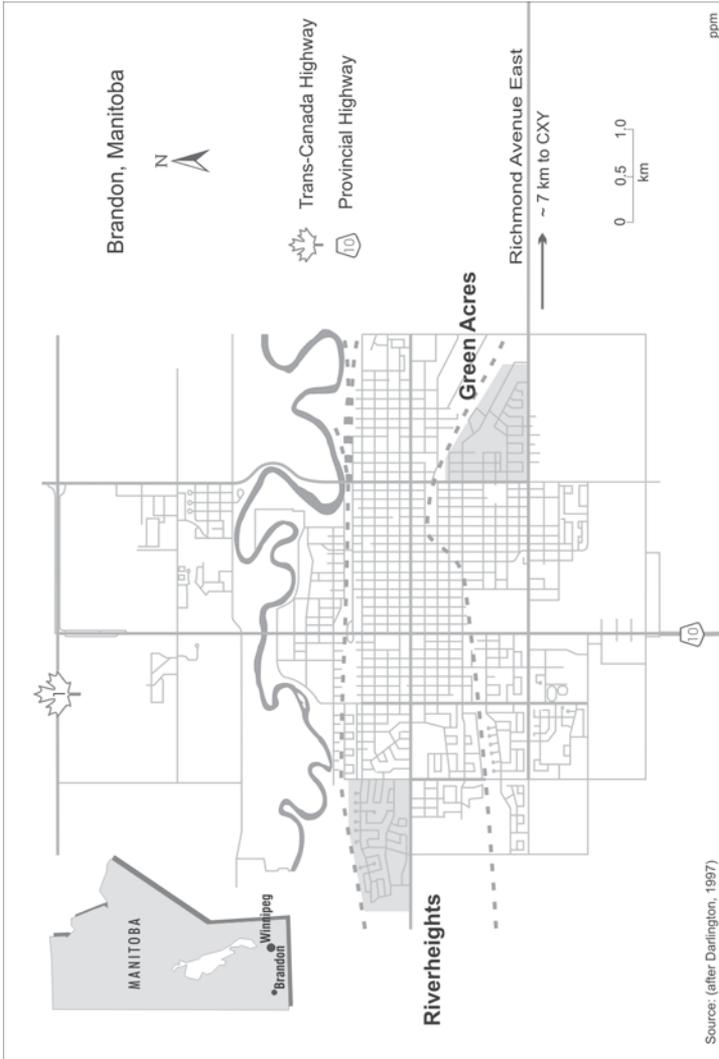


Figure 1: The study area.

Other materials used or produced by the plant included asbestos, and sodium chloride (Wotton and Elias 1996).

In 1974 CanadianOxy Chemicals (Canadian Occidental Petroleum Ltd.) bought the plant and subleased it to Hooker Chemicals. Four years later, CanadianOxy Chemicals took over the management of the plant, and developed it as a “sodium chlorate only” facility. Sodium chlorate is used in the process of bleaching paper in the wood and pulp industry. CanadianOxy was renamed CXY Chemicals in 1995 when a partnership was made between CanadianOxy (based in Calgary) and Occidental Chemical Corporation (headquartered in Los Angeles, California) (CXY Chemicals, n.d.). CXY Chemicals is the second largest producer of sodium chlorate in North America. Of the seven CXY plants located across Canada and the U.S., the Brandon plant is the second largest producer of sodium chlorate (CXY Chemicals, n.d. (b)). It is also one of the lowest cost producers of sodium chlorate in North America (Bunting 1998).

Environmental legislation was not stringent in 1968 when the Dryden Chemical Ltd. plant opened. Accepted practices at the time included open and unlined sludge pits (Figures 2a and 2b), surface runoff into ditches and the Assiniboine River, and chlorine emissions, which adversely impacted the vegetation around the plant in the 1970s. Areas on the plant site which were impacted by facility operations included the settling pond, the PCB building area, the rail car loading area, the cooling tower area, the current and former burn pits, the construction landfill, and the septic field (Figure 3). The soil and groundwater in these areas were mainly impacted through spills, unsafe disposal of wastes, and release of effluent (CXY 1996).

On June 9, 1995, CXY Chemicals and Manitoba Environment signed a Memorandum of Understanding (MOU). This document was signed to support legislation that would ensure remediation of contaminated sites. The MOU solidified CXY’s intent to voluntarily clean up the plant site. An interesting aspect about this MOU is that it is an entirely voluntary initiative with no legally binding obligations and it is among the first voluntary initiatives to deal with site remediation in Canada (CXY 1995). In June 1996, the following studies were commissioned by the Steering



Figure 2a: CXY circa 1974 (Source: CXY Chemicals, Brandon, Manitoba).



Figure 2b: CXY circa 1996 (Source: Al Rogosin, Brandon, Manitoba).

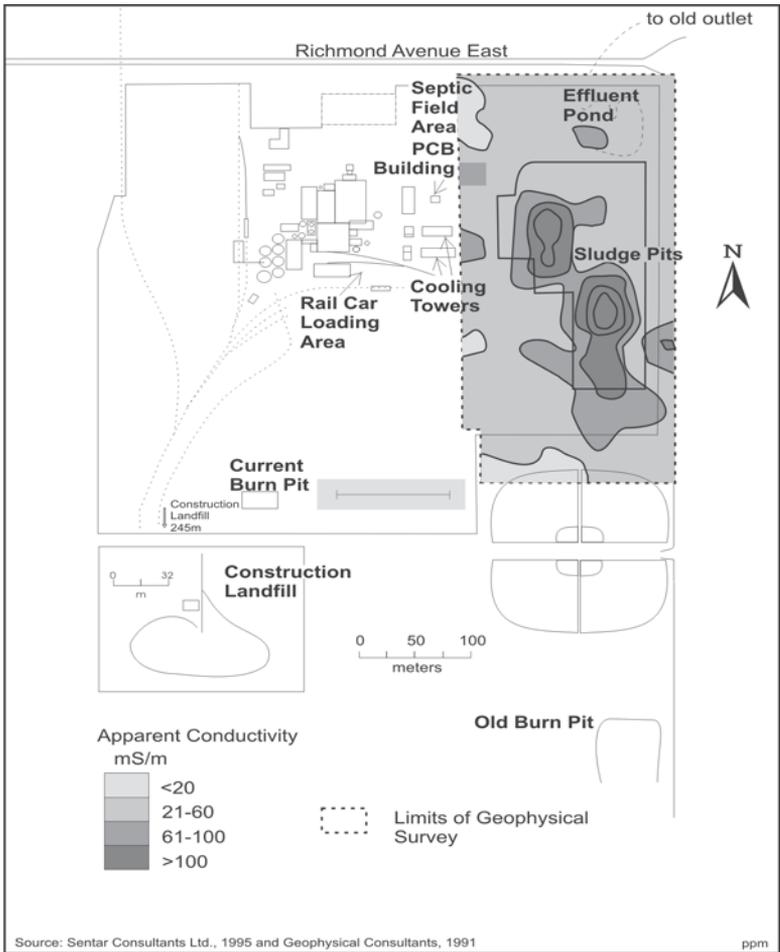


Figure 3: CXY 's remediation sites.

Committee / Advisory Panel (SC/CAP): (i) regular semi-annual groundwater monitoring of the site; (ii) additional soil testing and other research to fill gaps in information; (iii) additional health risk analysis including examining results of 1996 groundwater monitoring, and; (iv) development of remediation options for each site (The Steering Committee 1997).

At the November 1997 meeting the SC/CAP discussed remediation options for the sludge located in the lagoons and the settling pond. The majority of the contents of the sludge are non-hazardous, but there is concern about asbestos. It is likely that the sludge pits will be excavated and the contents transferred to a suitable landfill site, but the final destination has not yet been determined (SC/CAP Nov.1997).

The studies on groundwater have shown that the water does not meet drinking water guidelines for chloride and chromium. This is not a concern for local potable water wells or dugouts because these are located upstream from the plant. These contaminants would be of concern however, if the site were to revert to agricultural use in the future. The SC/CAP hopes that remediation efforts will cleanup the source of contamination and ensure safety for any type of potential land use in years to come (The Steering Committee 1996). The subsequent section will outline the study area, methodology and present the results of the questionnaire survey.

Study Area and Methodology

The study area for this research includes two communities within the City of Brandon and the CXY Brandon plant site. The City of Brandon is located approximately 200 km west of Winnipeg, Manitoba. Present population of Brandon is approximately 40,000 people. The two communities that were targeted for survey analysis in the city were Riverheights in the west end and, Green Acres in the east end. These communities were chosen because of their different proximities to CXY and because of their socioeconomic differences. According to Welsted, Everitt and Stadel (1988), historically the east side of Brandon was occupied by the working class and the upper class settled in the west end. Their research suggests that people at the extremes of a social scale will often locate at opposite ends of the city. In Brandon, the west end has newer, more expensive homes and is inhabited mostly by the middle and upper-middle social class. The east end has older, less

Table 1: Response Rates, Brandon, 1988

Sample	Surveys	Distributed Frequency	Percentage
Green Acres	92	38	41
Riverheights	81	42	52
CXY	43	27	63
SC/CAP	12	6	50
Totals	228	113	50

expensive homes that are owned or lived in by lower-middle social class.

The research methodology included direct personal interviews and a questionnaire survey. In order to obtain a higher response rate both a mail and a telephone survey were employed in this study as they are considered as complementary survey methods (Lounsbury and Aldrich 1986). Its major advantage is that it is relatively inexpensive and flexible. Its major disadvantage is that respondents are often highly suspicious and reluctant to cooperate. The mail survey, on the other hand, is relatively low-cost and easy to distribute. Response rates for this study are outlined in Table 1.

Hypotheses

Four hypotheses were tested in order to examine various aspects of public perception and knowledge of CXY. The pertinent components for this study include: (i) proximity to CXY; (ii) education of respondents; (iii) involvement of respondents, and; (iv) the determination of community awareness.

In the context of this study, the flow of goods and information are elements of spatial interaction. Characteristically, spatial interaction declines with distance (a phenomenon otherwise known as the distance decay function) (de Souza 1990). Green Acres is the closest residential community to CXY in Brandon. It would be expected that knowledge and interest in activities at CXY will

decrease with distance, and since Riverheights is at the west end of Brandon, it was hypothesized that this community would be less interested or knowledgeable about activities at the plant.

Hypothesis #1: that the Green Acres community in Brandon will be more knowledgeable than Riverheights about activities at CXY because of its proximity to the CXY plant.

In this study, education was used as a proxy variable for socioeconomic status. Various studies support the assumption that people with more education will be in a higher income bracket than people with less education (Smart and Pascarella 1986; Whitaker and Pascarella 1994). People who have a higher level of educational attainment (in this case, university education) should have more exposure to environmental issues, more opportunity to study issues, and will thus develop a more educated assessment of issues than people who have attended only high school or college.

Hypothesis #2: that people with a higher level of formal educational attainment will be more knowledgeable about CXY and its activities than people with less formal educational backgrounds.

Employees of Manitoba Environment, of CXY, and members of the Steering Committee/Community Advisory Panel (SC/CAP) are involved in the decision-making processes related to CXY's activities and thus will have more understanding about the issues.

Hypothesis #3: that persons involved within the chemical industry will be more knowledgeable about issues pertaining to CXY than the general public.

The goal of the Community Awareness / Emergency Response (CAER) code under the Responsible Care mandate is to reduce

public concern vis-à-vis chemicals in their community. Although CXY has conducted open houses, plant tours, and published information for public use, it is hypothesized that community awareness is lacking. In fact, unless a major chemical accident occurs, people are not likely to be interested in the activities of CXY.

Hypothesis #4: that the Community Awareness/Emergency Response (CAER) code of conduct within the Responsible Care mandate is not effectively informing the general public about activities within the plant.

Survey Results and Discussion

The first hypothesis postulated that because Green Acres is closer to CXY than Riverheights, its residents would be more knowledgeable about issues relating to the plant. In order to test this hypothesis, this section analysed a series of questions concerning knowledge and awareness. Respondents were asked whether they were aware of remediation efforts at the plant. This question was important to this study because it indicated whether the communities had an intimate knowledge about activities at the plant. Overall, 30 percent of both communities knew about remediation at the plant, but a substantial proportion of respondents were unaware (70 percent).

Two survey questions concerned safety training of employees and preparedness of CXY for emergencies. The majority of people in both communities had no opinion on this subject; however, 47 percent of Green Acres' respondents agreed that CXY is adequately prepared for emergencies, compared with 36 percent of Riverheights respondents (Table 2). It is apparent that residents in Green Acres are more confident about emergency preparedness than Riverheights respondents, implying that proximity does indicate more knowledge or more confidence in terms of emergency preparedness.

Table 2: *Distribution of opinion on “CXY is adequately prepared for emergencies” (percentage)*

Responses	Green Acres n=38	Riverheights n=42	Total n=80
Strongly Agree*	13	10	11
Agree*	34	26	30
No Opinion*	53	62	58
Disagree	0	2	1
Strongly Disagree	0	0	0

X^2 ($p < 0.001$; $df = 2$) = 79.00 (Significant)

* only these three categories were used for chi-square analysis

Education was chosen to be the representative socio-economic variable. The educational levels were categorized as: (i) high school, (ii) college and, (iii) university. It was hypothesized that people with university education would have more knowledge and interest in activities at the plant. Interest in activities of the plant was measured by asking respondents if they would be interested in attending an open house. Survey data indicates that 65 percent of university graduates and 56 percent of high school graduates would attend an open house. Among the college graduates, only 31 percent were in favor of attending an open house. From these results it could be concluded that the university sample is slightly more interested in activities at the plant.

When asked whether CXY had a negative impact on the local environment 54 percent of respondents with high school and college background, and 46 percent of the sample with university background had no opinion. However, 46 percent of the college-sample, 42 percent of the university-sample, and 41 percent of the high school-sample indicated that they did not think CXY has caused a negative impact on the local environment (Table 3). Thus, there is very little difference in response between the three education levels on this question. Other survey results suggest that there is little difference between education level and knowledge of issues

Table 3: Distribution of opinion on “CXY has a negative impact on the local environment” (percentage)

Responses	High School	College	University
	n=41	n=13	n=26
Strongly Agree	5	0	4
Agree	0	0	8
No Opinion	54	54	46
Disagree	34	46	31
Strongly Disagree	7	0	11

pertaining to CXY. Further comprehensive study would substantiate and provide more accurate results on these issues. Interest in activities at CXY could be more dependent on other factors, such as social contacts, than on education level.

One critical issue in this study is to examine the perceptions of the common public vs. those who are directly involved with CXY. It would be expected that the general public would be less knowledgeable about activities at CXY than would management, regulators, and employees. For this section the term “Insiders” is used to include employees of CXY and regulators who participated in the survey.

Insiders were more interested in attending open houses at the plant (88 percent) than were the community members (54 percent), indicating a stronger interest in activities of the plant on the part of insiders. In terms of whether CXY has a negative impact on the environment, 51 percent of the community had no opinion and 43 percent disagreed with the statement. This contrasted with 6 percent of the insiders who had no opinion and 88 percent who disagreed. Surprisingly 6 percent of both samples felt that CXY did have a negative impact on the environment. The insiders were more convinced that CXY’s efforts had changed public perception of the chemical industry than did the general public: 70 percent of the respondents agreed or strongly agreed with the statement,

Table 4: Distribution of opinion on “Public perception of the chemical industry has improved because of CXY’s efforts”(percentage)

Response	Community n = 80	Insiders n = 33
Strongly Agree	1	3
Agree	26	67
No Opinion	64	27
Disagree	9	3
Strongly Disagree	0	0

X^2 ($p < 0.001$; $df = 2$) = 113.00 (Significant)

* these categories were grouped into three categories: somewhat agree, no opinion and somewhat disagree, for chi-square analysis.

compared to 27 percent of the community. The community had a higher rate with no opinion (64 percent) than did the insiders (27 percent). This question indicates how different the view from inside the industry is compared to outsiders, such as community members. Community members, who have little understanding about activities at CXY, do not believe that perception has changed, whereas individuals within the industry disagree with this notion.

Another interesting comparison between the community and the insiders was the ranking of factors that motivates industry to change its processing methods. Both the community and the insiders ranked compliance to environmental legislation as the number one choice. The second choice was management directives (such as Responsible Care and the MOU) for insiders and public pressure for the community. This was interesting because the community ranks public pressure higher than the insiders do. The community ranked management directives last on the list. Personnel who are involved in the industry have more understanding about how management can influence the activities of CXY, because of management directives.

CXY has attempted to increase public awareness through open houses, newspaper advertisements (Brandon Sun 1997), and contributions to public libraries. Even with these attempts it would appear that the respondents in this survey are unaware of activities at the plant. Results show that the public believes that advertising is the best way to learn more about CXY. Suggestions for advertising included public television programs or advertisements in the newspaper. The public rated open houses as the second best choice; however, 41 percent of respondents indicated that they would not attend an open house. Notably, 39 percent of respondents who knew about changes at CXY learned about them from the media. This supports the fact that the media is perhaps the best way for CXY to communicate to the public. Perceptions of the public are dependent upon the media and misconceptions can occur. It is extremely important that the media be responsible in properly educating the public about objective risk (Taczanowski 1992).

Overall, it seems that Green Acres is slightly more knowledgeable than Riverheights about activities at CXY. Therefore the first hypothesis was accepted. It was also found that there was no difference in awareness and knowledge by education levels, thereby not allowing acceptance of the second hypothesis. The employees of CXY definitely have more knowledge than the general public, which supports hypothesis three. The CARE code was found to be generally ineffective, which supports hypothesis four.

Conclusions

The results of this study indicated that the two residential communities in Brandon are aware of CXY, but not aware of remediation there. It also indicates some degree of confidence in safety training for employees and emergency preparedness of CXY. Results also indicated that the public felt that advertising was the best way for CXY to communicate about remediation. This was interesting because it shows that the media is perceived to play an important role in public education. This makes it important for the media to be responsible in dealing with public issues. It also shows how unbiased reporting can educate the public responsibly, so that

people can decide for themselves where they stand in terms of the issues concerned. This is an essential component of societal change.

Another issue that deserves attention here is the size of Brandon. Brandon is a small city and, relative to larger cities, social contacts between people are likely to be more frequent. The perceptions and attitudes of friends, or peer groups will be more likely to influence how people make inferences about CXY rather than open houses, tours, media coverage or other sources of information.

It was somewhat disappointing to receive many “no opinion” responses in the survey. This was indicative however, of the nature and state of the perceptions and attitudes of the general public. They are mostly unaware of issues relating to CXY. For the most part, respondents found the questionnaire difficult to complete. This is also an indication of lack of knowledge. It is firmly believed that unless something dramatic was to happen, which would affect people personally, for example, an explosion at CXY, or a chemical truck spilling over, there is little interest in the chemical industry.

The results from this study demonstrate that CXY could be used as a model for larger industry. CXY is a small company, employing only 45 people and producing small amounts of toxic chemicals. The products of this industry however, are generally targeted towards a non-agricultural endpoint making it unique in this area. This is an interesting contrast. While CXY is working towards remediation and a better public image, they are supplying the raw materials for one of the most environmentally damaging industries, the pulp and paper industry. Certainly the methods by which CXY has voluntarily remediated areas on site, sets an example for larger industries. The efforts by the SC/CAP have been invaluable in this regard. It is important that all stakeholders involved become engaged in dialogues and address the issues cooperatively. It is also essential that members of the general public are able to contribute to this process.

Further in-depth studies could refine our knowledge of the perceptions and attitudes of people in Brandon. The study should contain a more statistically representative sample. The results from such a survey could be then be used to show a more accurate proportion of the population. It would also be interesting to develop working groups that would involve more of a cross-section of the

public than is already represented on the panel. Other research could involve testing the soils and groundwater for contamination. Although these tests have been performed by independent consultants (e.g. SENTAR Consultants Ltd., Geophysical Consultants, and Associated Mining Consultants), it would be interesting to compare them with results from independent academic research. Another interesting research project would be to interview past employees of CXY and examine the workplace safety initiatives in the early days of the plant compared to the current procedures.

Overall, the results and analysis of this study have been very favorable. The chemical industry is only a small part of industry in Canada, and only a small portion of the pollution problem. There is a need for more effective legislation concerning pollution in Canada. Regulations, fines and prosecutions need to be stiffer, inducement need to be established, and grandfather clauses need to be eliminated. These clauses were established in the days of less stringent environmental legislation, and are not applicable in today's society. Society needs to take its stewardship role more seriously and thus be more proactive against industry in order to induce change. As results indicate in this study, knowledge and awareness in society are sadly lacking, and there is an urgent need to address this problem.

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