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# RISK-IN-CONTEXT: THE IMPACT OF A LOCAL LAND USE DISPUTE ON PERCEPTIONS OF TECHNOLOGICAL RISK

Stephen G. Larock
*Western University*

# RISK-IN-CONTEXT: THE IMPACT OF A LOCAL LAND USE DISPUTE ON PERCEPTIONS OF TECHNOLOGICAL RISK

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Stephen G. Larock

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The School of Graduate and Postdoctoral Studies
The University of Western Ontario
London, Ontario, Canada

## ABSTRACT

This risk perception study uses a survey of households in Elgin County, Ontario and Ottawa-West, Ontario proximal to a technological hazard (land use) dispute to test the explanatory power of traditional risk perception models when applied in the local context. It is hypothesized that 'local context variables' – akin to the approach of the social amplification/attenuation of risk framework – will be significant predictors of perceived threat, perhaps more so than the psychometric paradigm and the cultural theory of risk. Likewise, fiduciary equity is hypothesized to be a significant predictor also. Data are analyzed using binary logistic regression and cross tabulations; most notable is the consistent significance of 'local context variables,' both as predictors of perceived threat from the local facility (a landfill) as well as towards non-local controversial technologies (e.g., nuclear facilities). Also intriguing is the significance of fiduciary equity specific to the local hazard as a predictor of perceived threat from non-local technologies. These findings suggest that experience with the local land use dispute is influencing (i.e., sensitizing) perceived threat from the local facility, as well as from technological hazards in general; a finding supporting the importance of specific local contexts (i.e., daily lived experience) in risk perception.



Keywords: Technological risk perception, environmental equity, facility siting, landfill expansion, context, psychometric paradigm, cultural theory of risk

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# Chapter 1:

# Introduction

## 1.1 Research Context

It was thought recently that perceived threat from technological land uses would decrease due to advancements in safety measures and reassurance from experts. However, perceived threat from various technologies continues to escalate as people view themselves as more, rather than less vulnerable to land uses such as landfills, incinerators, and chemical and nuclear facilities (Kasperson et al., 1988, Slovic, 2001). Facility-related concern has become amplified partly because of an increase in reporting about potentially hazardous facilities in the vicinity of the public. For instance, prolific publication about environmental mishaps such as Three Mile Island in Pennsylvania, USA, 1979 has created stigma towards what are now known as locally undesirable land uses (LULUs). Because facility-related concern is on the rise, the ability of the siting process to successfully locate controversial facilities is limited (Kasperson, 2005). Often termed the facility siting dilemma. this impasse describes the scenario whereby the need for facilities is supported, but locating them is extremely difficult due to intense and frequent public opposition (Shaw, 2005). For instance, Saha and Mohai (2005) report that between 1989 and the time of their analysis, no new treatment, storage, and disposal facilities for hazardous waste were successfully sited in Michigan, United Sates. Likewise, Andrew (2001) notes that, as of 2001, 21 of the 31 non-hazardous, municipal solid waste facilities (MSWF) in Ontario, Canada were proposed to be expanded; a likely indication that facility siting authorities are having difficulty locating new landfills in Ontario. The facility siting dilemma has been labeled an acute policy concern because of

the high capital and social costs (i.e., financial and risk infliction) associated with the siting process (Pol et al., 2006, Gallagher, Ferreira, and Covery, 2008, Lesbriel, 2005).

The possibility that public opposition will continue to increase in frequency and intensity is likely; this may well see a subsequent rise in failed facility siting efforts also (Edelstein, 2004, Kasperson, 2005, Andrew, 2001, Saha and Mohai, 2005, Kasperson, 2005). Yet, at the root of the facility siting dilemma is arguably the inability of policy regulators, risk managers, and social scientists to reach a general consensus concerning the primary reasons people oppose potentially hazardous facilities; indeed, the problem is an incomplete understanding of technological risk perception (Hunter and Leyden, 1995, Sjoberg, 2002). Since the characteristics of individuals and hazards change from place to place, risk researchers need to recognize that various people react to different hazards differently. Thus, it is suggested here that risk research conducted in the 'context' in which hazard risks are embedded presents a potential way forward. To clarify, 'context' refers to experience (e.g., awareness and engagement, fairness, and threat) from daily hazard coping: it is argued that specific local contexts are important since daily hazard coping may in fact be bound together with overall facility-related risk perception. However, contemporary risk perception models remain removed from such a focus on specific local contexts. For instance, the psychometric paradigm places emphasis on attributes which describe a particular risk event (e.g., dread) (Slovic, 1987). However, the paradigm does not incorporate the local context such that the focus is on the characteristics of the hazard, not the participant. Likewise, although the cultural theory of risk considers the societal-environmental interaction of the research participant (Lima and Castro, 2005), the framework does not relate the worldviews of individuals to the

local context in which they are created (Masuda and Garvin, 2006). Finally, the social amplification/attenuation of risk (SAR) framework, in using risk signals originating at the point source of a conflict, recognizes that experience, interpretation, and communication of risk events can impact on overall perceptions (Cassiday, 2007). Thus, this framework, and social and cultural theories of risk in general, seem the most relevant to technological risk research.

By way of comparison using a survey of respondents living near a landfill expansion in Elgin County, Ontario and an expansion proposal dispute in Ottawa-West, Ontario, the goal of this study is to determine which is most valuable to the study of technological risk perception; the psychometric paradigm, the cultural theory of risk, or a 'risk-in-context' approach (i.e., using local context variables), akin to the SAR framework. As such, the focus of this study is risk-in-context; the impact of daily experience with an immediately controversial land use on perceptions of risk towards that land use (a landfill expansion), as well the impact of daily hazard coping on risk perception towards non-local controversial hazards (e.g., nuclear facilities), is investigated. The goal of this comparison is to contribute to the growing body of empirical literature directed at better understanding the role of local context in risk perception while testing the explanatory power of 'competing' views on risk perception.

## 1.2 Research Problem

This study investigates one of the main problems in technological risk perception research: to account for the variance in risk preferences between individuals and groups. Thus, the main challenge is to explain why some communities/community members are willing to accept controversial land uses while others are not. As such, this research

examines how experience with a local, immediately controversial technological land use (a landfill expansion/proposed expansion) impacts on individual perceptions of technological risk to the local hazard (a landfill) as well as towards non-locally controversial hazards less relevant in the local communities (e.g., incinerators, chemical facilities, and nuclear installations); the impact on risk perception from daily hazard coping forms the basis for a comparison between the predictive power of various models for studying risk perception. In addition, a subset of an already empirically substantiated form of equity, termed fiduciary equity, is tested here for the first time academically. This is done in order to provide a more thorough account of perceived threat and to more rigorously test the importance of specific local contexts in risk perception.

## 1.3 Research Objectives

This study has three main objectives: 1) to develop a better understanding of why various individuals/groups respond to different hazards differently; 2) to test the ability of various paradigms of risk perception to predict perceived threat, and; 3) to test the nuances of an operationally defined, context specific measure of environmental equity, termed fiduciary equity. As such, the research hypotheses are as follows:

1. Local context variables (i.e., risk in context – akin to the SAR framework) will be significant predictors of risk perception toward the local facility, perhaps more so than the psychometric paradigm and the cultural theory of risk.

    1.2 The null hypothesis is that the local context variables will be less likely to be significant predictors of perceived threat from the non-local controversial hazards – a) incinerators, b) chemical facilities, c) nuclear facilities.

2. Fiduciary equity will be a significant predictor of perceived threat from the locally controversial land use.

## 1.4 Chapter Summaries

This thesis contains six chapters. The second chapter presents a comprehensive review of empirical literature focused on traditional methods of studying technological risk (e.g., the cultural theory of risk, the psychometric paradigm, and the SAR framework), while emphasizing the importance of specific local contexts in risk research. In addition, literature pertaining to environmental equity is reviewed since perceptions of fairness are often linked to perceived threat. Chapter 3 highlights the methodology employed in this study paying particular attention to the survey design, construction of the sampling framework, and modes of analysis. Also, this section includes a detailed description of the sample locations and populations. Following this, and roughly outlined by the research hypotheses noted above, the findings of this study are presented. Next, Chapter 5 discusses the findings of this study in relation to the literature reviewed in Chapter 2. The main focus of this section is on contrasting the effect of various predictor variables of risk perception under the psychometric paradigm and the cultural theory of risk with the local context variables included as per the risk-in-context approach. Finally, Chapter 6 notes the contributions of this study to the risk perception and environmental equity literature while providing some recommendations for future research.

# Chapter 2:

## A Review of Approaches to Studying Technological Risk Perception

### 2.1 Introduction

This review of risk perception literature highlights the concepts and frameworks which may be useful for understanding how people perceive risks from technological hazards in general, and from a local facility in particular. More specifically, this section focuses on the limitations of current technological risk perception models, in particular their inability to fully account for context in technological risk perception. Yet, considering local context in risk research is important since different groups of people may react very differently to a variety of technological risks (Mitchell and Carson, 1986, Lober and Green, 1994, Elliott et al., 2004). Thus, it is maintained here that accounting for context (i.e., daily lived experience) is necessary in risk research (Sjoberg, 1999, Masuda and Garvin, 2006).

This chapter begins with a brief review of technological/environmental risk perception with some emphasis on roots in geography. Subsequently, various risk perception models, developed in part to gain an understanding of perceived risk from LULUs are evaluated. These include the psychometric paradigm, the cultural theory of risk perception, and the SAR framework. Additionally, this section considers various aspects of environmental equity (e.g., fiduciary equity) since equity and fairness concerns are commonly regarded as important determinants of risk perception (Slovic 1987, Bohenblust and Slovic, 1998, Satterfield et al., 2004). These last sections lead into the main theme of this review: that context and 'place' in risk perception research (i.e., risk-

in-context), as well as contextual aspects of environmental equity (i.e., fiduciary equity) are understudied, potentially valuable concepts for explaining risk perception-in-context.

## 2.2 Risk Perception Research: The geographic perspective

Risk research emerged in the 1960s as researchers attempted to explain why various people respond to hazards differently. Initial investigations were in the context of risk taking and decision making about a variety of activities (e.g., gambling) (Slovic, Lichtenstein, and Edwards, 1965). Motivated somewhat by Starr's (1969) research examining social benefit relative to technological risk, as well as White's (1958) work about human response to natural hazards, various risk researchers directed their efforts at understanding people's responses to natural and technological hazard risks (Slovic, 1987). The call for environmental and technological risk research intensified in the 1970s and 1980s as several minor, yet heavily publicized environmental mishaps (e.g., Three Mile Island, Pennsylvania, USA, 1979) drew the public's attention towards potentially hazardous technologies in their vicinity. Although partially rooted in psychology, this focus on understanding environmental and technological risk perception signified the birth of risk research in geography. That is, risk research involving technological land uses is arguably replete with geographical concepts since considering a component of the environment (i.e., land use) as a risk is inherently geographic (Kasperson and Dow, 1993).

Risk research through a geographic lens was initially centered on the concept of bounded rationality introduced by Simon (1956). Theoretically, bounded rationality relates limited cognitive abilities and forced judgments with poor decisions regarding where to live, for example. It was found that as a result of limited prior knowledge, inaccurate perceptions, and an often inflexible decision-making process, an individual's

supposedly inappropriate behaviour (e.g., living in a floodplain) could be accounted for (Slovic, Kunreuther, and White, 1974). Although hotly debated, initial studies suggested that there was a single rationality to decision making which influenced risk perception to technological and environmental hazards (Watts, 1983). However, due to this limited perspective on risk choice, and its narrowed view of social theory and context, the bounded rationality approach gave way to other models of risk perception more adept at accounting for the variance in perceived risk. These include, amoung others, the psychometric paradigm and the cultural theory of risk (Fischhoff et al., 1978, Slovic, 1987, Douglas and Wildavsky, 1982).

## 2.3 Conventional Risk Perception Models

In general, risk perception research emerged in response to the increased prevalence of public opposition to LULUs and technologies (Saha and Mohai, 2005). As such, an implicit goal of technological risk perception research has been to inform policy decisions regarding the placement, operation, and upkeep of LULUs while developing an understanding of how risk perception varies based on a hazard's characteristics, the "culture" of the perceivers in question, and the context in which they interact (Fischhoff et al., 1978, Sjoberg, 2004). When applied to geographical issues (e.g., facility siting), the psychometric paradigm has been praised in the risk perception literature for its ability to explain risk preferences as a function of a few underlying hazard characteristics. It is, however, often criticized for its failure to provide a contextual measure of risk perception (Siegerst, Keller, and Kiers, 2005, Willis et al., 2005). Similarly, while the cultural theory does account for context to some degree (i.e., individual worldviews), its ability to fully account for risk preferences remains limited since the specific context in which a

hazard occurs remains unaccounted for (Langford et al., 2000). Beginning with the former, the following sections explore the contributions and limitations of these theories.

### 2.3.1 The Psychometric Paradigm

The psychometric paradigm emerged as a preliminary framework for understanding why different people perceive a variety of hazards differently. Proponents of the psychometric paradigm suggest that risk perception is best understood as a reaction to a hazard's characteristics (e.g., dread), and is not a function of the perceivers themselves. Over the past several decades, this paradigm has dominated the risk assessment process (Bronfman et al., 2007). Both Fischhoff et al. (1978) and Slovic (1987), in reaction to the initial 'how safe is safe enough' risk analysis writings of Starr (1969), contributed to the development of the psychometric paradigm. In contrast to Starr's focus on revealed preferences (i.e., inferring views from the activities one participates in), the aim of the psychometric paradigm is to understand the factors that drive risk perception at the individual level by eliciting expressed hazard preferences (i.e., asking people their views).

The psycho-scaling process of the psychometric paradigm is dependant on heuristics (i.e., immediate, subconscious reactions to stimulus) that operate when a survey participant is asked to respond to a variety of hazard characteristics. As such, participants in psychometric studies "make quantitative judgments about the current and desired riskiness of diverse hazards and the desired level of regulation of each..." hazard characteristic (Slovic, 1987, p.281). These individual expressed preferences are meant to be extrapolated to make generalizations about a larger group which may or may not face the hazard in question on a daily basis (Siegrist et al., 2005). This aggregate method,

through averaging the data over the participant's responses, allows for a stable estimate of the impact of each hazard characteristic on the risk perception of a general population. Also, aggregation allows hazards to be described in terms of a few underlying characteristics as opposed to multiple factors. For example, hazard characteristics such as dread, catastrophic potential, and voluntariness are often found to be significantly correlated with perceptions of threat (Willis et al., 2005, Bronfman et al., 2007). Likewise, several studies have taken a disaggregated approach to the psychometric paradigm where the focus is intra-individual differences in risk perception (Gardner and Gould, 1989, Marris, Langford, and O'Riordan, 1998). Nonetheless, results from these types of studies are typically similar. As such, the psychometric paradigm suggests that the characteristics of the hazards (i.e., dread) are significant determinants of risk perception, perhaps more so than the social, cultural, or contextual factors also found to impact on the perception of risk (Baxter, Eyles, and Elliott, 1999, Sjoberg, 2004).

As suggested, the psychometric paradigm uses diverse hazards and people and typically measures risk perception in general populations who may not face risk on a day-to-day basis. That is, the focus is on heterogeneous groups of people (i.e., randomly selected, convenience sampling of mixed groups) and their reaction to an equally heterogeneous list of hazards (Kraus and Slovic, 1988). For instance, participants are often asked to respond to diverse hazards ranging from the dangers associated with cigarette smoking to the threat from nuclear power facilities (Slovic, 1987). Doing so allows the psychometric paradigm to reach its goal: to explain general risk preference in a large group of people as a function of a few underlying hazard characteristics. These

sacrifices of breadth for depth, along with other limitations of the psychometric paradigm, are presented below.

### 2.3.2 Limitations of the Psychometric Paradigm

While its contributions to the general study of risk perception are well noted (Willlis et al., 2005), when directed at understanding how daily lived experience impacts on perceptions of risk, several underlying principles of the psychometric paradigm are suspect; these include the use of a large, heterogeneous list of hazards (i.e., 30 or more), the use of an equally heterogeneous selection of research participants (i.e., convenience sampling), the assigned importance of hazard characteristics (e.g., dread and voluntariness), and the use of aggregated levels of analysis. In combination, these shortcomings limit the psychometric paradigm to making recommendations often regarded as too general for environmental/technological policy; indeed the paradigms downfall is a lack of focus on specific local contexts (Sjoberg, 2003). However, as already emphasized, context is fundamental since risk perception is best understood in the everyday context in which it is experienced (Masuda and Garvin, 2006).

#### 2.3.2.1 The Issue of Heterogeneity

Referring to a list of hazards as diverse or heterogeneous implies that the items contained in that list have no real association to one another. Similarly, a heterogeneous group of people may or may not associate together, could have limited or detailed knowledge of potential hazards in their vicinity, and possibly prescribe to a variety of cultural views (Siegrist, et al., 2005). Thus, it is argued that including such a sample affords no consideration for the influence that personal experience might exert on a person's perception of risk, nor does it account for each participant's potential experience

with hazardous land uses. When investigating risk perception in communities exposed to controversial land use conflicts this lack of context can be problematic. For example, it can be difficult for a respondent to make informed judgments about hazards in their daily lives if they are contrasted against other, unrelated hazards not relevant to their lived experience (Siegerst et al., 2005). Similarly, garnering risk preferences from a diverse group of people (e.g., 'the league of women voters') in the context of hazards ranging from alcoholic beverages to nuclear power (Fischhoff et al., 1978, Slovic, 1987) is a far less contextual measure of risk when compared to eliciting concerns from a group of people who are known to have experience with a particular hazard.

In light of this, this study focuses on a homogenous group of people – in the sense that they are from a particular place – who are expected to have had experience with an immediately controversial land use. Likewise, along with expressing risk preference towards the local hazard (i.e., a municipal landfill), participants rated the level of threat they perceived to be associated with other technological land uses, not general, voluntary risks like smoking and operating a car. This was done in order to understand how a common case of local land use controversy can impact on a community's perceptions of technological threat in general. Thus, the goal is to produce a more value laden account of risk perception with potential implications for environmental and technological land use policy while improving on conventional models for study risk (Kraus and Slovic, 1988).

#### 2.3.2.2 The Perceived Importance of Hazard Characteristics

As mentioned, a number of hazard characteristic are typically found to be significant predictors of risk perception in studies which implement the psychometric

paradigm. For instance, if an individual associates feelings of dread and concern for catastrophe with a particular hazard risk, they have been found to be less likely to accept it (Bronfman and Cifuentes, 2003). Moreover, voluntary/involuntary participation was initially perceived as important such that the public was willing to accept voluntary risks approximately 1000 times greater than involuntary risks (Starr, 1969). Further, trust in various aspects of a hazard risk has been noted as an important determinant of risk perception, with varying success as a significant predictor (Bohnenblust and Slovic, 1998). Finally, other 'hazard characteristics' (e.g., risk attributes) defined by the psychometric paradigm have also been found to be significant predictors of risk perception; these include newness, known/unknown, and understood (Slovic, 1987).

During the last decade, however, risk perception researchers began to question the importance of hazard characteristics when explaining risk preference (Sjoberg, 2003). For instance, the explanatory power of the dread variable has been questioned in recent studies since it has been found that feelings of dread may in fact represent perceived threat, not account for it (Sjoberg, 1996). That is, because of a common semantic between the terms 'threat' and 'dread', it may be unreasonable to assume that feelings of dread necessarily explain perceptions of threat. Thus, it has been suggested that reliance on various hazard characteristics might restrict the psychometric paradigm to serve primarily as signal for risk aversion (Gregory and Mendolsohn, 1993). Similarly, the significance of the catastrophic potential variable has been questioned; akin to the dread variable, a common semantic between the term 'catastrophe' and 'risk' exposes the potential inflation of the significance of such a measure of perceived threat. Likewise, various technologies, due to frequent and often negative media depiction, remain more

'cognitively available' as potentially catastrophic hazards. Therefore, it is understandable that the catastrophic potential and dread variables are commonly associated with perceived threat towards controversial land uses (Lichtenstein et al., 1978, Slovic and Weber, 2002, Sjoberg, 2003).

With respect to voluntary/involuntary hazard participation, Barnett and Breakwell (2001) suggest that the strong correlation of risk with involuntary activities is due to more than the lack of 'control' or 'familiarity' associated with these risks. Instead, they found that the voluntary/involuntary nature of hazard participation accounted for a larger part of the variance when coupled with past 'negative outcomes', 'frequency', and 'impact' hazard characteristics. So, when an individual quantitatively assessed a past involuntary incident, they were responding based on the experience, the impact, and the occurrence of the hazard in addition to its involuntary nature. Finally, the trust variable typically included in psychometric studies has returned varying degrees of significance when regressed as a predictor of perceived threat (Kunreuther, Slovic, and MacGregor, 1996, Baxter et al., 1999). However, its utility in predicting risk perception has been questioned since trust is recognized as contextual. That is, trust in technological risk research is often considered in relation to 'experts' or 'regulating authorities.' For instance, Sjoberg (2001) found that the importance of trust varied with the level of knowledge an individual possessed regarding the operational characteristics of a technology. Indeed, if an individual is aware of the potential hazards in their vicinity, trust becomes less of an issue. However, when the knowledge base of someone is limited, they will rely on 'experts' more. In this case, trust becomes a more important contributor to risk mitigation (Baxter et al., 1999).

As a result of the above observations, it is reasonable to purport that perceived risk may be associated with a group of contextual, cultural, and social risk factors, and not solely the dread or catastrophic potential of the hazard, the voluntary/involuntary nature of the participation, nor the feelings of trust/distrust which they generate (Elliott et al., 2004, Baxter and Greenlaw, 2005, Masuda and Garvin, 2006).

**2.3.2.3 The Aggregate-Disaggregate Debate**

Bronfman and Cifuentes (2003) and Bronfman et al. (2007) questioned the aggregate level of analysis used in psychometric studies suggesting that failing to distinguish between individual and group perceptions of risk is problematic because correlations of aggregated data are not appropriate substitutions for individual responses. This problem represents a common criticism of the psychometric paradigm; the fact that it fails to recognize that risk perception may vary between groups and individuals (Marris Langford, and O'Riordan, 1998, Gardner and Gould, 1989, Slovic, 1992, and Trumbo, 1996). Indeed, with the exception of broad categories such as 'layperson', 'expert', or 'college student', psychometric studies make no attempt to differentiate individual risk perception from the general sample population. The result is a diluted depiction of risk perception, a sacrifice of breadth for depth, and an often overstated size of correlations explaining the variance. For example, Sjoberg (2002) found that going from an aggregate to an individual level resulted in a 50% drop in the correlation (i.e., the explained variance in perceived threat dropped from 0.7 to 0.35). On the same issue, Marris et al. (1997, p.311) suggest that "a more thorough analysis of psychometric data coupled with more qualitative explorations of the motivations behind individual's responses [may] lead to a [better] understanding of risk perception." Sjoberg (2002)

posits that this recommendation is riddled with uncertainty such that new information (i.e., unmeasured explanatory variables), not further interpretation and statistical manipulation of current psychometric data are needed to validate the psychometric method.

This research, by investigating risk perception at the individual, disaggregated level, and in the context of a specific hazard event, is in a position to increase the variance explained in technological risk perception studies. Through consideration of context variables specific to the event, and inclusion of research participants immersed in an immediately controversial land use dispute, this research presents findings that do not strive to be universally applicable to diverse hazards. Instead, this study addresses a particular aspect of the facility siting dilemma and technological risk perception while emphasizing the importance of conducting risk research in the context of the everyday lived experience. As such, it is suggested that, when considering the impact of a land use on a local community, the characteristics of the research participant may be more important than the hazard characteristics themselves. This suggestion stems from social and cultural approaches to risk perception where individual experience, knowledge, and feelings of familiarity typically account for a significant portion of the variance in risk perception (Satterfield et al., 2004, Savadori et al., 2004).

### 2.3.3 The Cultural Theory of Risk

While the psychometric paradigm focuses on the characteristics of the hazards, the cultural theory of risk adds emphasis on the "perceivers". Developed in part by Wildavsky and Douglas (1982), the cultural theory of risk suggests that people perceive risks differently because their worldviews are culturally situated. As such, people react

to risk in accordance with their involvement in society and the cultural lens through which they view the world (Lima and Castro, 2005). Thus, the social solidarity of a group influences perceptions of risk at both the individual and group level (Langford et al., 2000). In practice though, the cultural theory of risk typically investigates risk perception causality at the individual, disaggregated level – groups are rarely studied as "groups" (e.g., using participant observation). That is, it has not amounted to a complete paradigm shift from the psychometric model; indeed much may be gained, by using qualitative methods for example (Tansey and O'riordan, 1999, Tansey, 2004, Baxter and Lee, 2004). Despite this narrow focus on survey-based methods, the cultural theory of risk, and social theories in general, are regarded as the most relevant, effective, and reliable approaches for explaining varying views about risk since their focus is on the social and cultural characteristics of the individual participant (Chouinard, 1997, Finucane and Holup, 2005, Masuda and Garvin, 2006).

The cultural theory of risk is situated in two concepts. First, this theory suggests that living and participating in the patterns and norms of a certain society results in a unique way of viewing the world. These biases, or culturally influenced "worldviews", create, help sustain, and influence local individual/social relations and decisions regarding fairness, equity, and fear towards the environment (Langford et al., 2000). The second main concept is that all individuals subscribe to one of four distinct cultural biases; worldviews through which they perceive risk to society and the environment. These four worldviews are characterized along two key dimensions: 'grid' – the degree to which a social group is confined by conventionality; and 'group' – the degree of social integration of an individual in a social unit (Rayner, 1992). The orthogonal axis created by

graphically pairing the 'grid' and 'group' characteristics reveals four possible worldviews or 'types of people': individualist, egalitarian, hierarchist, and fatalist. Each 'grid-group' position suggests a unique worldview of the environment, governance, and personal freedom of the individual. For example, an individualist exhibits low grid and low group associations. As such, they have a minimal sense of responsibility towards others in society and view nature as adaptable and impervious to abuse. Moreover, they utilize rational decision making regarding risks (most often economically, through cost-benefit analysis). Egalitarians can be described as possessing strong group boundaries (i.e., high group), yet have little belief in prescribed social roles (i.e., low grid). Instead, they have a strong sense of social connectedness and equality, tend to be suspicious of authority, are concerned with risks which originate with institutions, especially if they are viewed as inequitable, and view the environment as fragile and vulnerable. Finally, the egalitarian worldview is typically found to be more sensitive to distal/global threats than proximal/local hazard risks (Lima and Castro, 2005). Hierarchists situate as high group and high grid. Therefore, they have strong grouped boundaries and binding prescriptions. Moreover, they view their place in society as governed by a particular institutional classification (e.g., age or gender). Lastly, they commonly place trust in higher (institutional) authority and are thus mainly concerned with environmental degradation that may impact on social order (Willis et al., 2005). Finally, fatalists are characterized as being in a low group-high grid position. This suggests that they have a low sense of group association but a strong sense of social distinction. Fatalists view themselves as outsiders to institutions; this sense of autonomy leaves them feeling powerless to exert

influence on any course of events. As a result, their inclusion in risk perception studies similar to this one is rare (Lima and Castro, 2005).

The cultural theory of risk has begun to gain momentum in risk research. During the last 20 years, post-positivist social scientists seeking a more holistic, culturally situated, and disaggregated approach to risk analysis research often adopt the cultural theory of risk paradigm (Lima and Castro, 2005). This framework is advantageous in relation to the psychometric paradigm for several reasons. Already highlighted as a conceptual and analytical advantage, the cultural theory uses a disaggregated level of analysis. This allows for a more individual account of risk preference where the focus is on the person, not the characteristics of the hazard (i.e., the psychometric paradigm). Moreover, by eliciting responses to a number of subscale items designed to reveal each participants cultural bias, a relatively thorough theoretical statement about each individual's concerns, political views, worries for the environment, and involvement in social networks results. Therefore, the context of the research participant, while not fully understood, is at least somewhat accounted for; certainly more so than when considered under the psychometric paradigm (Finucane and Holup, 2005).

### 2.3.4 Cultural Theory of Risk Limitations

The cultural theory of risk is commonly associated with several inadequacies; these include the problem of an unclear conceptual basis (i.e., the mobility vs. stability debate) and the inability to account for the life course of respondents (Marris et al., 1998, Sjoberg, 1997, Langford et al., 2000, Casiday, 2007). Although noted, these limitations will not be discussed in detail here. Instead, the outcome of these misspecifications will be addressed, namely the empirically noted inconsistency in the number of participants

successfully identified by cultural theory. Also, the specific limitation previously noted under the psychometric paradigm, that of a general disregard for risk-in-context is discussed.

The cultural theory of risk has enjoyed some success as a predictive model of risk perception (Sjoberg, 2003, Lima and Castro, 2005). However, due to an inability to accurately and consistently situate research participants within the four cultural biases outlined by the theory, the overall predictive power of the model is limited and often explains only a small portion of the variance (Sjoberg, 2002). For instance, out of an initial sample of 129 people, Marris et al. (1998) could only identify 41 respondents (32%) using the traditional biases under the cultural theory of risk. Indeed, 8 respondents did not identify with any of the four worldviews, while a substantial portion of the sample (n=80) were of mixed cultural bias. Thus, in this case the cultural theory was largely incapable of accounting for the risk preferences of the sample since the vast majority of the survey respondents did not clearly identify with a cultural bias. In contrast, Lima and Castro (2005), using questions and scales similar to Marris et al. (1998), successfully identified over 70% of the sample (211 of 300) as one of the four worldviews. Likewise, as presented in Chapter 4 and discussed in Chapter 5, this study identified a substantial portion of the sample based on the traditional (albeit slightly modified) version of the cultural biases/cultural theory of risk; evidence that, to at least some degree, cultural theory, and culturally/socially situated theories of risk perception present utility to technological risk research. Yet, in comparison to other theories (e.g., psychometric paradigm) the criticism stands that not all respondents consistently fit the mold as laid out by the framework. As such, and as a result of other, related limitations (i.e., mobility vs.

stability and notoriously small sample sizes), the cultural theory of risk remains limited in its ability to provide an overall account of risk preferences in a given population.

With respect to the importance of 'context' in risk research, while it is more contextually mindful than the psychometric paradigm (i.e., focus is on participant characteristics and views), cultural theory does not measure risk preferences of individuals in relation to their daily experiences. In doing so, the cultural theory ignores potentially valuable explanatory variables such as an individual's proximity to, participation in, and knowledge of an immediately controversial land use, and the impact this experience may have on their worldview and perceptions of risk. Therefore, the cultural theory of risk is less adept at accounting for the dynamic nature of social, cultural, and environmental interactions because it is ill suited to the task of accounting for risk perception in the context of everyday life (Finucane and Holup, 2005, Marris, et al., 1998).

Although the focus of this study is risk-in-context, an aspect of risk perception out of reach of the cultural theory, portions of the theoretical framework of the cultural theory of risk were adopted. Overall, this was done in order to test the predictive power of the cultural theory of risk; an effort directed at contributing to the body of literature which tests such theories and supports the use of cultural and social theories of risk perception (Steg and Sievers, 2000). Indeed, this study strives to not only improve on the psychometric paradigm, as noted, but to improve on the cultural theory of risk through empirical testing. Therefore, a disaggregate-level of analysis was adopted. Moreover, in response to a call from the risk perception community (Slovic, 1987, Finucane and Holup, 2005, and Bronfman et al., 2007), this research represents an attempt to include an

examination of the spatial and contextual changes in risk perception generally, while measuring the importance of new, potentially explanatory context variables. A more detailed description regarding the importance of the approach of this study is to follow.

## 2.4 A Way Forward: Risk research conducted 'in-context'

As noted, the focus of this study is risk-in-context; the impact of daily experience with an immediately controversial land use on perceptions of risk towards that land use (a landfill expansion), as well the impact of daily hazard coping on risk perception towards non-local controversial hazards (e.g., nuclear facilities), is investigated. The theory of conducting risk-in-context research most closely resembles the SAR framework first developed to account for the increasingly common scenario where risk events with minor consequences result in strong public concern and stigmatization (Frewer, Miles, and Marsh, 2002). The SAR theory suggests that a series of signals (i.e., technical, informational, socio-cultural, individual, cognitive, and group) work to feed back on a social system resulting in an increase (i.e., amplification) or decrease (i.e., attenuation) of individual and group reactions to a hazard event (Kasperson et al., 1988). This ripple effect amplifies or attenuates risk perception to the particular hazard and can result in intense facility-related stigmatization (Kasperson & Kasperson, 1996). Risk-in-context research operates in very much the same way since it accounts for the influence that knowledge of and experience with a hazard can have on overall risk perception to that hazard, as well as to similar hazards not in the perceiver's immediate vicinity. Yet, it remains unique such that its focus is not necessarily amplification and attenuation of risk via risk communication, but through daily lived experience, perceived threat, and feelings of fairness (i.e., local context variables).

Finally, with respect to participant selection, several points are in need of mention. As stated previously, conventional approaches to technological risk research typically ignore the immediate context of the hazard in direct relation to the research participant in a specific place. That is, participants in risk perception studies are rarely identified based on their involvement in a local land use dispute (i.e., a facility expansion) (see Slovic, 1987). Instead, sample populations are developed through convenience sampling. Further, conventional studies are based on reactions to a broad list of hazards and hazard characteristics (i.e., psychometric paradigm) rather than the perceivers themselves. Yet studies on the perceivers tend to focus on an individual's cultural biases or worldviews that are typically unconnected to any local controversy (i.e. cultural theory of risk). Conversely, this risk-in-context study investigates risk perception in places known to be directly experiencing a particular hazard since a situation may emerge where members of the local community become sensitized by their experience with a hazard controversy (Dake, 1992). This sensitization may influence their perceptions of risk to the hazard in the local context, as well as more general hazards not immediately controversial. Thus, a risk-in-context approach suggests that risk perception is influenced by factors in the local context (i.e., a land use dispute) in which the risk is embedded (Halvarson, 2003, Baxter et al., 1999). Therefore, risk-in-context research is important because it suggests that 'local context variables' (e.g., awareness and engagement) might explain more about risk perception towards environmental technologies than the characteristics of the technology (i.e., psychometric paradigm) or the worldviews of the research participants (i.e., cultural theory of risk) (Douglas and Wildavsky, 1982, Elliott et al., 1993). Thus, this study

supports a potential way forward in technological risk perception research: an investigation into the impact of daily life on technological risk perception.

## 2.5 Environmental Equity: Approaches and limitations

Under the approaches to risk research discussed above, the concept of environmental equity has been included in various risk studies as a predictor of risk perception (Current and Ratick, 1995, Mertz, Slovic, and Purchase, 1998, Baxter et al., 1999, Jacobson, Hengartner, and Louise, 2005). For example, Satterfield et al., (2004) found that respondents who agreed with the statement "I often feel discriminated against" ranked a list of 19 hazards as more threatening than those who did not feel 'discriminated' against. In addition, related variables such as 'fairness' and 'benefit' have been found to be strong predictors of risk perception (Slovic 1987, Bohenblust and Slovic, 1998). Thus, there was good reason to test the influence of environmental equity perception on risk perception in this study. This section introduces the concepts of environmental equity while highlighting inherent weaknesses. In doing so, the potential importance of fiduciary equity, a newly conceptualized subset of an already empirically substantiated form of environmental inequity is explored.

The concept of environmental equity emerged as a social movement and a public policy concern (Baden et al., 2007). Indeed, the terms environmental inequity and injustice surfaced as evidence mounted that certain disadvantaged groups were experiencing disproportional exposure to potentially hazardous land uses. More specifically, non-white and lower income communities have been identified as disproportionately exposed to waste facilities in particular (United Church of Christ, 2007, Pulido, 1996). As a result, the general tenets of environmental inequity were developed

with focus on social and spatial (i.e., outcome inequity) as well as procedural injustices (i.e., process inequity) (Baxter et al., 1999). Within these subsets, factors of ethnicity and income comprise an important, if not the most important aspect of environmental equity in North America since the focus is on disproportional exposure due to being disadvantaged (Pulido, 1996). Yet, the main difference in the sample populations of this thesis is an overall lack of disadvantage in the communities affected.

Typically, procedural inequity implies that normal facility siting criteria were deliberately ignored by a facility siting authority to locate a LULU in a disadvantaged community (Hird, 1993). More specifically, it most often describes a situation where politically active, wealthy, white communities are more adept at thwarting siting efforts than those communities less powerful (Harner et al., 2002). This form of equity is most commonly associated with feelings of distrust, particularly of government officials and facility proponents (Baxter et al., 1999). Similarly, outcome inequity is most often associated with the unfair spatial distribution of LULUs as a result of procedural inequities (Jacobson, Hengartner, and Louise, 2005). That is, outcome equity is identified when a pattern of injustice emerges whereby disadvantaged communities are disproportionately exposed to controversial, potentially harmful land uses. In relation to risk-in-context, if members of a particular community feel that they are disproportionately exposed to a hazardous land use, they may have a heightened perception of risk to the local hazard, as well as other hazards in general (Slovic et al., 2004, Sjoberg, 2002, Lima and Castro, 2005, Finucane and Holup, 2005).

Though equity variables have been measured in past risk perception studies as mentioned above (i.e., 'discrimination' variable), the issue is that they are often broadly

explained and lack an operational definition (Jacobson, Hengartner, and Louise, 2005). For instance, equity variables are often employed as personal measures of inequity (e.g., "I often feel discriminated against") rather than considerate of equity in relation to a specific hazard exposure in a particular place (e.g., "a landfill expansion in my community is unfair"). When used as a predictor of perceived threat in a risk-in-context study, in this case in relation to a facility expansion, this could result in a misspecification of environmental injustice. Certainly, in the context of risk perception and the reaction to potentially hazardous facilities, the form and specification of environmental equity is important.

An additional common charge of contemporary environmental equity research is the exclusiveness to one type of equity consideration. Equity research quite often focuses on one aspect of equity and fails to consider various forms simultaneously (Walker et al., 2005, Fairburn et al., 2005, Watson and Bulkeley, 2005). For instance, Mennis and Jordan (2005) show how empirical studies often standardize environmental equity variables across a study area, paying little attention to particular, fine scale relationships between dependent and independent equity variables (Burke 1993, Bowen et al., 1995). That is, in the quest for globally transferable measures of environmental equity, it is possible for extensive local variation to be masked by broad summarizations. However, considering various aspects of equity simultaneously has been found to be more explanatory of risk perception generally (Mennis and Jordan, 2005). As such, this study accounts for a variety of interrelated forms of environmental equity such as procedural, outcome, distributive, and fiduciary; the latter is explained in more detail below.

## 2.6 A Different Tack: Fiduciary inequity

Fiduciary equity concerns obligations regarding fair facility siting conditions and is different from other forms of environmental equity typically studied. As such, this form of equity may be critical for understanding hazardous facility concerns in context. As suggested above, research on environmental equity is commonly confined to outcome inequity (i.e., unfair distribution of LULUs as a result of public opposition) which only accounts for a portion of a range of inequity issues associated with hazards like facility expansions in communities of relatively low disadvantage (Harner et al., 2002). Further, considering contextual measures of environmental equity is necessary in order to fully account for the influence of perceived inequity on risk perception (Mennis and Jordan, 2005). For instance, landfill expansions, and the expansion of potentially hazardous, technological land uses generally, are on the rise and have the potential to impact uniquely on risk perception (Andrew, 2001, McCommas and Trumbo, 2001, Grant, 1994, Elliott et al., 1993). Thus, a way forward in risk perception research is to consider the importance of modified forms of equity specific to certain land use issues as determinants of risk perception (Sjoberg, 2002, Lima and Castro, 2005, Finucane and Holup, 2005).

In relation to conventional considerations of environmental equity (i.e., outcome and procedural), fiduciary equity represents an important distinction for a number of reasons: 1) it accounts for the obligation a proponent has to community members to keep true to the contractual agreement regarding the length of hosting obligations (i.e., an expansion is in breach of this agreement); 2) it addresses the unique inequities associated with the expansion of potentially hazardous land uses (i.e., hosting obligations), a widely unreported outcome of the facility siting dilemma (Grant, 1994, Kasperson, 2005), and; 3)

it suggests that environmental inequities (i.e., disproportionate exposure) may also be experienced by those traditionally not viewed as disadvantaged. That is, empirical measures of procedural and outcome equity, though they both refer to 'fairness', concern very different aspects of facility siting and risk perception (i.e., siting negligence versus unfair outcomes). Simply put, by expanding an existing facility, the facility operator (i.e., the trustee) concentrates the burdens of the greater community on the residents in direct proximity to the facility. The outcome, therefore, adheres to the principles of spatial and distributive inequity (i.e., outcome inequity), yet the focus is on contractual agreements with the 'beneficiary' in the immediate context (a.k.a. local residents) regarding fair hosting obligations. Further, in the context of landfill expansion disputes (although the intention is for it to be applied to facility expansions of all types) fiduciary equity may be conceptualized as a framework which accounts for the violation of contractual agreement pertaining to, for example, the length of hosting obligations, the daily intake volume of waste, the source of the waste (e.g., an outside community), or the type of waste accepted (e.g., municipal solid waste).

A case of fiduciary equity is arguably underway in the sample populations used in my research. For instance, nearby towns surrounding the host communities of the Green Lane Landfill in Elgin County, Ontario and the Ottawa Landfill in Ottawa, Ontario appear more adept at thwarting the siting efforts of waste management authorities. Since the siting process failed (i.e., procedural inequity independent from race and income), the communities who have already hosted a landfill in Ottawa-West may be forced to endure another term at hosting. On the other hand, the host communities for the Green Lane Landfill are currently burdened by a landfill expansion. While this result is typically

referred to as outcome inequity (Harner et al., 2002), fiduciary equity may be a more appropriate construct for understanding the unique risk and equity concerns surrounding disputes over the expansion of potentially harmful, locally undesirable land uses, particularly if race and income are not as important in the facility siting process.

## 2.7 Public Opposition and the Emergence of the NIMBY Attitude

This research tests the nuances of the not in my backyard (NIMBY) syndrome. This was done in order to provide an additional measure of context specific risk perception, to better understand the relationship between NIMBY sentiments and perceived threat, and to offer insight into how NIMBY attitudes change along with the operational characteristics of the technological risk. Thus, several NIMBY variables, categorized under the risk-in-context approach (i.e., local context variables), are included in the analysis outlined later on. As is the case with risk perception, it is suggested here that context is as important when considering the NIMBY attitude.

The concept of a NIMBY syndrome emerged as researchers attempted to account for, and in many ways discredit, the motivations and inconsistencies in public opposition towards LULUs. NIMBY is often used pejoratively to describe the social response to LULUs (Schively, 2007). It refers to the "protectionist attitudes of and oppositional tactics adopted by community groups facing an unwelcome development in their neighborhood" (Dear, 1992, p.288). Yet, according to some, a defining characteristic of NIMBY is that it describes more than simple opposition; a NIMBY community is one which rejects the siting of a particular facility while acknowledging the facility's social necessity and expressing no opposition to its installation elsewhere (Wolsink, 2006, OED, 2005, Boholm, 2004).

In contrast to this prevailing NIMBY classification of public response to LULUs, many researchers support the theory that public opposition is motivated by much more than narrowly conceived, self interests (e.g., fairness, sympathy, and civil duty) (Hunter and Leyden, 1995, Wolsink, 2006). Indeed, many feel that the term NIMBY is haphazardly applied to discredit any and all facility opposition, and a more sophisticated, holistic analysis of public opposition to potentially hazardous land uses is required (Davies, 2005). Through providing more contextual measures of risk perception and environmental equity, the results of this study should have implications for facility siting generally. That is, though this is largely a study of risk perception (in the broadest sense), this research is in a position to contribute to a better understanding of the NIMBY syndrome and facility opposition generally.

### 2.7.2 The Distance Decay of Public Opposition

Not unlike the inclusion of NIMBY noted above, the concept of distance-to-facility is considered as a context specific predictor variable in the analysis. This was done in order to flesh out the importance of proximity in technological risk perception, particularly towards a locally controversial hazard. The theory of distance decay has been longstanding in geographical research and is applicable to many geographical concepts; it suggests that the occurrence of processes and activities (e.g., perceiving threat) diminishes with increasing distance (Armour, 1991, Kuhn, 1998). As such, there is good reason to suspect that perceptions of threat from a local land use dispute may be related to the distance one lives from that facility (Elliott et al., 1998, Schively, 2007). For instance, Lober and Green (1994, p.40) show that, "as the distance an individual lives from a waste facility is increased, their willingness to oppose living near the facility

decreases." Similarly, Elliott (1998) found that, although there was no observable gradient between distance variables and reported concern, concern was highest within the sample closest to the waste facility. Conversely, Baxter and Greenlaw (2005) argue that distance to facility is of ancillary importance to perceived threat, while contextual variations between places possibly explain more about the variance in risk perception. These examples illustrate the important fact that citizens will react to different types of facilities in different ways and that the reaction may be related to proximity (Mitchell and Carson, 1986, Lober and Green, 1994). As such, measurements of NIMBY and distance decay are important to consider in any model of risk perception – whether considered as core predictors or simply control variables. Thus, this study considers the fact that the relationship between distance-to-facility and NIMBY prevalence may or may not change based on the circumstance in which a facility is operated, located, and experienced.

## 2.8 Summary

This research is guided by: 1) the impact that a local, controversial land use change can have on a community's perception of risk (i.e., theory that 'place' matters); 2) the limited ability of current risk perception models to situate risk perceptions in one's daily lived experience; 3) the relevance and potential explanatory power of social theories of risk (i.e., the cultural theory and the SAR framework), and; 4) the potential explanatory power of local context variables and the concept of fiduciary equity. That is, risk-in-context research describes several important aspects of risk perception, environmental equity, and facility siting; it implies the inclusion of 'local context variables' (e.g., awareness), it situates perceived risk in the everyday lived experience (e.g., a community in land use dispute), and it provides a more focused measure of

environmental equity (i.e.. fiduciary equity). Perhaps most importantly, this risk-in-context approach accounts for some of the depth lost in the psychometric paradigm (i.e., as a sacrifice for breadth) while more holistically accounting for the influence of individual views and experiences on risk perception (i.e., cultural theory).

# Chapter 3

# Research Design

## 3.1 Introduction

This chapter provides an overview of the context, approach, and methodology of this study. It begins by justifying the use of quantitative, survey methods in risk perception research. Following this, the use of a MSWF as a way to operationalize land use disputes is explained. The sections that follow provide information about the two sample locations; an area in Elgin County, Ontario, Canada (south of the City of London) surrounding the Green Lane Landfill and a portion of Ottawa-West, Ontario, Canada proximal to the Ottawa Landfill. Included here is a site history with considerations for population size, sample size, participant characteristics and location, as well as a description of the local MSWFs and the level of controversy surrounding the expansions. The remainder of the chapter outlines the data collection and analytical methods employed in this research. This includes a discussion about questionnaire design and reference to the analytical framework. The chapter concludes by considering the limitations associated with the methodology of this study.

## 3.2 Methodological Rational: Implementing quantitative survey methods in risk perception research

Risk perception research commonly employs quantitative methods to account for the variation in the perception of risk towards diverse hazards (Sjoberg, 2002). As such, a quantitative questionnaire is justified since it is consistent with risk and equity perception research to which the results are compared. Furthermore, since many of the risk perception measures applied are identical to those used in other empirical studies (e.g., dread, catastrophic potential, trust, equity, and cultural biases), the approach to this

theory testing endeavour is well founded (Fischhoff et al., 1978, Slovic, 1987, Sjoberg, 2000, Sjoberg and Walhberg, 2002, Siegerst et al., 2005, Bronfman et al., 2007). Indeed, since risk perception theory is well developed, inductive, theory-developing, qualitative methods were deemed less appropriate. Finally, through the inherent versatility of questionnaire design and implementation, the responses of a relatively small sample of people generated data from a group that closely matches the structure of the two local populations (Babbie, 2004). Thus, as is typically the case in survey research, breadth over depth in the two local cases is the focus (Alreck and Settle, 1995); yet, disaggregated analysis ensured that individual variations in risk preferences were accounted for (Willis et al., 2005).

As mentioned, survey methods were used to measure aspects of perceived risk typically studied in risk perception research. In addition, categories of risk perception and environmental equity not normally accounted for in these types of investigations were also measured. Indeed, there is sufficient literature on context and equity to test the nuances of concepts such as fiduciary equity, risk sensitization, and local context variables (Lima and Castro, 2005, Finucane and Holup, 2005, Current and Ratick, 1995, Elliott et al., 1993, Masuda and Garvin, 2006). Thus, by employing empirically replicated approaches to risk research, traditional risk perception models are put to the test. Perhaps more importantly, newly emerging risk perception characteristics and explanatory variables (e.g., local context variables) are considered as potentially worthwhile contributors to risk perception research (Sjoberg, 2002).

### 3.3 The Use of Municipal Solid Waste Facilities as Proxies for 'technological hazard (facility)'

The expansion of a MSWF (a landfill) was chosen for this risk perception comparison for a number of reasons. Simply stated, this study was, to a degree opportunistic since two controversial landfill expansions at various stages of development are underway in Ontario. These landfill controversies presented an opportunity to study technological risk in context, the focus of which was to test the predictive power of traditional models for studying risk perception. Additionally, through eliciting perceptions of risk towards landfill expansions in relation to a list of other technological hazards (e.g., waste incinerators, chemical facilities, and nuclear power facilities). it is possible to detect the presence and severity of risk sensitization in the sample population. That is, these non-local hazards serve as a barometer of general facility concern, indicating the degree to which the local landfill dispute is bound together with 'general' risk perception. This approach – which compares the local hazard with more distant ones – contrasts the traditional psychometric method which focuses on a diverse, heterogeneous list of hazards whose local/personal relevance is unknown (Slovic, 1987).

Similarly, the use of a landfill expansion for risk perception comparisons is reasonable when considering facility siting and environmental equity research. In the context of the facility siting dilemma, understanding public reaction to MSWF expansions is important in light of the recent drastic increase in MSWF expansion proposals in Ontario, Canada (Andrew, 2001). As such, this study has the potential to contribute not only to risk perception literature about facility related concern and facility expansions generally (i.e., risk perception in everyday life), but to the growing concern about municipal waste management and landfill operations in North America (Furuseth

and Johnson. 1988. Andrew. 2001. Okeke and Armour. 2000). and how reactions to these types of facilities can impact on risk perception. Lastly. a MSWF expansion generates unique environmental equity concerns. As previously described, fiduciary equity may be present: this modified form of outcome equity has yet to be considered in risk perception and environmental equity research. As such, it may well explain more about risk perception towards facility expansions than variables from conventional risk perception models (i.e., the psychometric paradigm or the cultural theory of risk).

## 3.4 Site Selection

This section provides a detailed overview of the MSWF expansion scenarios as well as the characteristics of the surrounding communities. Beginning with the Ottawa Landfill and surrounding communities of Stittsville and Kanata, attention is given to the site history of the landfill, the population characteristics of the communities involved, and the level to which nearby communities appear to be aware and involved in the land use dispute. In a similar fashion, the Green Lane Landfill and the surrounding communities in Elgin County are discussed. This section concludes by highlighting several important similarities and differences between each sample location.

### 3.4.1 The Ottawa Landfill, Ottawa-West, Ontario

The Ottawa Landfill is located in the western extent of the newly amalgamated City of Ottawa in the former Township of West Carleton (Figure 3.1). The site on which the Ottawa Landfill currently operates originated as an aggregate supply pit used by the Department of Highways during the construction of the Queensway (Hwy 417) in the 1950s. It was later purchased for use as an open sand pit in 1965. In 1971, The Ministry of the Environment (MOE) issued a Provisional Certificate of Approval for use of the site

as a sanitary landfill. From 1971 to current, this facility has accepted a variety of waste products including domestic and building refuse, municipal solid waste (MSW), and sewage sludge. At the present time, the primary intake is of non-hazardous, municipal, and industrial solid waste.

Within a potential landfill area of 138.4 hectares, approximately 34.95 hectares have been used for solid waste disposal. In 2008, the facility's proponent, the Waste Management of Canada Corporation (WMCC), submitted a closure plan for the existing landfill area to the MOE. Public consultation for this submission occurred from December, 2008 through to the end of January 2009. Yet, on the table remains a proposal for expansion involving the optimization of the remaining landfill area and an intake of 18,750,000 $m^3$ of waste in addition to the 8,744,400 $m^3$ already there (Henderson Paddon & Associates Limited, 2008). Since it became public knowledge in 2006, there has been extensive media coverage surrounding the expansion proposal and local residents have voiced their objection to the proposal at several public hearings and through online discussion forums. The consensus seems to be that it would be unfair if the Ottawa Landfill was not to close as scheduled. As a result, there exists the potential for increased perception of risk in the face of such controversy making the communities surrounding the landfill prime candidates for 'risk in context' research. More detail regarding the response from the local community is presented later.

#### 3.4.1.1 The Urban Centres of Stittsville and Kanata

In close proximity to the Ottawa landfill (less than 5 km to the south and east), resides the heavily populated suburban towns of Stittsville and Kanata (Figure 3.1). Stittsville has a population of approximately 20,000 people and is an area of primarily

suburban land use. Within the town limits there are roughly 6,300 households (see Table 3.1 for more detailed socio-demographics). The communities in these areas are primarily middle to upper working class. In addition, there is a central business district with outlying areas of light industry. With respect to growth and development, the population of Stittsville is expected to exceed 30,000 people by 2011 (Census, 2006).

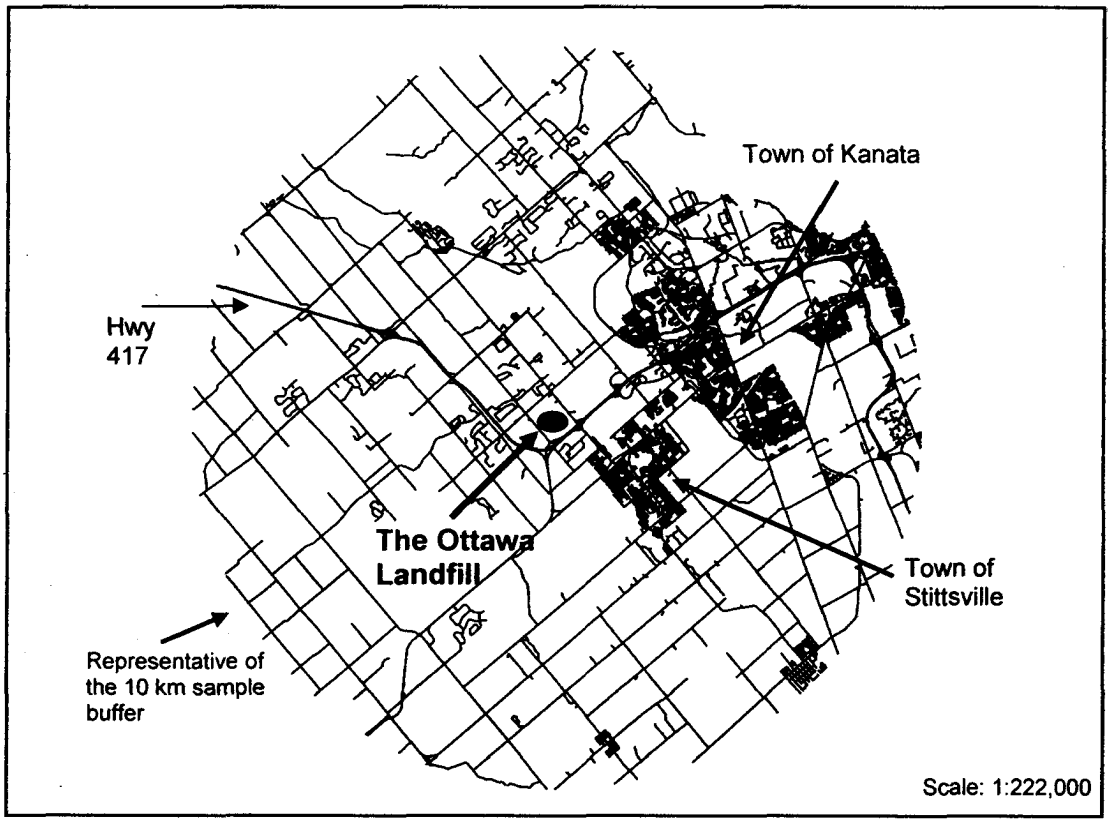


**Figure 3.1: The Ottawa Landfill and Surrounding Communities**

The Town of Kanata is considerably larger with a population of approximately 70,000 people and a subsequent 22,500 households (Table 3.1). Similar to Stittsville, Kanata is expected to experience considerable growth and development in the future (Census, 2006). However, Kanata is separated from the remainder of the City of Ottawa by the Greenbelt, a conservation area reserved for minimal development (National

Capital Commission, 2008). Kanata can be characterized as primarily suburban land use with a more dispersed business district and a high-tech corridor to the northeast.

**Table 3.1: Sociodemographics of Stittsville and Kanata, Ontario, Canada**

| Town | Stittsville | Kanata | Canada |
|---|---|---|---|
| Population | 19,410 | 66,990 | 31,612,895 |
| Population density ($km^2$) | 87 | 1866.9 | 3.5 |
| Number of dwellings | 6,310 | 22,530 | 13,576,855 |
| Males | 9,370 | 32,745 | 15,475,970 |
| Females | 10,035 | 34,245 | 16,136,930 |
| Percent visible minority | 11.8% | 17.3% | 16.2% |
| Education: | | | |
| No certificate, diploma, or degree | 9.7% | 9.1% | 8.5% |
| High school | 17.2% | 16.9% | 13.1% |
| College | 15.8% | 22.6% | 11.2% |
| University certificate or degree | 23.7 | 29.1% | 12.6% |
| Graduate degree (Master's or PhD) | 5.7% | 8.2% | N/A |
| Average income (full time workers) | $53,111 | $50,220 | |

(Source: STATS CAN Census 2006)

### 3.4.1.2 Landfill Awareness and Public Opposition

The sampling framework for this research included a portion of the Towns of Stittsville and Kanata for a number of reasons. Together these Towns contain an adequate pool of households from which to sample (combined approx. 28,000). In addition, the majority of these households are in close proximity to the Ottawa Landfill (Fig. 3.1). Furthermore, media coverage of the proposed expansion and failure to honour the closure date suggest that the expansion proposal has been met with opposition from the local communities, businesses, and government officials. Through several internet website, newscast, and newspaper article searches, it became evident that the local community is concerned and views the expansion as unfair.

A coalition run website entitled 'NoDump.ca' provides citizens with the opportunity to share their concerns and voice their opinions. Common topics within the discussion forum include concerns for property values, health and safety, and fairness. While no counter is in operation to monitor the activity on this website, 'statbrain.com,' a website with access to such information, confirmed that the site is visited approximately 130 times a day. While this is comparably low to other, more popular websites, (e.g. 'uwo.ca,' the University of Western Ontario's website is accessed approximately 30,000 times daily) the fact that there is continual activity at this site indicates that the community is aware and involved in the MSWF expansion controversy to some degree. Also present on the 'NoDump.ca' website is a counter which records the number of landfill odour complaints coming from the nearby community. From January, 2009 to August, 2009, there have been over 6,000 odour complaints to the City of Ottawa. While the source of these complaints is not known (i.e., a case of multiple complaints from one resident is not controlled for), based on the content present in an archive of odour reports from residents posted on NoDump.ca, it is reasonable to assume that at least some of the reports are coming from more than one concerned resident (Table 3.2).

**Table 3.2: Example of Complaints From Local Residents**

| Date | Complaint from concerned resident |
|---|---|
| Sept. 7 2007 | "Our two guests who are from Sweden cannot believe both the awful smell from the dump as well as the height and size of it." |
| Sept. 4 2007 | "Horrendous stench all night, we had to close the windows in our house, 3.5Km from the dump!!" |
| Sept. 4 2007 | "First day back to school and the smell greeting children at the bus-stop was OBNOXIOUS!! Is no one concerned about our children breathing in this polluted, chemical-laden, air!?? This dump has GOT to CLOSE! No amount of covering up the smell is working....or will ever work!! The polluted air is still there!! It is still a health risk no matter how much WMI tries to cover it up! This is a SERIOUS HEALTH HAZARD and the ONLY solution is to close this dump!." |
| Apr. 20 2007 | "...Absolutely putrid and disgusting... it is going to be such a beautiful day (weather-wise), warm and sunny... and we will be prisoners in our home today... can't even open a window. Awful. Not fair....." |
| Apr. 2 2008 | "Very obnoxious smell from the Carp landfill again. Went for a walk with the dog and could not even last 5 minutes outside, had to turn back home.<br>It is ridiculous that this has gotten to the point where I can't even walk my dog anymore. I can't believe that putting a large mountain of garbage right in the middle of a large and growing community is the solution to Ottawa's garbage problem! PLEASE CLOSE THE DUMP!" |

(Source: 'nodump.ca')

Finally, the immediacy of this controversy is evident from keyword searches in local newspapers and television stations which uncovered a combined 20 reports about the MSWF and expansion proposal between January, 2003 and August, 2008. Also, it was noted that the majority of these articles were in circulation during the fall and winter months of 2006, right around the time the initial Terms of Reference for the expansion was submitted formally to the MOE by the WMCC. While the number of reports in the media is, to a degree, illustrative of the immediacy of this controversy, perhaps more telling is the actual content of these reports.

Typically, reports focused on the public and government reaction to the expansion proposal. For example, several articles by the Canadian Broadcast Corporation (CBC) conveyed the fact that the Mayor of Ottawa refuses to support the expansion (CBC News, 2006a). Similarly, local members of provincial parliament, in an effort to increase their popularity, continue to vie for the closure of the Ottawa Landfill. Other articles described the specific reaction of the local community members at a public consultation meeting for the expansion proposal held by the WMCC in March of 2006. More than 2,000 residents, twice what organizers expected, attended the initial public hearing held in Stittsville where communal 'boos' reportedly filled the room and individuals shouted out their opposition to the expansion. Issues of trust, concern for ground water safety, and odour complaints dominated these outbursts. Also, attendees reportedly adorned 'No Dump' buttons as a way of further expressing their opposition (CBC News, 2006b). The fact that such a large, vocal group was in attendance is indicative of the immediacy of this land use controversy and the involvement of the local community (Okeke and Armour, 2000). Thus, the level of awareness, engagement, and opposition by the local

communities, as well as the amount of media attention surrounding the controversy, supports the assumption that a portion of the sample population has experience with the operation of the MSWF, and is aware of its proposed expansion. Based on these characteristics, the communities in this area were deemed to be a prime candidate for a study of facility-related risk perception.

### 3.4.2 The Green Lane Landfill, Elgin County, Ontario

Commencing operation in 1979 under a Provisional Certificate of Approval by the MOE, the entire Green Lane Landfill is smaller than the Ottawa landfill with a potential operating area of 129.7 hectares. Initial operations included only 20.6 hectares of the 129.7 hectares of usable space. In 1985, an additional 12.6 hectares was approved for landfill operations. However, following a landfill capacity review in 1991, the MOE determined that the site had reached its capacity – as defined by the original certificate of approval – and expansion operations ceased. This limited the landfill operations to the original 20.6 hectare landfill area. Yet, in 1998, submissions to, and approvals by the MOE for minor expansions of the landfill began to occur and continued until 2006. The 2006 approval, termed the 'Optimization of the Green Lane Landfill,' opened an additional 43.9 hectares of landfill space, more than doubling the facility's existing capacity. While this increase is not as substantial as the possible expansion in Ottawa-West (i.e., a potential tripling of the now 34.95 hectare Ottawa Landfill), the optimization of the Green Lane Landfill is certainly substantial considering the long history of operational changes at the facility (Conestoga-Rovers and Associates, 2006).

### 3.4.2.1 Green Lane Landfill Ownership: City of Toronto waste diversion

As the Keele Valley Landfill near Toronto, Ontario neared capacity in the 1990s, the City of Toronto began searching for a new waste disposal site. The initial plan was to ship the waste to a decommissioned mine in Northern Ontario. However, as a result of intense public opposition to this proposal from the local community, this waste diversion plan was abandoned. Instead, the City of Toronto secured a deal with Detroit, Michigan and began transporting its MSW to privately owned landfills there in 1998. As of 2003, all of the MSW produced in Toronto was diverted, the majority of it to Michigan (City of Toronto, 2009). Although the City of Toronto has enjoyed over a decade of MSW diversion to the US, their agreement with the State of Michigan will expire in 2010. In order to continue their waste diversion, the City of Toronto has recently secured the Green Lane Landfill as its new diversion site. The Green Lane Landfill was identified as their choice site for purchase and waste diversion because the site is undergoing an optimization and can accommodate a large volume of waste over several decades.

To clarify, the City of Toronto has no plans for additional expansion of the Green Lane Landfill. Instead, they will 'optimize' (i.e., fill up) the currently available space (approximately 70 hectares) which was approved in the expansion of 2006. It is projected that at a rate of 70% waste diversion (i.e., 70% of waste produced in Toronto will be shipped to the Green Lane Landfill), the space will be filled over the next 25 years (City of Toronto, 2009). At that point, waste management in Toronto will again require reconsideration. However, it is interesting to note that the purchase of the Green Lane Landfill by the City of Toronto includes ownership of almost 500 hectares of surrounding farmland. While it is extremely unlikely that this entire space will be approved for waste

disposal, considering the City of Toronto's history of trans-boundary waste diversion, it is reasonable to assume that additional expansion may be attempted.

### 3.4.2.2 The Urban Centres of St. Thomas and South-London

The sample area for this study included portions of the Town of St. Thomas and the southern reaches of the City of London (Figure 3.2). In total, the projected population contained in the sampling framework – a 10 km buffer around the Green Lane Landfill – is approximately 15,000 people occupying around 4,000 private dwellings (see Table 3.3 for detailed socio-demographics of the areas involved). In comparison to the distance-to-facility of the sample population in the Ottawa-West sample, which is more densely situated around the Ottawa Landfill (approximately 5 km), the bulk of the sample population in Elgin County is more dispersed with denser urban areas situated further away from the Green Lane Landfill (6-8 km). This characteristic is important since distance-to-facility could influence the level to which local risk concern/sensitization affects risk and equity perception (Hunter and Leyden, 1995, Elliott et al., 1998 Baxter and Greenlaw, 2005). Thus, in light of the sample size, the difference in density and proximity of potential participants in each location, and the origin of the waste (local – Ottawa, vs. diverted – Elgin County), the Elgin County area served as a suitable site for this study of risk and environmental equity in context.

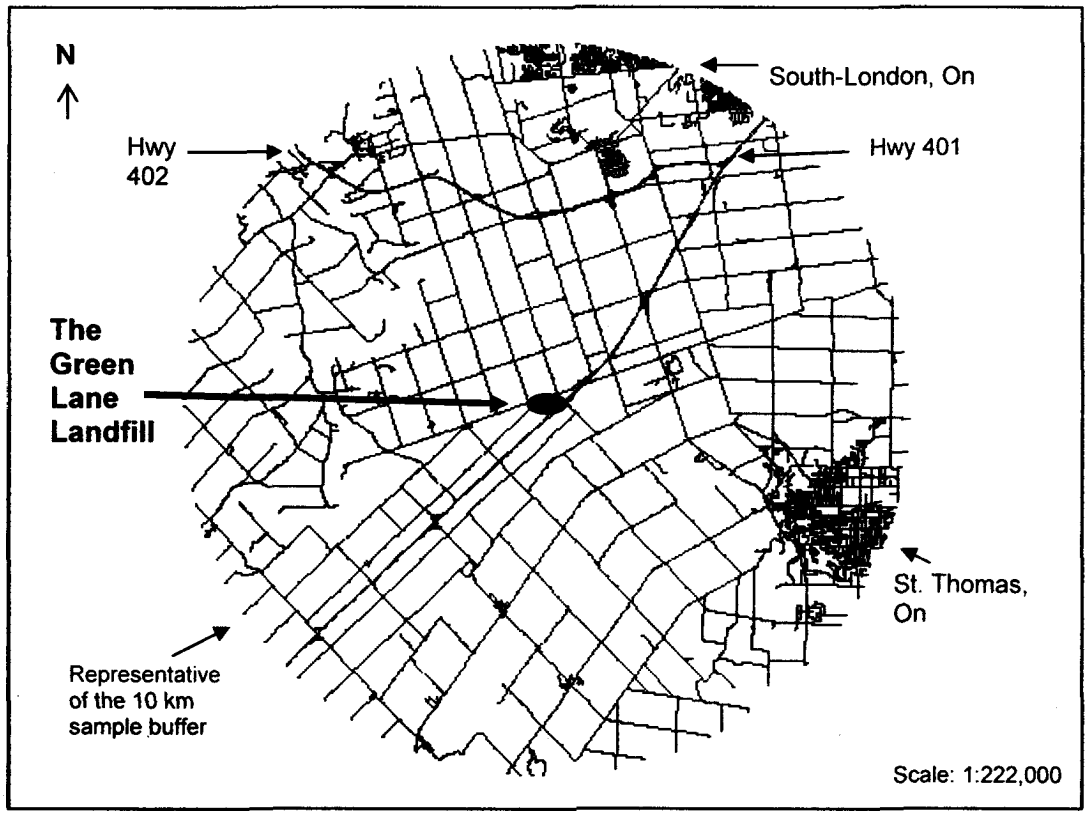


**Figure 3.2: The Green Lane Landfill and Surrounding Communities**

**Table 3.3: Sociodemographics of Elgin County, Ontario**

| Town | St. Thomas | The City of London | Elgin County | Canada |
|---|---|---|---|---|
| Population | 36,110 | 352,395 | 85,351 | 31,612,895 |
| Population density ($km^2$) | 1,017.7 | 837.9 | 45.4 | 3.5 |
| Number of dwellings | 15,225 | 157,436 | 33,634 | 13,576,855 |
| Males | 17,460 | 169,685 | 42,015 | 15,475,970 |
| Females | 18,650 | 182,710 | 43,340 | 16,136,930 |
| Proportion of population visible minority | 3.6% | 13.6% | 2.4% | 16.2% |
| Education: | | | | |
| No certificate, diploma, or degree | 20.6% | 16.7% | 23.5% | 8.5% |
| High school | 24.2% | 22.9% | 22.6% | 13.1% |
| College | 17.7% | 16.6% | 16.2% | 11.2% |
| University certificate or degree | 7.2% | 16.5% | 6.8% | 12.6% |
| Graduate degree (Master's or PhD) | N/A | N/A | N/A | N/A |
| Median income (full time workers) | $30,960 | $42,226 | $41,077 | $41,401 |

(Source: STATS CAN Census 2006)

### 3.4.2.3 Public Awareness and Opposition

In similar fashion to the citizens, politicians, and business owners in Ottawa-West, community members have expressed opposition to the Green Lane Landfill expansion. Although seemingly not as intense as Ottawa-West opposition (e.g., no active lobbyist groups or online 'anti-dump' forums have surfaced), a number of concerned citizens submit daily complaints to the facility operators and the MOE, local newspapers have carried an equal number of reports as Ottawa area papers (approximately 20), and concerned government officials publicly oppose the expansion. This lower level of public opposition is somewhat expected given that the community is dealing with a post-expansion scenario – the expansion was approved and is underway. Indeed, the public

opposition in Ottawa-West is seemingly more intense for good reason; the community is actively opposing a landfill expansion proposal (Okeke and Armour, 2000).

As evidence of public opposition towards the Green Lane Landfill, the MOE and proponents of the facility keep a detailed record of complaints from residents surrounding the Green Lane Landfill. The archive is extensive and represents a level of opposition to the landfill operation in general, as well as the expansion of the facility. Although the reports appear to be from a limited number of residents (i.e., the same 20 or so households commonly complain), given the low population density (approximately 137 homes within a 4 km radius of the Green Lane Landfill) the archive suggests that local residents are aware, concerned, and involved in the ongoing controversy to some degree (Green Lane Landfill Public Liaison Committee, 2006).

Moreover, not unlike the media coverage in Ottawa-West, reports in Elgin County cover various aspects of the controversy surrounding the use of the Green Lane Landfill. Newspaper articles and newscasts located through internet searches reveal a media focus on issues of fairness, trust, First Nations consultation, and opposition to the trans-boundary shipment of waste. For example, the CBC carried stories about the opposition from the Oneida of the Thames, a First Nations community in close proximity to the landfill (approximately 6 km). In general, this community feels that their right to hunt and live in a healthy environment was breached when the MOE issued the certificate for the purchase of the Green Lane Landfill by Toronto (CBC, 2007). This report, released in January, 2007 signifies that a considerable portion of the community in proximity to this facility is opposed to its operation and fears for the health and safety of its members. Another report issued in May, 2008 noted the concern that some residents have regarding

safety on nearby roads and highways since trans-boundary waste shipment involves an increase in truck traffic (London Free Press, 2008). Since many residents live along major service routes to the Green Lane Landfill, they are concerned for their safety while driving. as well as for the safety of their household.

Finally, akin to the case in Ottawa-West, opposition towards the expansion of the Green Lane landfill is not limited to residents and community members. Government officials have publicly denounced the MOE and the City of Toronto for passing the burden of their waste production to other communities via waste diversion and MSWF expansion. For example, the Mayor of London expressed opposition to the expansion and urged London residents to be concerned about the expansion and voice their opinions. Additionally, as previously mentioned, Oneida representatives are reportedly actively pursuing appeals to the expansion and waste diversion in Canadian courts. Thus, based on the number of mentions in the media and the specific content of these reports, it is safe to say that communities surrounding the Green Lane Landfill are at least exposed to the controversy surrounding the facility's expansion.

## 3.5 Survey Design

The survey design helps address the three main objectives of this study outlined in Section 1.3; in general terms the objective is to develop a better understanding of technological risk perception by testing the effect of various paradigms of risk research and environmental equity with focus on the importance of local contexts. Thus, the survey contains variables, scales, and questions typically found in psychometric and cultural theory studies (Slovic, 1987, Bronfman and Cifuentes, 2003, Lima and Castro, 2005). In addition, variables not typically used in risk perception questionnaires (i.e.,

local context variables) are also included (Elliott et al., 1993, Sjoberg, 2002) (Table 3.3). As such, the questionnaire (Appendix A) was designed in several parts in accordance with the analytical framework developed for this study (Figure 3.3).

**Table 3.4: List of Independent Variables**

| Theory/model | Variable name (reference category) | Variable description |
|---|---|---|
| **Psychometric paradigm** | | |
| | Dread (1) | Gut sick feelings associated with a technology |
| | Catastrophic potential (1) | A technological mishap at a facility could have catastrophic consequences. |
| | Voluntary/ Involuntary (0) | Perceive exposure to a facility as involuntary – thus are more likely to avoid the hazard risk. |
| | Trust (0) | If not trustworthy, the hazard risk is more likely to be avoided. |
| | Known (1) | Perceive higher threat if technology/operators are not trusted. |
| | Understood (1) | Perceive higher threat from unknown/not well understood technologies |
| **Cultural theory of risk (worldviews)** | | |
| Adapted from Wildavsky and Dake, 1990. | Egalitarian (6 item index) (1) | 1) With greater equality comes fewer social issues.<br>2) Those more fortunate should support the less fortunate.<br>3) Discrimination is a major social issue<br>4) Support for equal rights has gone too far (reverse scored).<br>5) The environment is fragile<br>6) On our present course, we face a major environmental catastrophe. |
| | Individualist (6 item index) (0) | 1) The more able should earn more<br>2) The brightest should make it to the top.<br>3) Social security discourages effort.<br>4) Humans were meant to rule nature.<br>5) The environment is very adaptable.<br>6) Science and technology will solve our |

| | | |
|---|---|---|
| | | environmental problems. |
| | Hierarchist (6 item index) (1) | 1) A serious social problem is lack of respect.<br>2) I am stricter than most about right and wrong.<br>3) People should be rewarded based on their position in society<br>4) Canada should have a stronger army.<br>5) Expert management will prevent environmental issues.<br>6) We should pay more attention to scientist to avoid environmental disaster. |
| **Risk in Context (Local context variables)** | | |
| Adapted from Elliott et al., 1993 | Awareness (3 item index) (1) | 1) I am aware of the landfill.<br>2) I am aware of the landfill expansion/ proposed expansion.<br>3) I am aware of the controversy surrounding the expansion. |
| | Engagement (3 item index) (1) | 1) I have complained to officials about the landfill<br>2) I have attended public meetings about the landfill.<br>3) I am a member of an activist group lobbying against the landfill. |
| | Fiduciary equity (1) | Landfills should not be expanded beyond what was initially approved. |
| | Distributive equity/ hosting obligations (1) | Landfill expansions are unfair if neighboring communities have not yet had a turn at hosting. |
| | Landfill distribution (reverse scored) (1) | Certain groups of people are not disproportionately exposed to landfills |
| | Landfill exposure (reverse scored) (1) | It is fair that some are exposed to landfills while other are not. |
| | Expansion opposition (1) | I am against the expansion of the landfill in my community. |

| | | |
|---|---|---|
| | Landfill expansion threat (1) | The expansion of the landfill threatens the health and safety of me and my family. |
| | Right of refusal (1) | A community should have the right to refuse a landfill expansion by way of a vote. |
| | Landfill NIMBY (0) | We need landfills to dispose of waste, but I do not want a landfill in my community. |
| | Burdens vs. Benefits (reverse scored) (0) | The benefits of the expansion to the greater community outweigh the locally concentrated burdens on the host community. |
| | City (0) | The area where the respondent lives (Ottawa-West or Elgin County)- included as a control/ predictor context variable |
| **Socio-demographics** | | |
| | Political views (1) | Very conservative to very liberal |
| | Residence time (0) | The length of residence in current home<br>1) under 3 years<br>2) between 3 and 10 years<br>3) greater than 10 years |
| | Residence time (city) (1) | The length of time living in current city<br>1) under 3 years<br>2) between 3 and 10 years<br>3) greater than 10 years |
| | Income (1) | Categorical ranging from less than $20, 000 to greater than $120,000 |
| | Value of home (1) | Categorical ranging from less than $100,000 to greater than $400,000. |
| | Gender (0) | Male or Female |
| | Ethnicity (1) | Open ended question |
| | Education (1) | Expressed highest level ranging from less than high school to post-graduate studies. |
| | Age (1) | Four point categorical scale range from 18 to 65+. |

The survey has 5 sections: 1) Hazard Rank; 2) Perceived risks and benefits from technologies; 3) Local land use awareness; 4) Views about society, and; 5) Sociodemographics. However, due to flaws inherent in the design (i.e., unclear instructions) responses to the Hazard Rank did not generate usable data. As a result, this section was left out of the analysis. Further, as is typical in questionnaires of this nature,

participants responded to most questions via a Likert style, 4 point scale ranging from 'strongly agree' to 'strongly disagree' (McCommas and Trumbo, 2001, Kunreuther, Fitzgerald, and Aarts, 1993). Moreover, no 'neutral' choice was included; this is advantageous in that it pushes respondents to make a choice, yet is a disadvantage in that respondents are forced to respond in a way that may not represent their actual views. Where this four point Likert scale was not used, participants responded by answering 'yes' or 'no', by assigning a numbered rank, by placing a 'check' in a specific box, or by responding to various categories found only in the sociodemographic section.

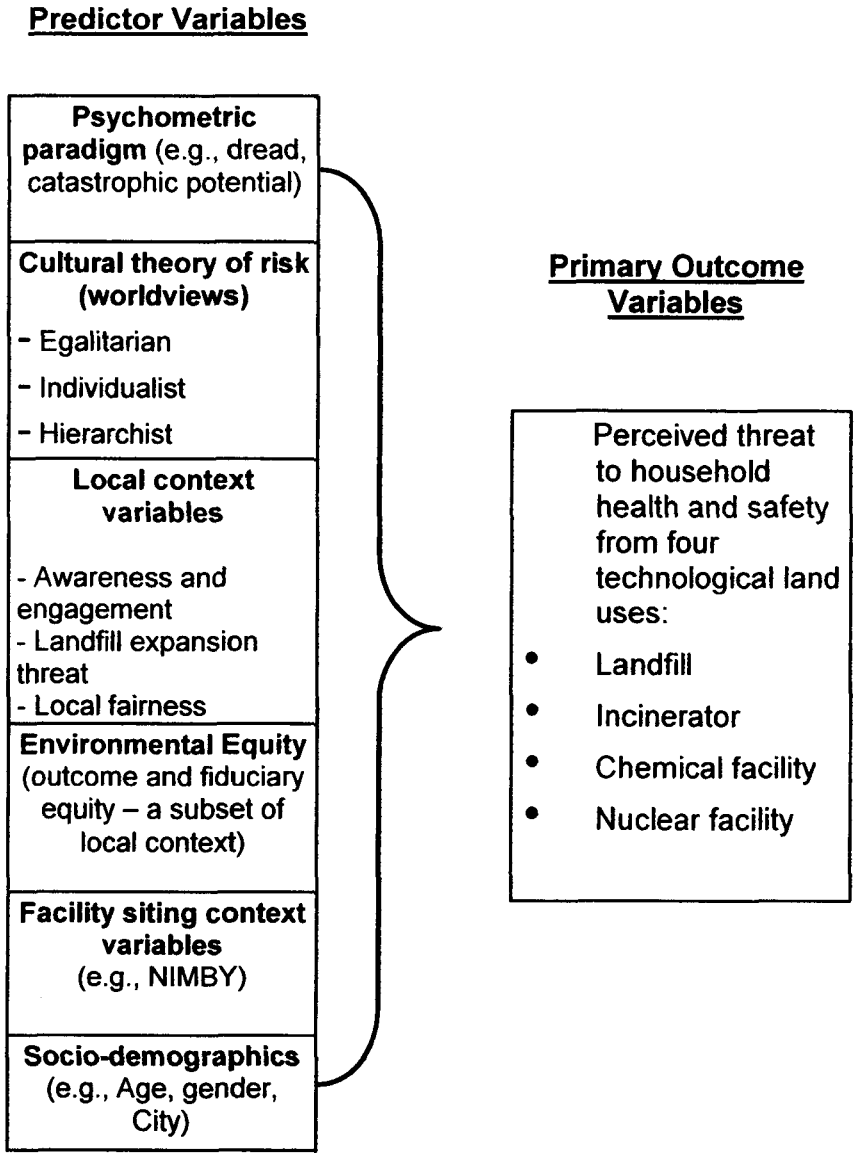


**Figure 3.3: Analytical Framework**

## 3.6 The Dependent Variable

The dependent variable in this study contains four parts, one for each of the technological land uses included in the questionnaire. Further, each of the four subparts of the dependent variable was determined based on responses to a single question;

participants were asked to either strongly agree, somewhat agree, somewhat disagree, or strongly disagree that a MSWF (a landfill), an incinerator (for municipal solid waste), a chemical facility (an oil refinery) and a nuclear facility (for power generation) present a threat to their household's health and safety. As such, explaining the variance in perceived threat to household health and safety from each hazard is the central focus with a particular emphasis on how perception of MSWF risk is linked to risk perception regarding the other three. Additional measures of perceived threat from the technologies were also garnered as each respondent was asked if they feel personally threatened by them, whether they perceive their community as threatened, and if the four technologies present a threat to future generations. While the initial intention was to include these measures of threat in the analysis as predictor variables, during coding and analysis, the personal threat measure seemed redundant. Indeed, when compared, perceived personal threat and household threat appeared to be measuring nearly identical constructs (e.g., Cronbach's alpha for MSWF = 0.92). Therefore, personal threat was represented by household threat as the dependent variable. Finally, because at times the 'distal' measures of perceived threat (e.g., communal and generational) overwhelmed the models (i.e., kicked out potentially interesting independent variables) perceived threat to the community and future generations from the technologies were, for the most part, excluded as predictor variables during modeling.

### 3.7 The Independent Variables

This section briefly outlines the independent variables used in the analysis stage of this research (Appendix B). In reference to the analytical framework, the independent variables are divided into five main categories: 1) Psychometric paradigm variables; 2)

Cultural theory of risk variables; 3) Local context variables; 4) Environmental equity variables, and; 5) Sociodemographic variables. The 'facility siting variables' are described along side the local context variables since they describe a particular aspect of facility siting in the local context.

### 3.7.1 Psychometric Paradigm Variables

The second section of the survey contained four sub-sections specific to each of the four technologies included in this study. Within these four hazard specific sub-sections, a number of researcher-defined hazard dimensions researchers have asked respondents to rate were included; this was done in order to test the empirically noted explanatory power of the psychometric paradigm. Also, including these commonly employed, psychometric style questions allowed for a comparison between risk perception as measured by the hazard characteristic (i.e., the psychometric paradigm) and the 'local context' and cultural bias variables included in a later section. The psychometric paradigm variables used in the analysis are dread, catastrophic potential, trust, known, understood, and voluntary/involuntary exposure (Slovic, 1987, Sjoberg, 2004, Graham, 2001). For example, respondents were asked if they agree or disagree that chemical facilities instill a sense of dread (i.e., gut sick reaction). Thus, if a respondent agrees, they are said to feel threatened by chemical facilities because they dread them.

### 3.7.2 Cultural Theory of Risk Variables

The fourth section of the survey contained questions specific to the cultural theory of risk. For the most part, these were borrowed directly from past cultural theory studies (Wildavsky and Dake, 1990). Yet, minor revisions were made to these 'world view' questions based on past findings and the timeliness of this research. For example,

questions about humanity's use of the environment were favoured over more general, less specific questions about society which focus less on the society-environment relationship and technological land uses. This was done in order to make valid comparisons with other studies which employed the cultural theory to predict risk perception (Brenot et al., 1998, Marris et al., 1998, Langford et al., 2000).

As is common practice, the cultural type 'fatalist' was left out because fatalists view nature as capricious (i.e., out of our control); as such, they are typically not concerned about the risks associated with potentially hazardous land uses (Lima and Castro, 2005). Considering that the goal of this study is to elicit perceptions of risk related to controversial land uses, their inclusion was considered inappropriate (Marris et al., 1998). Questions (i.e., subscale items) which would highlight the remaining cultural biases of egalitarian, individualist, and hierarchist were included in the questionnaire since these particular worldviews do exhibit a distinct opinion regarding social-environmental interaction. Egalitarians were identified based on their agreement with statements about the way discrimination has been dealt with in society, the fragility of the environment, and the potential for a catastrophic event if society continues on its present course of interaction with the environment (Cronbach's alpha = .63, n = 76). Individualists were recognized if they identified with subscale items pertaining to the nature of North American society (i.e., the more capable prevail, and so they should), the state of the environment as robust, adaptable, and capable of self-recovery regardless of society's use of it, and their reliance on science to repair the damage done (Cronbach's alpha = .64, n = 83). Finally, hierarchists were acknowledged through their support for increased military clout in Canada, their personal reflection on how strict they are about

what is right and wrong, and their reliance on expert management and science to mitigate environmental degradation (Cronbach's alpha = .552, n = 53) (Wildavsky and Dake, 1990, Dake, 1991).

### 3.7.3 Local Context Variables

Through the use of variables specific to the locally controversial land use, the third section of the questionnaire was directed at highlighting the unique relationship between each respondent and the landfill controversy in their community. For instance, awareness and engagement were considered separately as measures of risk perception because they represent different levels of knowledge and action in the local land use. These awareness and engagement variables are reworked versions of what Elliott et al. (1993) referred to as 'awareness' and 'action' variables. Likewise to Elliott et al., it is suggested that a person's level of awareness and involvement in a local land use controversy could impact on their perceptions of risk from the local hazard, and possibly from other hazards also. Thus, each respondent was asked about the operation of the MSWF, their knowledge of the expansion, and their awareness of the controversy surrounding the expansion. They were then asked if they have complained to any officials about the MSWF, if they have attended any public meetings regarding the expansion proposal, and whether or not they are a member of an activist group. The latter set of questions made up the 'engagement' variable. Unlike other sections which used a Likert style scale, these questions required 'yes' or 'no' answers. Yet, similar to the above questions, no 'neutral' or 'don't know' answer category was provided to increase the breadth of the results.

Several other context variables measured perceptions of fairness related to the landfill expansions. Likewise, a variable measuring perceived threat from landfill expansions and variables specific to landfill distribution and exposure (e.g., voluntary/involuntary and fairness) were also included. In addition, a number of indicators of the NIMBY syndrome were included as context specific variables; respondents were asked to voice their opinion regarding the need for landfills in contrast to their willingness to 'host' one in their community (i.e., 'classic' NIMBY), and whether or not they viewed the benefits of the landfill expansion to the 'greater area' as outweighing the burdens concentrated locally on them.

Finally, since distance to facility is often considered as important in risk perception and facility siting, a control for proximity (i.e., buffer location) was included as a local context variable. Likewise, since there are potentially interesting variations between sample locations, and since the models ran as a pooled sample for the most part, a 'city' variable was included. As a result, it was possible to observe any differences in risk perception based on the stage of the land use dispute (i.e., proposed expansion versus active expansion), the respondent's distance-to-facility, as well as any other factors contributing to potential differences in results between locations (e.g., socio-demographic variables, cultural views, or NIMBY prevalence). Likewise, various effects on risk perception could also be observed across all participants, regardless of the particular MSWF to which they reacted. Lastly, as described in more detail next, two variables measuring the possible significance of fiduciary equity were included. While fiduciary equity is an important concept in and of itself with possible implications for the general

study of environmental equity, it is also considered under the umbrella of local context variables since it describes a particular aspect of the local land use dispute.

### 3.7.4 Environmental Equity Variables

The environmental equity variables used in the analysis were found in two separate sections of the questionnaire. Those equity variables typically included in studies of this nature were located alongside the psychometric paradigm variables in the second section. For instance, a distributive equity (i.e., outcome/spatial equity), and a 'right of refusal' style question was used. In addition, two questions specific to the equity subset termed fiduciary equity were included in the third section. More specifically, respondents were asked whether they think it is fair to expand a landfill if neighbouring communities have not yet had a turn at hosting and whether they agree or disagree with the statement that landfills should not be expanded beyond the originally promised lifetime of the facility. This allowed for a comparison between perceptions of environmental equity towards all four hazards with the fiduciary equity variables presented in relation to the local land use dispute – a landfill expansion. In doing so, it may be possible to detect any impact that the landfill expansion dispute has on perceptions of risk and environmental equity.

### 3.7.5 Sociodemographic Variables

The final section contained questions about socio-demographics which have been shown in past studies to influence risk perception. First, each respondent's gender was requested since past studies have found that females are generally more risk averse than males (Satterfield et al., 2004). Similarly, education level has been found to influence on risk perception such that those with higher education have been found to be less

concerned with such facilities as landfills and nuclear power stations since they may have more knowledge of their operation (Slovic, 1998, Sjoberg and Walhberg, 2002). In addition, political stance has also been found to impact on risk perception (Davidson and Anderton, 2000). This is in close relation to the cultural theory of risk whereby individuals are likely to respond to a particular risk in a way which is consistent with their political views (Reams and Templet, 1996, Sjoberg, 2001). Also, accounting for the political views of questionnaire participants is an important contextual consideration (Baxter et al., 1999). Finally, ethnicity was included as a socio-demographic determinant of risk perception because perceptions of environmental racism can influence a person's view of risk (Satterfield et al., 2004).

Several other socio-demographic characteristics were requested from the participants. A grouping of questions pertaining to time of residence in their current home and city, as well as their annual income and value of home were included in an attempt to establish each participant's unique financial situation as well as their potential level of community involvement, commitment to their home, and concern for property values. Finally, in order to interpret the importance of responses to the questionnaire generally, it was necessary to know the location of each respondent relative to the landfill controversy in their community in order to understand how awareness and concern are related to risk perception via the distance decay function. This was done by simply numbering each questionnaire so that returned responses could be compared against the original sampling frame constructed through GIS software; the sampling strategy is outlined in detail later on.

## 3.8 Site Selection and Participant Identification

This section outlines the steps taken to construct the sample framework for this research. Likewise, it shows how potential participants were identified in, and selected from the sampling framework for inclusion in this study. As previously mentioned, there are a number of reasons why Ottawa-West and Elgin County were selected for sampling: 1) each location is embroiled in a dispute over a controversial land use, and; 2) there exist distinct and important similarities and differences in each location with respect to population dynamics, public awareness, and other socio-demographic factors. In addition, there were a number of general goals in the sample construction: 1) to compare risk perception in a community facing an ongoing MSWF expansion against a community facing a proposed expansion; 2) to identify potential participants on the basis of their proximity to each of the two MSWFs, and; 3) to create a suitable sampling frame since no readily available, appropriate sampling framework – which would allow for participant identification based on proximity to the MSWFs – existed. The sections to follow discuss the construction of the framework and the sampling procedures in greater detail.

### 3.8.1 Sampling Framework Construction

Because this research requires a sample from a unique population, no readily available sampling frame exists. Nevertheless, this provided an opportunity to construct a sampling strategy that accounted for the distance-to-facility of each participant; an important consideration when measuring the impact of a local land use controversy on risk perception (Kuhn, 1998, Hunter and Leyden, 1995). Thus, through the use of several sampling 'buffers' (circles of particular diameter superimposed on the landscape), the

sampling frame allowed for the general location of each participant to be known, relative to the location of the MSWFs.

The sampling buffer determined the cut-off boundary for participation in this study and was selected based on the theory of distance-decay. A specific distance-to-facility exists where it is unlikely that the controversy surrounding the MSWF will influence a resident's risk perception. For example, Okeke and Armour (2000) suggest that, past a buffer of 3 km, land use changes typically cease to influence a resident's concerns. Similarly, Furuseth and Johnson (1998) note that, in their specific case of facility related concern, a sampling buffer of 4.8 km around a MSWF was sufficient in order to capture the impact of the facility on the local residents. Thus, based on these recommendations, as well as several other related factors explained below, a 4 km and 10 km sampling buffer surrounding each MSWF were established.

Several aspects of the sample population were also considered when determining appropriate sampling buffers. As mentioned, the population density in the Elgin County area is quite low. As such, a 4 km buffer surrounding the Green Lane Landfill was constructed in order to include an adequate number of households who live in close proximity to the MSWF expansion controversy. Thus, all households within 4 km from the Green Lane Landfill (n = 137) were identified for participation in this study. A similar 4 km sampling buffer was applied to the areas surrounding the Ottawa Landfill. However, given the higher population density in these areas, it was infeasible to include all households identified in the 4 km buffer. Instead, 137 households were randomly sampled from the communities 4 km from the Ottawa Landfill.

A 10 km buffer was also included for several reasons. First, it provided an overall sampling cut-off. Also, it allowed for various comparisons to be made with respondents in the 4 km buffer. That is, since it is recognized that facility controversy can be regional as well, it was important to include residents in the analysis who live further away, up to a distance where facility related concern may well cease to influence risk perception (Baxter and Greenlaw, 2005). Finally, applying an overall sample boundary of 10 km increased the sample size, making it more representative of the general population.

Within the 4 km and 10 km buffers, households were identified using Arc Map 9.2. This GIS software uses aerial photography and housing footprint data to identify 'buildings' within a selected area. The 'buildings' were then manually checked to ensure that those selected by Arc Map are in fact houses. Once all building points within the sampling buffers were verified as houses, the Hawth's Spatial Analysis Tool available for Arc GIS 9.2 was used for random sampling. In addition to the 100% sample in the Elgin County 4 km buffer (n = 137), 363 households from the 10 km buffer were selected randomly. Similarly, 137 households within the 4 km buffer and 363 households within the 10 km buffer surrounding the Ottawa Landfill were randomly sampled. As a result, 500 households from each of the two communities surrounding the MSWFs were selected for participation in this study (Figures 3.4 and 3.5). This amounted to a total pooled sample of 1000 potential participants. With an anticipated response rate of 35%, a final response of 350 participants, 175 in each centre, would be available for analysis. This response rate is consistent with similar empirical studies (Sjoberg and Drottz-Sjoberg, 2001), and is considered by some to be a 'worst case' scenario of response (Babbie, 2004). Finally, with a pooled sample, this response rate was deemed sufficient

to keep cell counts above five in the categorical modeling. Questionnaire distribution commenced in late October, 2008 in the Elgin County area and early November, 2008 in Ottawa-West. The details of the questionnaire distribution are below.

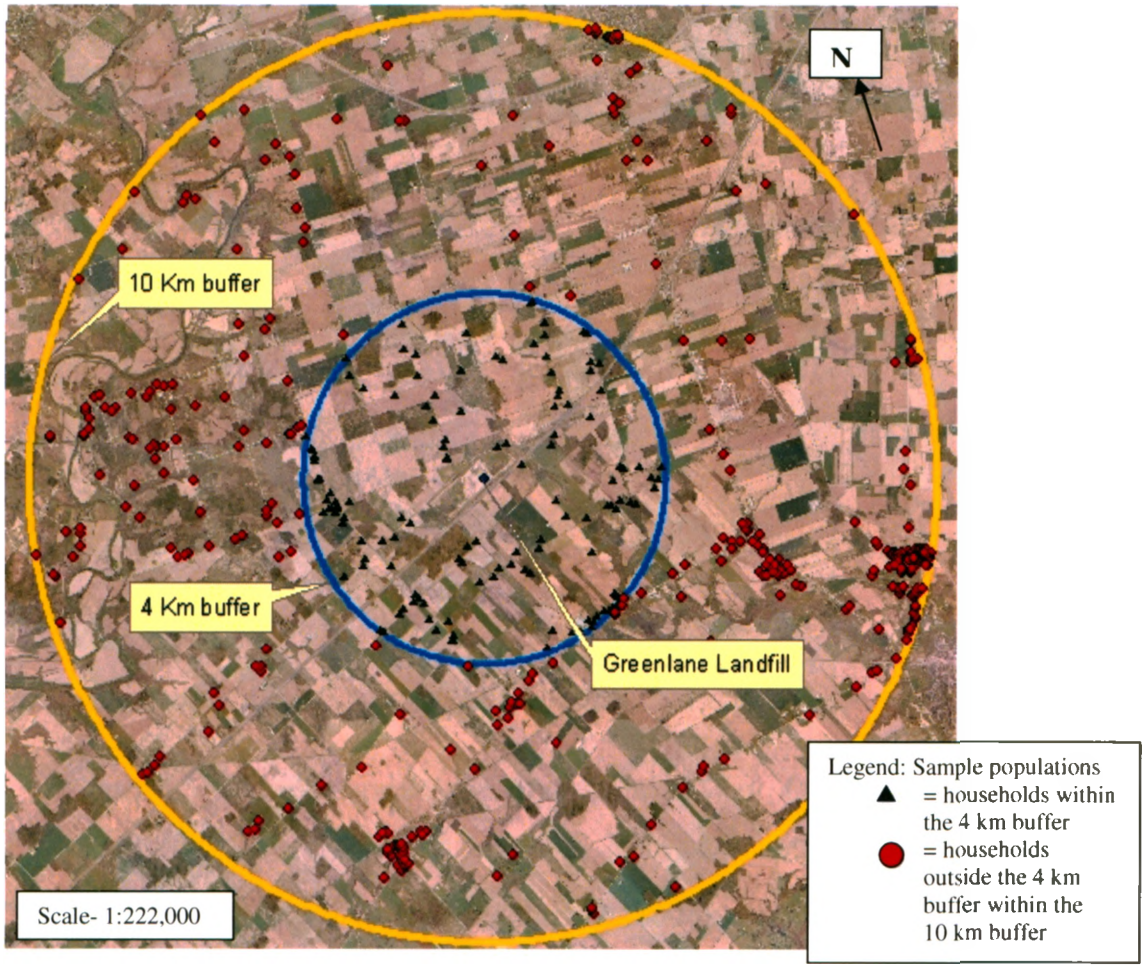


**Figure 3.4: Sample Population Within Elgin County, Ontario**

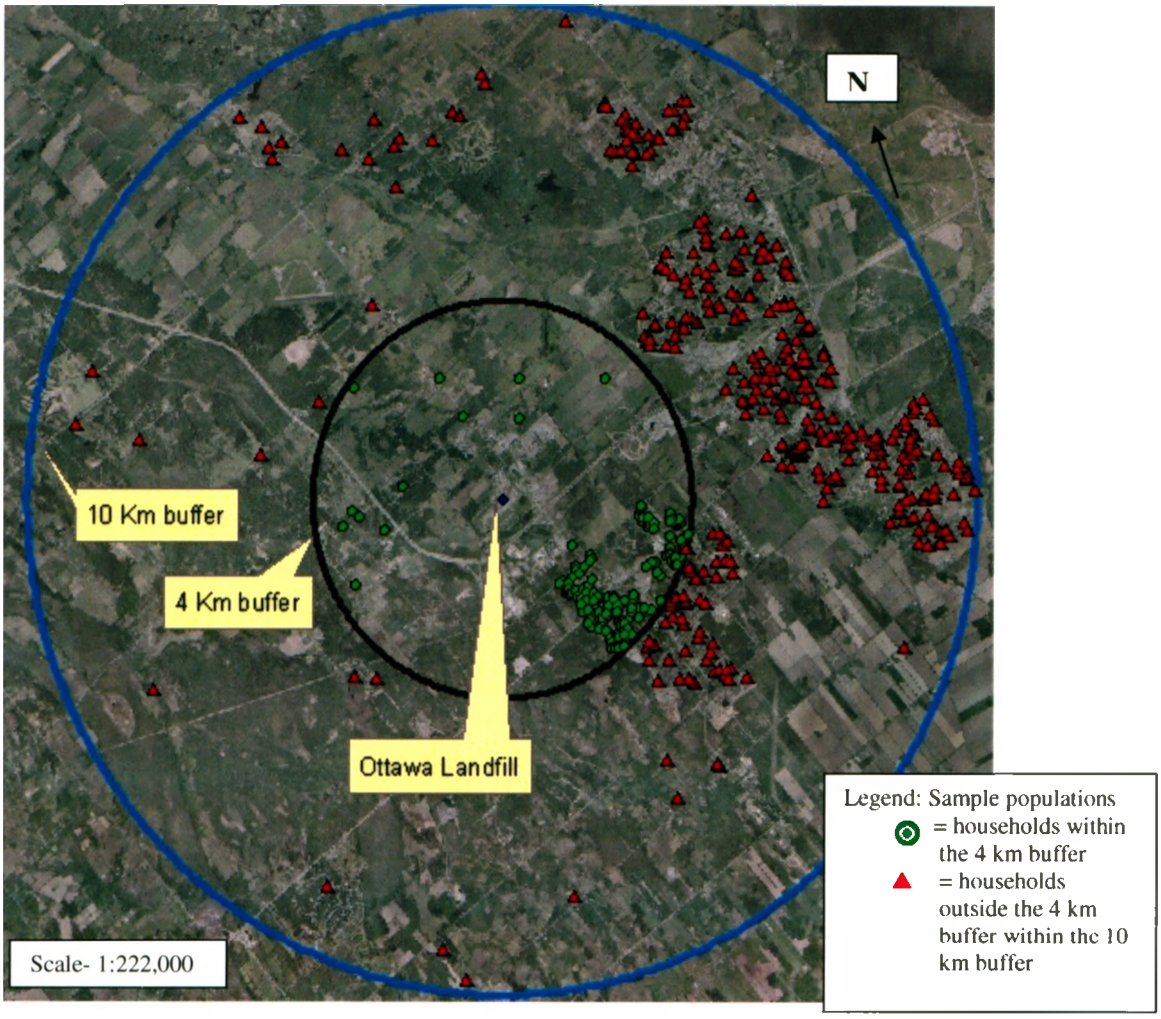


**Figure 3.5: Sample Population Within Ottawa-West, Ontario**

## 3.9 Questionnaire Distribution: Initial contact and follow up procedures

The questionnaire was hand delivered and self-administered (see Table 3.4 for response statistics). Hand delivery ensured a level of locational accuracy not possible through bulk mail delivery or random digit dialing (Babbie, 2004). Moreover, when hand delivering, face-to-face interaction between the researcher and participant was possible, preferred, and attempted in all cases. This was done in the hope of increasing response rates since each prospective participant might have felt a greater sense of attachment to

the research and researcher having met them (Babbie, 2004). In the event that a person did not answer their door (e.g., was not home), the questionnaire was left in a visible place, such as a mailbox, protected from the elements. Unfortunately, limited contact with potential participants resulted, due likely to the time of day when the hand out was conducted (between 10 am and 5 pm). Overall, less then 10% were contacted face to face. Finally, as each survey was delivered, the mailing address of each potential participant was recorded and later verified with those households randomly selected with GIS software. This was done in order to create an accurate distance-from-facility variable and to prepare for a mail-out follow up.

Based on piloting, it was estimated that completion of the questionnaire would take approximately 20 minutes. Following completion, the respondents were provided with all that was necessary to easily return the completed questionnaire (e.g., an introductory letter outlining the study and informed consent, a copy of the questionnaire, and a stamped, self-addressed envelope). The questionnaires were identical for each sample location with the exception of a reference to the MSWF particular to each location (See Appendix A).

After 6 weeks past initial questionnaire delivery, a follow up mail-out was conducted for all non-responders. This involved mail delivery of an additional copy of the questionnaire along with the necessary supplies for mail return. The mail out commenced in January, 2009. Again, these follow-up questionnaires were identical to the first, with the exception of a modified introductory letter which encouraged recipients to participate while thanking those that already did for their contribution. In total, 743 follow-up packages were mailed.

**Table 3.5: Survey Response Statistics**

| Location | Total mailed/ delivered | Returned complete | Returned incomplete | Not returned | Response rate |
|---|---|---|---|---|---|
| | **Initial** | | | | |
| **Elgin County** | 500 | 117 | 26 | 357 | **27.8%** |
| | **Follow up** | | | | |
| | 360 | 22 | 38 | 300 | |
| | **Initial** | | | | |
| **Ottawa-West** | 500 | 108 | 22 | 370 | **25.8** |
| | **Follow up** | | | | |
| | 383 | 21 | 9 | 350 | |
| | **Initial** | | | | |
| **Overall (pooled sample)** | 1000 | 225 | 48 | 684 | **22.5%** |
| | **Follow up** | | | | |
| | 743 | 43 | 47 | 653 | **2.8%** |
| | | | | **Total response rate** | **26.8%** |

## 3.10 Analytical Procedures

### 3.10.1 Data Entry and Coding

In order to maintain the integrity of the data, questionnaire responses were initially entered as raw data into the program 'Statistical Packages for the Social Sciences' (SPSS 16.0). This involved ordered, numerical coding of the responses. For example, when coding the Likert 'strongly agree' to 'strongly disagree' scale, a simple '1, 2, 3, 4' coding system was used where 1 equaled strongly agree and 4 equaled strongly disagree. Similarly, for 'yes' and 'no' responses, a score of 1 was used to represent 'yes' answers while a 2 signified a 'no' response. This form of data entry allowed for the questionnaire data set to be entered efficiently while maintaining the integrity of the initial responses.

Following the preliminary data entry, variables were coded and grouped based on their initially perceived significance. That is, specific questions which appeared to be correlated (i.e., had alpha values of 0.5 or higher) were scored and grouped into indices (Lima and Castro, 2005). Those questions which did not group together (i.e. had low alpha values) were coded as individual variables and were not included as an index. Of all the variables included in the analysis, only those pertaining to the cultural theory of risk and awareness and engagement (two of the 'local context variables') were grouped into an index as described below.

The cultural theory of risk subscale items were coded and indexed as follows. First, it was assumed that groups of questions would be correlated, as is typical in studies which employ cultural theory (Brenot et al., 1998). As a result, it was reasonable to group them into separate indices. Then, the responses were scored so that high

cumulative scores across the subscale items (i.e.. the questions which measure the cultural bias) would represent someone who 'strongly agrees' with the subscale items pertaining to that particular worldview. In this case, the items were scored 0-2. That is, a 0 signified any level of disagreement while a score of 1 indicated that the respondent somewhat agreed and a 2 indicated strong agreement with the statement. Finally, a dominance approach to assigning the worldviews was adopted (Palmer, 1996). This involved assigning a sole worldview to each participant based on the difference between a respondent's median on each of the three biases relative to the mean of the sample for each bias. Thus, the median for the 6 subscale items with the greatest range above the mean of the total sample on the same subscale items determined the cultural bias for that respondent. For instance, if a respondent's median score across the egalitarian questions was greater than the mean of the sample, and was larger than the range between the median and mean of the individualist and hierarchist subscale items, they were said to be an egalitarian.

As per a principal component factor analysis, two of the 'local context' variables (6 items total) were grouped into indices; a participant's level of 'awareness' regarding the MSWF operation and expansion (Cronbach's alpha = .78), and a respondents level of 'engagement' in the controversy surrounding the MSWF's controversy (Cronbach's alpha = .55). The three questions pertaining to 'awareness' and the three questions directed at 'engagement' were grouped into separate indices since it was determined that they measured similar constructs. Also, in similar fashion to the development of the cultural bias indices, the median of the cumulative scores across the subscale items (i.e., the three questions for each index) were compared to the mean of the entire sample for

those questions. This method determined the level of awareness and engagement each participant conveyed (i.e., disaggregated). For example, the cumulative score across the three awareness questions returned a median of 6. As such, a score below 6 indicates 'no/low awareness' while a score equal to or above 6 indicates 'moderate/high awareness.' Similarly, with a median of 3 across the engagement subscale items, it was determined that those cumulative scores equal to or less than 3 indicates 'no/low engagement' while a score of 3 or higher indicates 'moderate/high engagement' in the MSWF controversy.

Unlike the procedure used to group the cultural theory and context subscale items described above, questions pertaining to the psychometric paradigm, perceived threat, NIMBY, and environmental equity were left as individual items. Indeed, the focus was on agreement and disagreement with the statements. For example, when scoring the 'dread' factor from the psychometric paradigm section, 'disagrees' and 'agrees' were grouped and scored 0-1. As such, those participants that did not dread a particular technology (represented by a score of 0) were separated from those that did (i.e., scored a 1). This allowed the relative contribution of the dread factor, along with other variables, as a predictor of risk perception to be determined in the analysis stage, outlined in detail below.

### 3.10.2 Data Analysis

Data was analyzed using SPSS 16.0. More specifically, binary logistic regression modeling was used because the potential outcome of this research contained two categories (i.e. no/low threat and moderate/high threat to household health and safety from a MSWF). The variables and indices were added as blocks into the regression

model in the order listed in the analytical framework (Figure 3.3). Block one contained the psychometric paradigm variables, followed by the cultural theory of risk variables and local context variables in blocks 2 and 3. Block 4 included the environmental equity variables, block 5 added the facility siting variables (e.g., NIMBY), and block 6 contained the sociodemographic variables. The strength of the various models was determined by a rho-squared 'goodness of fit' measure (Wrigley, 1985). This measure determines model fit by contrasting initial log likelihoods at the outset of the model with the final log likelihood. A range between 0.2 and 0.4 indicates a well suited model – all others except the MSWF model (rho-squared = .43) were within this range. Nevertheless, the MSWF regression model was deemed a reasonably good fit such that it was very near to within the acceptable range.

The odds ratios (OR) of those variables which were significant (i.e., below the .05 level) were used to detect the effect of each variable in the model. The OR indicates how often something happens relative to how often it does not happen, for instance how likely a person is to feel threatened by something based on a particular characteristic. Thus, OR values are commonly used to determine the effect of predictor variables in logistic regression analysis (Long, 1997). Similarly, ORs are often 'flipped' in order to be more easily interpreted. This method was adopted here; the direction of effect of various reference categories was changed if the *b* coefficients were negative. This resulted in all OR values being above 1. As such, direction of relationship is noted in Tables 4.2 to 4.5.

In order to detect the importance of one variable over another in each of the models – akin to partial correlation coefficients in linear regression analysis – the regression coefficients of the predictor variables were standardized. This involved a

simple calculation whereby the un-standardized *b* coefficient was multiplied by the standard deviation of the predictor to which the coefficient referred (Menard, 2004). The result is a partially standardized regression coefficient (SRC) since the variance in the predictor, but not the empirical variation in the dependent variable, is incorporated. However, this highlights the weakness of this method; it does not account for the empirical variation in the dependent variable. Nonetheless, since the goal of this analysis is to rank order the predictor variables based on the magnitude of their effect on the dependent variable, and because the dependent variable is dichotomous, this method is valid (Agresti, 1996). Likewise, it is recognized that the order of influence of predictor variables remains the same and is not dependent on which approach to standardizing the coefficients is used (Menard, 2004). Thus, through the use of logistic regression, OR values, and partially SRCs it was possible to determine which factors (e.g., local context variables, psychometric paradigm variables, worldviews, fiduciary inequity) were strongest in effect as predictors of perceived threat from the four controversial land uses.

### 3.11 Methodological Limitations

One of the most noted limitations of the methodology of this study is the sacrifice of breadth for depth inherent in quantitative survey research. That is, in striving for the most general, transferable data, a survey will often use scales, topics, and questions that are *at least* minimally appropriate to all potential respondents while possibly avoiding items which may elicit detailed responses from only a portion of the sample (Babbie, 2004, Allreck and Settle, 1995). Similarly, as the survey is primarily comprised of closed-ended questions, the opportunity for discovery is low. This represents a tradeoff between a research design that may miss important aspects of the everyday life contexts

in which the residents live and one which tests the relative contribution of concepts well-known to influence risk perception (but have nevertheless not been studied together). Thus, although surveys are often accused of providing superficial understanding of complex issues (Babbie, 2004), because there is a relatively well developed qualitative literature on risk in context (Marris et al., 1998, Brenot et al., 1998, Bronfman et al., 2007), further exploration of risk perception in context from a positivist stance is needed.

Another inherent limitation of survey research is the potential inaccuracy of data generated by self reporting, an issue because the respondent completes a questionnaire without the benefit of "clarification" if needed. Indeed, when a researcher is not present during the questioning process, any clarity issues with respect to the focus, topic, or particular questions could affect a respondent's ability to participate since they may feel unable to answer a particular section. Thus, survey design is very important. This limitation was evident here since the threat rank and worry scale sections, as mentioned in Section 3.5, were admittedly poorly designed. As a result, participants who may have misunderstood the format or purpose of these sections failed to complete them. Moreover, attempting to determine causality (i.e., why certain people react to potentially hazardous land uses differently) may be difficult since survey respondents "are notoriously bad at assessing causality, either because they [do not] know why they or others behave in a certain way or because they [will not] say why" (Alreck and Settle, 1995, p.6-7). As such, it was important to choose variables which could potentially explain each respondent's variation in risk perception. Indeed, covering a wide range of potential explanations for risk perception guarded against the potential indecisiveness of survey participants. Finally, survey piloting and revisions, the selection of methods

consistent with the literature, the use of empirically substantiated survey questions, and the inclusion of multiple predictor variables contributed to a well-directed effort at reducing the effects of these and other limitations of survey research.

# Chapter 4: Results

## Risk in Context and Other Determinants of Technological Risk Perception

### 4.1 Introduction

This chapter presents the findings of this study in several parts roughly divided based on the research hypotheses and the four part dependent variable outlined in Chapter 3. Both case sub-samples (London and Ottawa) are pooled since they both have this land use type (hazard) immediately controversial in their respective local contexts. The characteristics of the sample population are presented in Table 4.1. Using binary logistic regression modeling, the first section outlines those variables which were significant predictors of perceived threat to household health and safety from a MSWF. Similarly, later sections outline the variables that were significant predictors of risk perception towards each of the other three, non-local technological hazards (i.e., incinerator, chemical facility, and nuclear facility); these first sections represent the substantial contribution of this study to technological risk perception research (i.e., Hypothesis 1). Finally, the importance of fiduciary equity, a contextual measure of environmental equity, is considered (Hypothesis 2).

**Table 4.1: Participant Characteristics**

| Variables | Sub-sample 1 (Elgin County) | Sub-sample 2 (Ottawa-West) | Whole Sample | Whole Province (Ontario) |
|---|---|---|---|---|
| City | n = 139 | n = 129 | n = 268 | n = 12,687,000 |
| Gender – % female | 46.6% | 46.4% | 46.4% | 51.0% |
| Age (average range) | 73% = 45-65+ years of age | 67% = 45-65+ years of age | 70% = 45-65+ years of age | 24% = 45-65+ years of age |
| Income (average range) | 50% = $50,000 - $119,999 | 49% = $50,000 - $119,999 | 50% = $50,000 - $119,999 | Average = $55,016 |
| Most commonly held degree | 62% with Post-secondary | 87% with Post-secondary | 74% with Post-secondary | 30% with Post-secondary |

(Source: STATS CAN Census, 2006)

## 4.2 Hypothesis 1: Local context variables will be significant predictors of perceived threat from municipal solid waste facilities, perhaps over and above psychometric paradigm and cultural theory variables

In order to try and understand the impact that a local land use controversy may have on technological risk perception, risk preferences were elicited for the type of hazard (a landfill) immediately controversial in the local context; this formed a baseline for which to compare to the risk preferences elicited from the non-local hazards (incineration, chemical, and nuclear facilities). Table 4.2 shows the variables which were significant predictors of perceived threat to household health and safety from a MSWF. These include: legislative trust; dread; the worldview egalitarian; threat from landfill expansions; benefit versus burden of expansions; gender, and; home value. While these 7 variables were found to be significant predictors of risk (i.e., 95% confidence interval), noting ORs and comparing the SRCs further illustrates the contribution of each of these variables.

Dread was by far the largest single predictor of perceived threat from MSWFs (OR = 19.4 vs. not dreaded). This corroborates, perhaps unsurprisingly, that participants surrounding the landfill controversies are considerably more likely to perceive a landfill as threatening if they dread it. Likewise, residents are more likely to perceive threat to their household health and safety from a MSWF if they: own a home of greater than or equal to $400,000 (OR = 6.4 vs. <$399,999); are an egalitarian (OR = 3.3 vs. not an egalitarian); perceive landfill *expansions* as threatening (OR = 3.1 vs. not threatening); do not trust the federal legislation controlling landfills (OR = 2.9 vs. trust); perceive their burdens of hosting an expanded landfill as more important than the benefits of the operation of the facility to the greater area (OR = 2.7 vs. benefits greater), and; are female (OR = 2.6 vs. male).

When comparing the relative effect of one predictor variable over another, the home value variable appears most important (SRC = 1.53). That is, a one standard deviation difference in home value is associated with a 1.53 standard deviation difference in perceived threat from MSWFs (the dependent variable). The next effective predictor of perceived threat from MSWFs is dread (SRC = 1.43). Although slightly less in effect, the dread variable remains a significant predictor of perceived threat in this case. Based on SRC, the relative effect of the remaining predictor variables are as follows: egalitarian (SRC = .55); perceived landfill threat (SRC = .55); landfill trust (SRC = .53); burdens of hosting relative to benefits (SRC = .47); and; gender (SRC = .47). Therefore, while the psychometric paradigm variable 'dread' is a highly effective predictor of perceived threat from MSWFs, cultural theory and local context variables are also strong predictors.

**Table 4.2: Predictors of Perceived Threat from Municipal Solid Waste Facilities**

| **Municipal solid waste facility: Binary logistic regression for perceived threat to household health and safety** | | | | | | |
|---|---|---|---|---|---|---|
| **Predictors of moderate/high perceived threat** | **^Odds ratio** | **Direction of relationship** (expected = yes or no) | **SRC** | **Significance** * = 0.05 ** = 0.01 | **95% CI** Lower | Upper |
| **Psychometric paradigm variables** | | | | | | |
| - Trust landfill legislation | 2.9 | - Yes | .53 | * | 1.2 | 7.2 |
| - Associate dread with landfills | 19.4 | + Yes | 1.43 | ** | 6.6 | 57.4 |
| **Cultural theory of risk variables** | | | | | | |
| - Worldview = Egalitarian | 3.3 | + Yes | .55 | * | 1.2 | 8.9 |
| **Local context variables** | | | | | | |
| - Perceive threat from landfill expansions | 3.1 | + Yes | .55 | * | 1.3 | 7.3 |
| - Benefits of landfill expansion vs. burdens | 2.7 | - Yes | .47 | * | 1.1 | 7.2 |
| **Socio-demographics** | | | | | | |
| - Gender | 2.6 | - Yes | .47 | * | 1.1 | 6.2 |
| - Home value (> $400,000) | 6.4 | + Yes | 1.56 | ** | 1.5 | 26.2 |
| **Rho-squared goodness of fit** (desired range = 0.2 to 0.4, Wrigley, 1985) | 0.43 | | | | | |

^ all reference categories are set so that odds ratios are above 1 (see direction of relationship, + or -)

Thus, as anticipated, psychometric paradigm variables were significant predictors of risk perception, although only two of six that were measured were significant. Similarly, although not as strong of a predictor (see OR and SRC values, Table 4.2) the cultural theory of risk accounted for some of the variance in risk perception towards MSWFs. Yet it is the relatively novel idea of local context variables (i.e., threat from

landfill expansions and perceptions of facility hosting burden) that are most noteworthy since these have not been studied much in the empirical literature. Finally, two sociodemographic variables surfaced as significant predictors; gender is important (i.e., females perceiving greater risk) as well as home value.

Noteworthy too are some of the key variables that did not show up in the model. For instance, the concept of fiduciary equity was contrived in an attempt to garner an in-depth understanding of environmental equity not possible through traditional equity classifications (e.g., outcome and spatial). Yet, the fiduciary equity variable was not significant as a predictor of perceived threat from landfills, a finding contrary to what was hypothesized. This may well indicate a limitation in this case of using quantitative methods – a qualitative approach to understanding the issue of fiduciary equity may have yielded more interesting findings. Likewise, the measure of the NIMBY syndrome was specific to landfills. Thus, its absence as a predictor of perceived threat from MSWFs is also contrary to what was expected. Finally, given their importance in past studies, it was expected that varying levels of awareness and engagement in the landfill controversy, as expressed by the participant, would significantly correlate with perceptions of threat from the local facility. However, these local context variables were not significant in this case. A possible explanation for the absence of these variables (i.e., their non-significance) is that there is no heterogeneity in the responses. For example, if 95% of respondents are aware of the landfill, it is highly improbable that the same 95% agree on risk perception.

## 4.3 Hypothesis 1.2a: Local context variables will not predict perceived threat from incinerators since there are no local incinerator facilities

Eliciting expressed risk preferences towards incinerators is the first of three hazards used to test the influence of a local controversy on general technological risk perception since an incinerator represents a non-local hazard: indeed, the landfill remains the most immediately controversial land use. Nonetheless, it could be argued that an incinerator is a type of land use hazard (i.e., waste disposal) immediately controversial in the local context since it is an alternative to landfills. Yet, there are no specific incinerators planned in either of the sample locations. As such, the predictors of perceived household threat from incinerators are similar to those for landfills except that the psychometric paradigm variable 'catastrophic potential' is significant (it was not for MSWFs), while the dread variable remained an effective predictor. Also, the cultural theory of risk is not significant in this case while only one local context variable is significant. Finally, the city variable replaced gender as the significant sociodemographic variable along with home value (Table 4.3). Thus, residents surrounding the landfill controversies in question are more likely to perceive municipal incinerators as threatening if they: perceive incinerators as having catastrophic potential (OR = 5.6 vs. no catastrophic potential); own a home of greater than or equal to $400,000 (OR = 5.3 vs. <$399,999); associate feelings of dread with incinerators (OR = 4.5 vs. not dreaded); perceive landfill expansions as threatening to health and safety (OR = 3.7 vs. no threat); live in Elgin County, Ontario (OR = 3.6 vs. Ottawa, Ontario), and; do not trust the federal legislation controlling incinerators (OR = 2.8).

The home value variable is greatest in effect as a predictor of perceived threat (SRC = 1.41). Following this is the catastrophic potential variable; one standard

deviation difference in catastrophic potential associates with a 0.75 standard deviation difference in the dependant variable. The remaining variables, ranked by their relative effect, are as follows: dread (SRC = .70); landfill threat (SRC = .66); City (SRC = .64), and; landfill trust (SRC = .51). Thus, not unlike the results for the MSWF regression, psychometric paradigm variables are greatest in effect. However, in comparison, the local context variables are strong in effect, certainly more so than the cultural theory variables which were not effective in this model.

**Table 4.3: Predictors of Perceived Threat from Incinerators**

| **Incinerator: Binary logistic regression for perceived threat to household health and safety** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictors of moderate /high perceived threat** | **^Odds ratio** | **Direction of relationship** (expected = yes or no) | | **SRC** | **Significance * = 0.05 ** = 0.01** | **95% CI** | |
| | | | | | | **Lower** | **Upper** |
| **Psychometric paradigm variables** | | | | | | | |
| - Trust incinerator legislation | 2.8 | - | Yes | .51 | * | 1.2 | 6.4 |
| - Associate dread with incinerators | 4.5 | + | Yes | .70 | ** | 1.8 | 11.4 |
| - Feel incinerators have catastrophic potential | 5.6 | + | Yes | .75 | ** | 1.9 | 16.4 |
| **Local context variables** | | | | | | | |
| - Perceive threat from landfill expansions | 3.7 | + | Yes | .66 | ** | 1.4 | 10.2 |
| **Socio-demographics** | | | | | | | |
| - Home value (> $400,000) | 5.3 | + | Yes | 1.41 | * | 1.4 | 20.4 |
| - City | 3.6 | - | No | .64 | ** | 1.5 | 8.6 |
| **Rho-squared** (Wrigley, 1985) | 0.36 | | | | | | |

^ all reference categories are set so that odds ratios are above 1 (see direction of relationship, + or -)

As was the case with predictors of perceived threat to MSWFs, the psychometric paradigm is useful for predicting risk perception towards incinerators. However, dread has a much less dramatic effect (SRC = .70 vs. 1.43 in MSWF model) while catastrophic potential is added as a significant predictor. However, unlike predictors of landfill threat, the cultural theory of risk variables did not predict threat towards incinerators. Perhaps most interestingly, the local context variable measuring perceived threat from landfill expansions was again a significant predictor of perceived threat from incinerators. Thus the null hypothesis must be rejected because a local context variable is a significant predictor of perceived threat from incinerators; a non-local hazard less likely to be experienced by the participants in their daily lives, certainly less so than landfills This finding suggests that, as a result of their experience with the landfill controversy in their vicinity, residents are more sensitive towards technological land uses which focus on waste disposal. Finally, while the city variable is significant, it is not in the direction expected. That is, Elgin County respondents appear more averse to incineration than Ottawa respondents. This is substantial such that it suggests that the landfill controversy experienced in Elgin County has impacted more on resident's perceptions of risk than in the Ottawa sample.

### 4.4 Hypothesis 1.2b: Local context variables will not predict perceived threat from chemical facilities since there are no local chemical facilities

The predictors of perceived threat from chemical facilities are different than predictors of incinerator threat. For instance, the dread variable is the only significant psychometric paradigm variable in the chemical facility model (Table 4.4). This is in comparison to the incineration regression where trust, catastrophic potential, and dread are significant predictors with high effect (i.e., SRC values are amoungst the highest).

Similarly, while the cultural theory variables did not predict risk preferences towards incinerators, the individualist worldview was significant in the chemical facility regression. Finally, and perhaps most unexpected is the strength of effect of local context variables in the chemical facility regression compared to that of the incinerator regression. Three local context variables are significant predictors of perceived threat from chemical facilities. Thus, not unlike incinerators, but perhaps to a greater degree, perceived threat from chemical facilities serves as a barometer of the impact of context on risk perception since there is no large scale 'chemical facility' in either sampling area, yet a chemical facility elicits the type of concern typically felt for the local facility (a landfill expansion).

More specifically, residents surrounding the landfill controversies are more likely to perceive immediate threat from chemical facilities if they: associate feelings of dread with chemical facilities (OR = 8.9 vs. not dreaded); perceive landfill expansions as threatening (OR = 2.6 vs. not threatened); exhibit sentiments of the NIMBY syndrome towards landfill expansions (OR = 2.6 vs. not NIMBY); are not an individualist (OR = 2.3, vs. are an individualist); are less conservative (OR = 2.3, tending towards liberalism), and; perceive landfill expansions as unfair (OR = 2.2 vs. fair). When standardized, the relative effect of one variable over another is similar; dread is greatest in effect (SRC = 1.1), followed by political views (SRC = .86), landfill threat (SRC = .64), the perception that landfill expansions are unfair (SRC = .62), NIMBY towards landfills (SRC = .43), and the cultural bias individualist (SRC = .39). Thus, in similar fashion to the incinerator model, the psychometric paradigm variables are greatest in effect followed closely by the local context variables. Unlike the incinerator model, the cultural theory is a significant predictor, while its effect compared to the other models/variables is markedly lower.

**Table 4.4: Predictors of Perceived Threat from Chemical Facilities**

| **Chemical facility: Binary logistic regression for perceived threat to household health and safety** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictors of moderate/high perceived threat** | **^Odds ratio** | **Direction of relationship** (expected = yes or no) | | **SRC** | **Significance * = 0.05 ** = 0.01** | **95% CI** Lower | Upper |
| **Psychometric paradigm variables** | | | | | | | |
| - Associate dread with chemical facilities | 8.9 | + | Yes | 1.1 | ** | 3.9 | 20.6 |
| **Cultural theory of risk variables** | | | | | | | |
| - Worldview = Individualist | 2.3 | - | Yes | .39 | * | 1.1 | 4.9 |
| - Political views | 2.3 | + | Yes | .86 | * | 1.1 | 5.3 |
| **Local context variables** | | | | | | | |
| - Perceive landfill expansions as unfair | 2.2 | + | Yes | .62 | * | 1.6 | 8.5 |
| - Perceive threat from landfill expansions | 2.6 | + | Yes | .64 | * | 1.6 | 8.2 |
| - Exhibit NIMBY towards landfill expansions | 2.6 | - | Yes | .43 | * | 1.1 | 6.3 |
| **Rho-squared** (Wrigley, 1985) | 0.31 | | | | | | |

^ all reference categories are set so that odds ratios are above 1 (see direction of relationship, + or -)

The findings from this regression of predictors of perceived threat from chemical facilities are remarkable. Not unlike for incinerators, what is expected here is that the local context variables will be less important as predictors of risk perception. Interestingly, this is not the case since the local context variables again proved significant in predicting risk preferences towards a non-local hazard; nonetheless, the main hypothesis about the role of controversy in risk perception seems to remain in tact. In addition, the predictive power of the psychometric paradigm and cultural theory of risk

highlight the fact that the explanatory power of empirically substantiated models of risk perception can vary. For instance, dread, while a significant predictor of perceived threat (sig. = 0.01, OR = 8.9, SRC = 1.1), is the only variable under the psychometric paradigm capable of explaining risk perception towards this non-local hazard. Finally, cultural theory of risk variables also predicted risk perception in this case, while political views emerged for the first time as an explanatory variable.

## 4.5 Hypothesis 1.2c: Local context variables will not predict perceived threat from nuclear facilities since there are no local nuclear facilities

In similar fashion to the use of incinerator and chemical facilities in this study (i.e., as a barometer of controversy importance), participants were asked to respond to various aspects of nuclear facilities; this allowed for a more thorough measure of the potential impact of local controversy on risk perception. Through the use of logistic regression, the results for perceived threat to household health and safety from a nuclear facility are presented (Table 4.5). As has been the case for the other three hazards, the dread factor from the psychometric paradigm was a significant predictor of perceived threat form nuclear facilities (OR = 11.3 vs. not dreaded). In addition, respondents are more likely to perceive nuclear facilities as threatening if they: are aware of the landfill expansion controversy (OR = 6.8 vs. not aware); perceive landfill expansions as a fiduciary inequity (OR = 3.5 vs. not inequitable); do not trust nuclear facility legislation (OR = 2.8 vs. trusted); perceive nuclear facility exposure as involuntary (OR = 2.5 vs. voluntary), and; have lived in their home for less than 10 years (OR = 2.3 vs. >10 years).

Similarly, through standardizing the regression coefficients for these significant variables, it is possible to see the relative effect of one variable over the other. The dread variable is most effective such that a one standard deviation difference in the dread

variable is associated with a 1.16 standard deviation difference in perceived threat from nuclear facilities. The remaining variables, presented here in rank order based on the SRC are: landfill awareness (SRC = .60); trust in nuclear legislation (SRC = .52); fiduciary equity (SRC = .49); voluntary exposure (SRC = .39), and; home residence time (SRC = -.57).

**Table 4.5: Predictors of Perceived Threat from Nuclear Facilities**

| **Nuclear facility: Binary logistic regression for perceived threat to household health and safety** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictors of moderate /high perceived threat** | **^Odds ratio** | **Direction of relationship** (expected = yes or no) | | **SRC** | **Significance * = 0.05 ** = 0.01** | **95% CI** Lower | Upper |
| **Psychometric paradigm variables** | | | | | | | |
| - Trust nuclear facility legislation | 2.8 | - | Yes | .52 | ** | 1.3 | 6.2 |
| - Associate dread with nuclear facilities | 11.3 | + | Yes | 1.16 | ** | 4.8 | 26.3 |
| - Perceive nuclear facility exposure as voluntary | 2.5 | - | Yes | .39 | * | 1.1 | 6.0 |
| **Environmental equity** | | | | | | | |
| - Perceive landfill expansions as a fiduciary inequity | 3.5 | + | Yes | .49 | * | 1.3 | 9.1 |
| **Local context variables** | | | | | | | |
| - Are aware of the landfill expansion controversy | 6.8 | + | Yes | .60 | ** | 1.7 | 27.4 |
| **Socio-demographics** | | | | | | | |
| - Lived in home > 10 years | 2.3 | - | Yes | -.57 | * | 1.1 | 5.1 |
| **Rho-squared** (Wrigley, 1985) | 0.26 | | | | | | |

^ all reference categories are set so that odds ratios are above 1 (see direction of relationship, + or -)

Much like the results observed from the regression of predictors for chemical facility and incinerator facility threat, local context variables unexpectedly predicted perceived threat to nuclear facilities. The findings in this regard are considerable since it was predicted that local context variables (e.g., landfill expansion awareness) would be important in the local context; their presence as predictors of perceived threat towards a non-local hazard such as a nuclear facility speaks to the impact these technological land uses (e.g., landfills) are having on local communities and their perceptions of risk towards potentially hazardous, technological land uses in general. Indeed, this is arguably the least local technological land use included in this study – the nearest proposed or existing facilities are upwards of 200 km away. Moreover, based on the SRCs, these local context variables were second and fourth in predicting risk perception. More specifically, fiduciary equity – which may be considered a specific instance of risk-in-context – is a significant predictor of risk towards a facility not typically expanded and not in the immediate vicinity of the participant (OR = 3.5 and SRC = .49 vs. dread, OR = 11.3 and SRC = 1.16). More detail regarding fiduciary equity is presented in a later section. Finally, the positive relationship between a high level of awareness regarding the landfill expansion controversy and perceptions of threat from nuclear facilities corroborates with the chemical facility findings, emphasizing further the impact of the local controversy on general technological risk perception (awareness OR = 6.8 and SRC = .60 vs. dread, OR = 11.3 and SRC = 1.16).

In summary, the above sections indicate that the local controversy (a MSWF expansion/proposed expansion) has impacted on the risk perception of the sample populations. Moreover, the psychometric paradigm was a consistent predictor of risk

perception towards all four hazards, while the cultural theory of risk was less adept at accounting for the variance in risk preferences. In addition, the local context variables were consistently significant predictors of perceived threat from both local and non-local controversial hazards. Finally, the contextual measure of environmental equity (fiduciary equity) did not account for risk perception towards MSWFs (unexpected), while it was a significant predictor in the nuclear facility regression (unexpected); the importance of this variable in regards to the second hypothesis of this study is discussed next.

## 4.6 Hypothesis 2: Fiduciary equity regarding landfill expansions as a predictor of technological risk perception

Fiduciary equity, a contextual measure of environmental equity in reference to the local landfill controversy, was expected to be an important predictor of risk perception towards the local controversy, yet less likely to be a significant predictor of risk perception towards non-local controversial land uses. This was deemed a reasonable hypothesis considering the tenets of fiduciary equity; it describes a scenario whereby an otherwise relatively non-disadvantaged community is disproportionately exposed to a potentially hazardous land use via facility expansion – an expansion that was either promised not to happen, or at least was not proposed at the site's original inception. However, this is not the case; fiduciary equity is not a significant predictor of risk perception towards MSWFs (unexpected). Instead, fiduciary equity concerning the local landfill is significant as a predictor of perceived threat from nuclear facilities (Table 4.5); one of the least local (i.e., nearest facility in Ottawa is <200 km away, nearest in Elgin County is <100 km) and less likely to be expanded facilities included in this study.

While the significance of other local context variables (e.g., perceived landfill expansion threat) as predictors of risk perception towards non-local hazards is noted

above as surprising, the fact that a measure of equity in direct reference to the local land use controversy predicted perceptions of threat from nuclear facilities is astounding. This finding provides some of the most decisive evidence that the local controversy may indeed be powerful in shaping the views of local residents, in this case particular to their feelings of fairness related to technological land use hazards in general. Therefore, while the hypothesis that fiduciary equity will be a significant predictor of risk perception towards the local hazard (landfill) is rejected, the overall hypothesis regarding the importance of context in technological risk perception remains solid.

## 4.7 Summary

This chapter divides the results of this study into two main streams of academic contribution; sections 4.2 to 4.5 address hypothesis 1 – the importance of studying risk-in-context while highlighting the contributions of this study to risk perception literature (i.e., theory testing). In a slightly different manner, section 4.6 outlines the hypothesis regarding the importance of fiduciary equity in risk perception. That is, this section was directed at theory testing while providing a more in-depth description regarding the reactions of an Ontarian community towards landfill technology and landfill expansions. For clarification, Table 4.6 summarizes the results explained above in relation to the hypotheses of this study.

**Table 4.6: Summary of Results in Relation to Research Hypotheses**

| Hypothesis | Statement | Support |
|---|---|---|
| H1 "Context" | Local context variables will be significant predictors of risk perception regarding: | |
| | • locally controversial hazards (e.g., a landfill/landfill expansion) | YES |
| | • but not for non-locally controversial hazards (e.g., a nuclear facility) (1.2 a,b,c) | NO |
| H2 "Fiduciary Equity" | Fiduciary equity will be a significant predictor of risk perception towards: | |
| | • locally controversial hazards (e.g., a landfill/landfill expansion) | NO |
| | • but not for non-locally controversial hazards (e.g., a nuclear facility) | NO |

# Chapter 5:

# Discussion

## 5.1 Introduction

This chapter relates the results of this study to the risk perception and environmental equity literature reviewed in chapter 2. In addition to noting where the findings corroborate and refute other studies, this discussion focuses on the observed importance of the local context (land use controversy) variables which were significant predictors of perceived threat from both local and non-local technological land uses. Likewise. the importance of a locally pertinent contextual measure of environmental equity (i.e., fiduciary equity) as a potential contributor to our understanding of risk perception dealing with facility expansions is discussed. That is, there seems to be more to facility opposition than simply the threat of harm (i.e., "risk") such that fairness is tied up with facility concerns. Thus, by contrasting the significance of local context variables with traditional context variables (i.e., dread – psychometric paradigm, cultural biases – cultural theory of risk), and through emphasizing the importance of environmental equity variables focused on particular injustices (i.e., facility expansions), I argue that risk perception studies conducted 'in-context' with reference to particular risk events (i.e., local context variables) and using purposeful sampling represent an important way forward for the study of technological risk perception generally.

## 5.2 The Explanatory Power of the Psychometric Paradigm

The approach taken towards the psychometric paradigm mirrors that of past investigations; a disaggregated approach to data analysis and interpretation of psychometric variables is the focus (Gardner and Gould, 1989, Marris et. al, 1998). This

contrasts with the traditional psychometric focus that seeks to explain why groups of people judge different hazards differently by averaging across the groups (Sjoberg, 1996). Nonetheless, the psychometric paradigm performed as expected; it linked a few hazard characteristics with perceptions of threat, thus explaining most of the variance in risk perception in each of the four models (Slovic, 1987, Sjoberg, 2000, Bronfman et al., 2007). Yet, the importance and explanatory power of these psychometric variables, and the overall utility of the paradigm, have been questioned in the risk literature (Siegerst et al., 2005, Willis et al., 2005). For instance, Sjoberg (2002) reminds that the psychometric paradigm, and risk perception models in general, typically account for only a portion of the variance in risk preferences (i.e., 10-15%); indeed, there is much more to be 'explained.' Likewise, several issues with these variables have been identified in this study, calling into question the effectiveness of the psychometric paradigm in accounting for perceived threat in the communities investigated. As such, it is often suggested that the psychometric paradigm serves primarily as a signal for risk aversion, explaining only a portion of threat causality and little about how threat perceptions relate to the local context (Gregory and Mendolsohn, 1993, Bronfman and Cifuentes, 2003, Bronfman et al., 2007). Through a discussion about the importance of the psychometric variables that are significant in this study, the overall utility of the psychometric paradigm is discussed below.

### 5.2.1 The Predictive Power of the Dread Variable

Although the dread variable was consistently one of the most significant predictor variables of risk preferences in Elgin County and Ottawa-West, Ontario (i.e., accounted for perceived threat to all 4 technologies), there are potential ambiguities in the measure(s)

of dread itself. For instance, the dread variable may be regarded as a result of perceived risk, not a cause of it; thus, its use as an explanatory variable may be inappropriate (Sjoberg, 1996). In addition, although the dread variable was present as a predictor of incinerator threat, based on the SRC, it was marginally lower in effect as compared to the home value sociodemographic variable (dread SRC = .70). In fact, as a standardized coefficient, the dread variable ranked third overall as a predictor of incinerator threat. This is a revealing finding since dread is described as manifesting with physical symptoms (i.e., gut sick reactions). Moreover, it has been suggested that the consistent, empirically replicated significance of psychometric variables such as dread may be due primarily to a common semantic of such terms (Sjoberg, 2000, Willis et al., 2005). This may well be the case in this study since dread was a significant predictor of perceived threat from technological land uses not in the immediate vicinity of the participants. Indeed, feelings of dread towards non-local facilities may be a result of a semantic association between 'dread' and 'threat;' this is to say that they may well be measuring similar constructs and serve primarily as a signal for risk aversion (i.e., a heightened perception of threat) (Gregory and Mendolsohn, 1993). Thus, the statistical significance of 'dread' as a predictor of perceived threat is not surprising and explains little about risk preferences, particularly in specific local contexts. Instead, it is reasonable to suggest that the perceived risk commonly associated with the dread factor may be better explained via a group of risk factors (e.g., local context variables) and not solely the feelings of dread associated with a particular land use, nor the association of feeling threatened and dreading something (Barnett and Breakwell, 2001). Therefore, although highly significant, the dread variable is only one of many possible explanatory variables.

This point resonates strongly with the findings of this study since it is argued that classifying a technology as threatening based solely on a hazard characteristic such as dread affords no consideration for potential unique, local variations in risk preference not necessarily related to the attributes of the hazard (Gardner and Gould, 1989, Trumbo, 1996, Elliott et al., 2004). Instead, this thesis places considerable emphasis on the personality profiles of the individual research participants by considering more than the basic characteristics of a hazard; it incorporates into the risk analysis the daily hazard coping of individuals and the local context in which various hazards are situated.

### 5.2.2 The Importance of Trust

Trust in federal legislation was also a significant predictor, except in the case of predicting perceived threat from chemical facilities. The significance of trust is common as it is revered as an important component in mitigating perceived risk and increasing the success of the facility siting process (Kunreuther et al., 1996, Sjoberg, 2001). Although trust is sometimes considered as a local context variable (Baxter, et al., 1999, Baxter and Greenlaw, 2005), this finding nonetheless suggests that a lack of trust in the government's ability to effectively, safely, and satisfactorily operate these facilities contributes to risk perception. Moreover, once trust is lost, it is often difficult to re-establish (Kasperson, 2005). Thus, in the context of the local land use disputes (i.e., landfill expansion), it is suggested that in order to begin mitigating facility risk, the facility proponents involved need to re-establish trust within these communities. Why it is not a significant predictor of chemical facility risk perception is unclear.

### 5.2.3 The Importance of Catastrophic Potential and Voluntary/Involuntary Hazard Participation

Two other psychometric predictor variables – catastrophic potential and voluntary/involuntary hazard participation – exhibited surprisingly limited predictive power; they accounted for risk preferences to only one hazard each (catastrophic potential – incinerators, voluntary/involuntary – nuclear facilities). Yet, these hazard characteristics are commonly found to be significant predictors of risk alongside dread (Bohnenblust and Slovic, 1998). However, catastrophic potential is a significant predictor of risk perception only towards incinerators, a finding of particular interest given the types of technological facilities the participants in this study were asked to consider. Indeed, catastrophic potential is the type of hazard characteristic typically associated with more stigmatized technologies (e.g., nuclear and chemical facilities) because they elicit concern for the health and safety of future generations, generate distal risk concern (versus local/proximal), and, due to being more 'cognitively available' because of frequent negative depiction in the media, are more often perceived as risky (Lichtenstein et al., 1978, Slovic and Weber, 2002, Sjoberg, 2003). Yet, catastrophic potential was not a significant predictor of perceived threat to household health and safety from nuclear and chemical facilities, nor from landfills for that matter. Finally, studies investigating risk perception towards waste facilities (e.g., landfills) have found that catastrophic potential is not a significant predictor of perceived threat (Gregory et al., 1991). Conversely, this study found that catastrophic potential is a significant predictor of perceived threat from incinerators; the type of facility (i.e., waste disposal – a landfill) immediately controversial in the local context. Why it is not a significant predictor of landfill risk perception is unclear.

The unique finding with respect to the catastrophic potential variable may be explained by considering the local context in which these risk preferences are situated: the experience respondents are having with the landfill dispute in their community has impacted on how they perceive waste disposal facilities, as well as more general, non-local technological hazards. Indeed, incinerators elicited the types of concerns usually associated with nuclear and chemical facilities (e.g., catastrophic potential) (Fischhoff et al., 1978, Slovic and Weber, 2002). This finding suggests the presence of risk sensitization such that the communities risk aversion towards incinerators, a type of waste disposal facility, is arguably fueled by their experience with the waste facility dispute in their immediate vicinity (Sjoberg, 1996, Elliott et al., 2004). This finding highlights the potential importance of context in this regard, and the impact that experience can have on perceptions of technological risk.

Finally, like in past studies, the voluntary/involuntary variable was inconsistent as a predictor of risk perception; it was only a significant predictor of perceived threat from nuclear facilities (a common finding) but not towards the other three technologies (Gregory and Mendolsohn, 1993, Barnett and Breakwell, 2001). The near absence of the voluntary/involuntary variable suggests that the nature of exposure (i.e., chosen or forced) is not as important to community members as the potential impacts from various technologies. This is particularly interesting when considering the model of perceived threat from the local hazard, landfills. It would be reasonable to assume that the proportion of residents against the landfill expansion may associate risk choice (i.e., voluntary exposure) with feelings of fairness and trust, variables which *were* significant predictors of risk perception to landfills. However, choice with respect to risk exposure

seems less important when compared to dread and perceived benefits versus locally concentrated burdens of hosting an expanded landfill; a surprising finding indicating that the relationship between experience with a hazard and perceptions of threat from that hazard may not vary depending on the voluntary/involuntary nature of the exposure (Starr, 1969, Gregory et al., 1991, Barnett and Breakwell, 2001). Instead, risk aversion may be better explained vis-à-vis feelings related to experience with a local land use controversy (e.g., threat, trust, and fairness) (Sjoberg, 1998, Satterfield et al., 2004, Savadori et al., 2004, Slovic et. al., 2007). The local context variables discussed in more detail later pinpoint the underlying causes of public opposition to LULUs such as landfills, perhaps more effectively than the psychometric variables discussed here.

## 5.3 The Explanatory Value Added by the Cultural Theory of Risk

This study included a slightly modified version of the traditional cultural theory of risk framework (Wildavsky and Dake, 1990) in order to compare the explanatory power of cultural biases alongside both the psychometric variables described above and local context variables described later. As such, the intention is not necessarily to improve on the cultural theory, as it is often criticized for a number of conceptual shortcomings (see Marris et al, 1998, Sjoberg, 1997, Langford et al., 2000, Casiday, 2007). Instead, the goal is to contribute to the growing body of empirical literature directed at testing the role of local context in comparison to the cultural theory of risk: no studies to date have involved landfill expansions as the hazard at issue. As such, findings follow two main themes: 1) they agree with past findings that the cultural theory of risk presents somewhat limited utility as a general model of risk prediction (Sjoberg, 2002, Finucane and Holup, 2005) and; 2) they support the idea that, though the variance explained is small, the

cultural theory remains relevant (statistically significant) for risk perception research (Masuda and Garvin, 2006). This is likely due to the fact that it focuses on the worldviews of the individual which complement psychometric studies that focus on characteristics of the hazard. Thus, with support from the findings of this study, this section submits that further use of the cultural theory of risk in technological risk perception research is certainly warranted, while efforts should continue to refine the theory's conceptual framework, and that of social theories of risk in general (Chouinard, 1997, Finucane and Holup, 2005).

The findings with respect to the predictive power of the cultural theory of risk can be interpreted a number of ways. First, when considered overall (i.e., as a general predictor of risk towards technological hazards), cultural theory presents limited predictive power since cultural biases only accounted for perceived threat in two of the four logistic regression models (i.e., for two of the four technologies). In addition, when compared to the psychometric paradigm and risk-in-context variables, which predicted perceived threat from all four technological hazards included in this study, the limited utility of the cultural theory is evident. For instance, the effect of the cultural biases in the MSWF and chemical facility models (SRC = .55 and .39) are comparatively less than the psychometric dread variable (SRC = 1.43 and 1.1) while they appear on par with the local context variables in these respective models (SRC = .55 and .47, and SRC = .62, .64, and .43). Thus, the worldviews outlined by the cultural theory explained less about risk perception than the psychometric paradigm and local context variables.

The predictive power of the cultural theory can also be considered in the context of each individual hazard and worldview. For instance, the worldviews egalitarian and

individualist were significant predictors of perceived threat, while the hierarchist view was not. In this case, it is suggested that cultural theory has at least some utility since a portion of the sample appear to function according to some of the worldviews specified by cultural theory (Marris et al., 1998, Lima and Castro). For instance, egalitarians were identified in this study as more likely to perceive landfills as threatening to the health and safety of their household. Further, based on SRC, the egalitarian worldview was fourth out of seven significant predictors of landfill threat. This finding is consistent with the literature which typically shows, as expected, that egalitarians view the environment as fragile and vulnerable and therefore fear damage to it and humans from hazards most (Willis et al., 2005). Also, they exhibit a strong sense of social connectedness and equality, tend to be suspicious of authority, and are concerned with risks which originate with institutions, especially if they are viewed as inequitable (Wildavsky and Dake, 1990). In this case, these individual characteristics can be related to a heightened perception of risk from landfills. Also as expected, individualists were identified as less likely to feel threatened by chemical facilities; this is a common finding since, as outlined by cultural theory, individualists typically exhibit a minimal sense of responsibility towards others in society and view nature as adaptable and impervious to abuse. Thus, when considered as a framework, cultural theory presents some utility since portions of the total sample (n=268) clearly identified with the egalitarian (n=76) and individualist (n=83) world views. To a degree, this fact supports the use of the cultural theory of risk as a predictive model since the underlying goal is to identify individuals, and subsequent risk preferences, based on the lens through which they view the world (Marris et al., 1998, Sjoberg, 2002, Langford et al., 2000).

Another important finding with respect to the cultural theory of risk is that it contradicts previous findings that risk perception is different from proximal (local) as opposed to distal hazards. For instance, Lima and Castro (2005) found that in general samples, people indicate that threats from hazards are generally felt by somebody else, so the respondent tends to fear them less. This study shows that this clearly changes when a person is involved in a local controversy as the landfill expansion is in both Elgin County and Ottawa-West. Specifically, the egalitarian worldview, previously found to be less sensitive to local problems and more so towards global issues (Lima and Castro, 2005), is a significant predictor of risk preference towards the land use immediately controversial in the local context (i.e., landfills). This finding is important since an underlying goal of this study was to provide some insight into how local communities respond to hazards generally, but also to the specific case of landfill controversies/expansions. Further, since trust is a significant predictor of perceived threat from landfills, and because egalitarians typically do not trust certain technologies/companies (particularly if their operation is seen as unfair), it is reasonable to suggest that a portion of the community feels threatened by the landfill in their vicinity because they exhibit the characteristics of an egalitarian (i.e., aspire to social solidarity, trustworthiness, and fairness). This fact highlights the association that certain variables (i.e., trust – psychometric paradigm) can have with other models of risk prediction (i.e., egalitarian- cultural theory) (Sjoberg, 2002). Moreover, it highlights the importance of measuring local (i.e., individual) variations in risk preference. Indeed, by accounting for local context, the cultural theory of risk may add to the explanatory of the psychometric paradigm that dominates the risk perception literature.

## 5.4 The Explanatory Power of Local context variables

Although consistently statistically significant, the local context variables admittedly did not perform as expected, particularly as predictors of perceived threat from the local hazard. It was expected that local context variables would be significant predictors of perceived threat from landfills (the local hazard); a hypothesis considered to be well founded based on the empirically noted impact that specific local contexts can have on perceptions of risk (Masuda and Garvin, 2006, Elliott et al., 2004). Likewise, the null hypothesis that these local context variables will be less important in shaping views of risk towards the non-locally controversial hazards is reasonable.

To clarify, the non-local facilities (hazards) are *not* currently being locally proposed and debated – i.e., an incinerator, chemical facility, or nuclear facility. Thus the landfill is the local, proximal, immediately controversial land use since its expansion is at issue in both communities used in the sample. The incinerator hazard is somewhat unique (somewhere in between local and non-local) since they are technically non-local (i.e., the landfill remains the most immediate), yet incinerators are considered an alternative to landfills. Nonetheless, these non-local technologies served as a barometer of the impact of context on risk perception since there are no large-scale incinerator, chemical, or nuclear facilities in either sampling area. Yet, the local context variables, while significant as predictors of risk from the local facility, appear to explain more about resident's views towards the non-local hazards. Nevertheless, the overall hypothesis that context is important in risk research remains intact since experience with a local land use dispute appears important in shaping general views of technological risk perception.

The predictive power of the local context variables at times rivaled that of the psychometric paradigm and cultural theory of risk. For instance, the dread variable is most effective as a predictor of MSWF risk perception (SRC = 1.43). Yet, the local context variables 'perceive threat from landfill expansions' (SRC = .55) and 'benefit vs. burden of expansion' (SRC = .47) are equal to/better in effect than the psychometric paradigm variable 'trust' (SRC = .53). Likewise, the effect of these local context variables is on par with the cultural theory of risk worldview egalitarian (SRC = .55). The effect of the local context variables as predictors of perceived threat from incinerators provides further support of the importance of local context in risk perception since incinerators are considered as a non-local hazard risk. Although only one local land use variable is significant (perceived threat from landfill expansions, SRC = .66), the effect is similar to the psychometric paradigm variables trust (SRC = .51), 'dread' (SRC = .70), and catastrophic potential (SRC = .75); the cultural theory of risk was not a significant predictor is this case. In the chemical facility regression, several of the local context variables (e.g., 'perceived landfill expansions as unfair', SRC = .62, 'NIMBY towards landfills', SRC = .43, and 'threat from landfill expansion', SRC = .64) were greater in effect when compared to the cultural bias individualist (SRC = .39); further evidence of the comparative, and in some cases superior predictive power of local context variables (Sjoberg, 2001). Moreover, in comparison to the psychometric paradigm (dread, SRC = 1.1), the effect of the local context variables as predictors of perceived threat from chemical facilities is competitive (average SRC = .56). Finally, in predicting risk preferences towards nuclear facilities, the least local of the non-local controversial hazards, local context variables are particularly effective. While psychometric paradigm

variables are also quite effective (voluntary, SRC = .39, trust, SRC = .52, dread, SRC = 1.16), so to are 'fiduciary equity' (SRC = .49) and 'awareness' of the local landfill dispute (SRC = .60). Again, the cultural theory of risk was ineffective in accounting for risk preferences in this case. Thus, at times, the effect of local context variables is greater than traditional, empirically substantiated risk perception variables. Indeed, the power of local context on risk perception (as well as the potential presence of risk sensitization) is underscored by contrasting the size of effects against psychometric paradigm and cultural theory variables (Lima and Castro, 2005, Uzzell, 2000).

These findings suggest a distinct relationship between the experience respondents have had with the technological land use in their daily lives (i.e., landfill controversy) and their views regarding potentially hazardous, technological land uses generally. That is, experience appears to be driving risk perception towards the local hazard, not the reverse (Sjoberg, 1996); findings that have also been observed in past studies. For example, Sjoberg (1999) found that interest in a particular risk (i.e., awareness leading to concern) can be a powerful predictor of desire for general risk mitigation. This fact emphasizes the importance of local context in risk research since an individual may feel more threatened (i.e., desire mitigation) by a risk to which they are aware of, involved in, and exposed to on a daily basis (Sjoberg, 2000, Slovic and Weber, 2002). Likewise, Elliott et al. (2004) found that heightened awareness and experience with a landfill translated to higher perceived risk of the facility; further evidence of the influence of context on risk perception, in this case specific to waste management facilities. Moreover, this study suggests that the relationship between awareness of local land uses and perceived threat from that local facility can be extended to perceived threat from non-local facilities also

(Halvorson, 2003). This seems to suggest a risk-aversion profile for a group of residents who are concerned about both their local issue (the landfill) and related facilities (i.e., 'all-or-none' cross pollination/risk sensitization). Thus, experience with the local facility seems to impact on risk perception generally, causing sensitization to the potential risks associated with technological land uses not in the immediate vicinity of the individual (e.g., nuclear facilities).

## 5.5 Risk-In-Context and the Social Amplification and Attenuation of Risk (SAR) Framework

In theory, conducting risk research 'in-context' mirrors closely that of the SAR framework. More specifically, both risk-in-context and the SAR framework focus on measuring reactions to hazards that people live with on a day-to-day basis. In the case of the SAR framework for example, risk interpretation and communication influence the way in which people view the world, in one way or another. It seems that risk perception is indeed a product of the combination of one's social, political, and physical environments (Rayner, 1992, Perri, 2005). Likewise, the SAR framework suggests that risk signals are amplified or attenuated by various receivers in society. As such, the processes that occur in a particular place, and how these processes are interpreted and responded to by the individuals occupying that space, can have a marked affect on how people respond to and perceive potential risks in their vicinity (Kasperson et al., 1988, Frewer et al., 2002). Measuring SAR-like variables was beyond the scope of this study, but combining the local context variables in this study with SAR-style risk communication variables and theory seems a reasonable way forward.

Clearly, social and cultural theories of risk represent potentially useful approaches to studying risk perception above and beyond the psychometric approach (Finucane and

Holup, 2005). The cultural theory of risk, although limited in its overall predictive power, still provides a more in-depth, individual, and socially situated account of risk perception. Likewise, the SAR framework considers how experience, communication, and interpretation of risk events and signals can direct risk perception; a finding fully supported by the results of this study. Thus, continued effort should be made to refine these measures and increase their use academically as models for predicting risk (Masuda and Garvin, 2006). Likewise, through the addition of variables specific to the local context, the psychometric paradigm may well provide a more value laden account of risk perception. However, this may only be realized through disaggregated analysis of psychometric data and a homogeneous focus on hazards and research participants (Sjoberg, 2002).

## 5.6 A Potential Way Forward: The importance of understanding hazard risk perception in context

It has been suggested by this study, as well as by others (Masuda and Garvin, 2006, Sjoberg, 2002, Elliott et al., 2004), that risk perception models which account to some degree for the local context in which a respondent lives (i.e., homogeneous focus on participants and hazards) possibly have the most utility in contemporary risk perception research. Yet, I am not suggesting that the psychometric paradigm is necessarily flawed, nor does its empirical substantiation require reconsideration; indeed, variables like dread and trust are important predictors in this study regarding a variety of technological (hazardous) land uses. Instead, considering specific local contexts alongside the psychometric paradigm may further enhance its utility for understanding how people view hazards. Likewise, although not particularly effective in this study, the cultural theory of risk remains a potentially worthwhile contributor to the study of

technological risk perception since it allows risk preferences to be investigated at the individual level. Indeed, the cultural theory of risk may present more utility as the models conceptual framework and operational specificity develops through continued empirical testing (Steg and Sievers, 2000). However, both these models fail to situate risk preferences in the context in which they are ingrained; a worthwhile effort considering the relationship between experience and risk perception observed in this study.

A possible way forward for the psychometric paradigm may lie in the integration of various 'competing' views on risk. Indeed, additional utility may present by relating the hazard focused measures of perceived threat used in the psychometric paradigm and the person-focused aspects of the cultural theory framework with variables focused on particular aspects of a respondent's daily lived experience of hazards and risk controversy – like fairness, awareness, and fiduciary equity. That is, the potential for the psychometric paradigm may be realized with the addition, and subsequent measurement, of new, context specific explanatory variables. This recommendation is motivated somewhat by Sjoberg (2002) who experimented with the psychometric paradigm by including variables specific to a facility's operation (e.g., its impact on local communities). Overall, Sjoberg found that, through the measurement of locally specific variables, he was able to increase the explanatory power of the psychometric paradigm. This point may be better explained through the use of examples specific to this study.

As observed, a participant in this study is more likely to feel threatened by incinerators if (s)he dreads them. However, their risk aversion may be better explained if the researcher studied people facing those hazards on a day-to-day basis, and further,

explored aspects of the local context that effect perceptions of those hazards (re: fairness, trust, awareness, benefits vs. burdens). Indeed, an individual may feel dread towards incinerators because they are involved in an immediately controversial dispute over the expansion of a landfill in their community. Likewise, they may feel that incinerators have catastrophic potential, another psychometric variable which proved significant in this case, because they are concerned about the health impacts a landfill expansion may have on their community. Similarly, if an individual perceives a nuclear facility as threatening, this may be best explained by their general feeling towards the local facility and their neighbours who work there, and not solely on their "gut reaction" to nuclear technology.

This point resonates most strongly, both in the context of the findings of this study, and the call from the risk perception community for a more thorough, value laden, fine scale account of risk perception towards environmental and technological hazard risks that both recognizes the importance of individual attitudes, and abandons the use of general risk dimensions as explanatory of risk perception (Sjoberg, 1996, Masuda and Garvin, 2006). Thus, through explicit focus on the research participant, and by way of recognition of the influence of daily lived experience on individual risk appraisals, the risk-in-context/SAR approach of this study, on its own or by contributing to other, empirically substantiated models of risk perception (e.g., the psychometric paradigm) may well provide a way forward in technological risk perception research.

## 5.7 The Potential Importance of Fiduciary Equity

A context specific, operationally defined subset of outcome equity is tested here for the first time academically. To review, fiduciary equity is defined by the failure of

facility proponents to honour a social contract pertaining to the length of facility hosting obligations (e.g., a landfill) of a community. Further, it describes a situation whereby non-disadvantaged communities are disproportionately exposed to potentially hazardous land uses via facility expansion Although disappointingly it failed to account for risk preferences as hypothesized (i.e., in the local context – towards landfills), fiduciary equity was explanatory of perceived threat to at least one hazard, albeit a non-local one. The discussion to follow briefly reviews the potential importance of fiduciary equity to risk perception research while noting its contribution to the findings of this study.

Various measures of environmental equity are commonly included in risk perception studies as a way to more fully account for the variance in perceived risk (Baxter et al., 1999, Satterfield, Mertz, and Slovic, 2004). However, these equity considerations typically lack an operational definition, are broadly explained, and fail to account for smaller scale, land use specific inequities (e.g., facility expansions) (Jacobson, Hengartner, and Louise, 2005, Walker et al., 2005). Moreover, perceptions of environmental equity are often garnered in relation to personal accounts (i.e., 'I feel inequitably treated') rather than specific to a particular hazard exposure in a particular place (Bowen et al., 1995). In light of these inadequacies, a context specific measure of environmental equity was included in this study in an attempt to provide a more contextual account of equity related risk perception. To measure the potential importance of this concept, respondents were asked to agree or disagree with the following statements: 1) Landfills should not be expanded beyond the originally promised lifetime of the facility, and; 2) It is unfair to expand a landfill if neighbouring communities have not yet had their turn at hosting a landfill. In doing so, respondents expressed their

feelings regarding fairness, as well as the fiduciary obligation the proponent of the facility has towards them to act in their best interest. In order to determine its importance as a predictor of risk perception, the fiduciary equity variables were included in each of the four regression models. In the end, only the first statement above was significant in one of the regressions; participants are more likely to perceive nuclear facilities as threatening if they feel that landfills should not be spatially or temporally expanded beyond what was initially approved (i.e., fiduciary obligation).

I hypothesized that the fiduciary equity variable would be a significant predictor of risk perception in the local context specifically, while the predictive power in the non-local context would likely be limited. This was deemed a reasonable assumption since both communities studied were embroiled in debates about the fairness of expansion of local landfills. However, not only was this not the case for landfills, it curiously proved to be a predictor of nuclear facility risk perception only. There are a number of possible reasons for such a combination of findings. First, it is possible that, not unlike other, empirically tested forms of environmental equity, the conceptualization of fiduciary equity is somehow flawed. While this is a possibility which must be considered, the measures of fiduciary environmental equity have considerable face validity. A possible other explanation for the surprising finding regarding the lack of prediction of risk perception by the fiduciary equity variables is that other similar variables simply overshadow such effects in the models – particularly the ones about general fairness. It is also possible that there is simply no heterogeneity in responses to the various measures of fiduciary equity. As such, it may be reasonable to accept the fiduciary equity variables as important since even the low risk perceivers might well agree that there is a fiduciary

inequity related to the facility dispute in their community. Finally, the quantitative methods employed in this study may not be suited to unearthing the nuances of fiduciary equity, particularly considering that this is a relatively new concept. As such, a qualitative, inductive approach may be more appropriate for understanding the importance of fiduciary equity. Thus, in general, the findings with respect to the fiduciary equity variable indicate that refined, operationally defined measures of environmental equity are important when attempting to account for technological risk perception. As such, it is suggested here that efforts should continue to be made to develop contextually specific measures of environmental equity since, akin to the power of context in risk perception research, daily lived experience appears important in shaping views on the equitability of various controversial land uses (Burke 1993, Bowen et al., 1995, Mennis and Jordan, 2005).

## 5.8 Summary

The focus of this discussion has been on relaying the importance of context in technological risk perception research. It has been shown time and again how the local context in which an individual is situated can impact on their perceptions of risk towards technological facilities in their immediate vicinity (e.g., landfills), as well as towards non-local controversial hazards (e.g., nuclear facilities). Thus, in this case it would seem that risk preferences are indeed situated in the context in which the hazard risk is embedded. Moreover, the psychometric paradigm and cultural theory of risk presented varying utility to this study as predictive models. For instance, the psychometric paradigm was capable of predicting risk preferences to all four technologies included. However, as a result of a heterogeneous focus on hazards and participants, the use of aggregated levels of analysis,

and construction of personality profiles of the hazard, not the participant, the psychometric paradigm served as a general signal for risk perception (i.e., a net measure). Likewise, while cultural theory predicted risk to both local and non-local controversial hazards, its predictive power in comparison to the psychometric paradigm and local context variables was indeed limited. Moreover, when compared against other 'competing' paradigms of risk research, the risk-in-context portion of this study proved successful since the predictive power of the local context variables is on par with psychometric paradigm and cultural theory of risk variables. Yet, when considered on its own, the risk-in-context approach performed contrary to what was hypothesized since local context variables appear to explain more about risk preferences towards the non-local hazards than the local one. Nevertheless, the central hypothesis about the role of context in risk perception remains solid such that context variables specific to the local land use dispute – a landfill expansion/expansion proposal – were capable of explaining risk perception towards all four hazards.

Thus, with respect to studying risk perception in this case, a focus on local context and daily lived experience has produced a value laden, contextual account of risk perception not possible through the psychometric paradigm or the cultural theory of risk – in the sense that more than mere statistical significance is reported. Further, since the concepts of conducting risk research in-context closely mirror that of the social amplification of risk framework, the finding with respect to the explanatory power of risk-in-context studies such as this emphasizes the importance of social and cultural theories of risk in technological risk perception research. Finally, akin to a portion of the risk-in-context approach, the findings with regard to the concept of fiduciary equity are

contrary to what was hypothesized. That is, fiduciary equity, while important as an overall construct (i.e., accounted for risk preferences towards nuclear facilities), admittedly failed to account for risk preferences in the local context; a purpose for which it was constructed (i.e., as a local context variable). Yet, this finding provides further evidence of the importance of context in risk perception such that feelings of inequity related to experience with a local land use dispute has transferred to feelings of threat from a facility (nuclear power generator) not in the immediate vicinity of the perceiver.

# Chapter 6:

# Conclusions

This study uses a survey of community members in Ottawa-West, Ontario and Elgin County, Ontario in close proximity to a landfill to determine the impact that hazard controversy in the local context can have on perceptions of risk about the local hazard, as well as about non-local hazards (e.g., nuclear power facilities). As such, the focus is on a comparison between empirically substantiated models for studying risk perception – the psychometric paradigm and cultural theory of risk – and the risk-in-context approach designed for this study. Through a similar focus on the importance of context (i.e.. daily lived experience), a subset of outcome equity termed fiduciary equity is tested for the first time academically; this type of environmental equity is meant to get at the unique injustices associated with the expansion of potentially hazardous facilities such as landfills, and the impact that feelings of injustice may have on risk perception.

In addressing the various objectives of this study, several contributions to the interrelated literatures of risk perception, environmental equity, and facility siting are made. Indeed, the results of this thesis respond somewhat to the problem of accounting for why different people perceive a variety of hazards differently – their experiences day to day influence the degree to which they feel threatened by technological risks. While the methodological limitations are already noted in an above chapter, the sections below note the substantive, theoretical, and methodological contributions of this study. In addition, some recommendations for future research are made.

## 6.1 Substantive Contributions

Through an investigation into a controversy surrounding a local land use. this study provides an empirical account of the impact that daily hazard coping can have on technological risk perception. In doing so, this thesis makes an important substantive contribution to risk research aimed at better understanding public opposition to controversial land uses. Overall, it is suggested that controversial, local hazards may sensitize some community members to all hazards, local and non-local. Risk sensitization carries implications for facility siting since it suggests that 'cross-pollination' of hazard risk perception can occur. This is to say that specific local contexts, in shaping views of risk towards local controversies, may also have the power to impact on technological risk perception generally. This fact is evident in the findings of this study such that the local landfill dispute has clearly sensitized some residents to non-local hazards such as incinerator, chemical, and nuclear facilities. Therefore, because specific local context shape psychosocial responses to hazard risks, and because 'cross-pollination' of risk perception is possible, risk research should adopt a context specific approach. Similarly, policy analysts need to recognize that the siting process for a particular facility may sensitize a community to technological risks generally. Understanding this may well provide a more complete account of risk perception thus mitigating facility related concern and the facility siting dilemma.

## 6.2 Theoretical Contributions

Foremost, this study sheds light on the contemporary debate surrounding the importance of 'context' in risk research, particularly as a way of accounting for the variance in risk perception between individuals and groups. As evident in the apparent

importance of conducting 'risk-in-context' research (i.e., daily lived experience), it is clear that the SAR framework presents utility to the study of technological risk perception. Although not strictly situated in the tenets of the SAR framework, the risk-in-context portion of this study is focused on the impact that experience, communication, and community dynamics can have on risk perception. Indeed, the consistent significance of 'local context variables' highlights the potential importance of such theories (i.e., SAR). Similarly, there is a minor contribution to the cultural theory of risk and the psychometric paradigm since this study corroborates with past studies that have used these methods. While not overly powerful in accounting for the variance in risk preferences in the sample communities, the cultural theory of risk seems to 'explain' more about perceived threat, certainly more so than the psychometric paradigm. Yet this is not to say that positivist approaches (e.g., the psychometric paradigm) afford no utility to the study of technological risk perception. Instead, in order to better mitigate public opposition (a.k.a. risk perception) and potentially increase the success of the facility siting process, particularly for the types of facilities included here, the level of perceived threat/public opposition in potential host communities needs to be interpreted in the context specific to that place. This is to say that the utility of a theory of risk perception manifests not only in measures of statistical significance, but also in 'explanatory' power (i.e., substantive significance) of particular variables; an exercise in 'adding value' to mere statistical significance. Therefore, it is maintained that social theories of risk, particularly those which focus on daily lived experience and local influences on risk perception, are understudied, potentially valuable modes for understanding why risk preferences vary between individuals.

A curious theoretical contribution of this study concerns the environmental equity literature; based on the significance of fiduciary equity, further investigation in terms of 'breaking promises' in the siting and operation of facilities is required. Indeed, although closely related, fiduciary equity and basic facility trust appear to have different effects. Moreover, this study finds that fiduciary equity related to landfill expansions (the locally controversial land use in the sample communities) is a significant predictor of perceived threat from nuclear facilities; a non-local controversial technology. This finding highlights the impact that the local landfills are having on perceptions of equity and fairness. As such, this study suggests that perceptions of environmental equity are, to a degree, influenced by daily lived experience. Thus, some consideration for local context, (i.e., past facility 'hosting' obligations) should be considered in siting scenarios, particularly if the siting process is for a facility expansion; only then may perceptions of inequity and unfairness be mitigated.

## 6.3 Methodological Contributions

Although overshadowed by the theoretical significance of the findings, the methodological contributions of this research are noteworthy. The theoretical-methodological overlap of conducting 'risk-in-context' research is an important aspect of this study. That is, the concept of 'risk-in-context' research involves a departure from typical quantitative risk perception investigations since it identifies research participants who are often missed or are not analyzed as specific groups in existing risk perception studies. More specifically, instead of the typical approach of utilizing a pre-existing and readily available sample frame (e.g., a voter's list or a university student directory), this study involves residents known to be living near a technology/hazard (an expanding or

proposed to be expanded MSWF) that has created local controversy. Thus, the sampling and data collection methodology employed in this research identified potential research participants based on their proximity to a particular, immediately controversial land use dispute. This is an important distinction because it allows one to parse out the characteristics and experience of the participant relative to the controversy from the characteristics they attribute to the hazard itself.

## 6.4 Future Recommendations

There are a number of recommendations for future research. First, this study could well have benefited from a comparison between pre and post landfill expansion host communities and a community which is not actively involved in a land use controversy. While it is debatable whether such a community exists (i.e., land use issues seem ubiquitous), it may be interesting to compare communities embroiled in controversial land use issues with communities experiencing little/no land use dispute. Such a 'longitudinal' approach could determine whether the local controversy in effect caused the risk sensitization, or if the community was simply predisposed to be non-risk takers. Second, this study would undoubtedly benefit from a mixed methods approach; qualitative methods allow for a value laden account of perceived threat in communities experiencing land use conflicts not possible through survey methods and statistical analysis (i.e., more depth, less breadth). As such, future research may employ a mixed methods approach to more fully understand the nuances of risk and equity perception underway in communities such as Ottawa-West and Elgin County, Ontario. Finally, in the context of risk perception theory, it is suggested here that social and cultural theories

of risk should continue to be pursued as valuable models for understanding perceived threat, particularly in the context of technological risk perception.

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# APPENDIX A: TECHNOLOGICAL RISK PERCEPTION SURVEY

**Purpose of Questionnaire**
Your household has been randomly selected to participate in our university research project.

The questionnaire below is part of a University of Western Ontario study, conducted by myself, Steve Larock. The work is the basis of my Masters thesis. In general, this questionnaire is aimed at understanding how your perceptions of risk are linked to your general views about society. That is, I am trying to understand how people's experience with a land use controversy in their community impacts on their perceptions of risk and fairness. Since this research is focused on how you respond to a land use controversy in your community (i.e. landfill expansions) some questions may be personal and sensitive. In the event that you feel a question is too sensitive for you to answer, you can, at any time, skip a question or stop responding to the questionnaire all together.

**Importance**
Research like this is important as many municipalities across Canada frequently struggle to locate locally undesirable land uses such as landfills.

**Your involvement**
For your convenience, the questionnaire can be completed on the copy provided and returned by mail in the self addressed envelope. I would greatly appreciate you taking the time to participate. Of course, you are under no obligation to participate, you are not required to include your name, and you can terminate your participation at any time.

**A small incentive**
As thanks to those households that do participate, all who complete a questionnaire will be entered into a draw for a $150 gift certificate to Home Depot. In order to be contacted in the event you are the winner, please provide your return address on the envelope containing your completed questionnaire. This information will be used for the gift card lottery and will remain separate from your survey in order to maintain anonymity.
(Please note that you will be entered into this lottery regardless of the level of completion of your questionnaire- in the event that you did not answer some questions).

**What happens with the data?**
The data will be used for anonymous statistical analysis and will be included in a Masters Thesis submission and publication. Following publication, the data will be destroyed.

---

**Before Starting**
Prior to beginning, it is important to understand that this survey involves *your* perceptions That is, there are no right and wrong answers.

**Not Interested?**
To avoid any further contact, please return the blank questionnaire using the enclosed stamped envelop. If you choose not to participate (by sending back the questionnaire blank), you will receive no further contact.

**Hazard Rank**

This first section involves ranking technologies based on your perceived level of threat and worry. First, please rank the following technologies based on your perceptions of threat to your health and safety (1 = most threatening, 4= least threatening). Next, please check the box which best describes your level of worry associated with each technology.

| **Rank** (1=most threat, 4=least threat) | **Technology** | **Your level of worry associated with each technology** | | | | |
|---|---|---|---|---|---|---|
| | | **No worry** | **Low worry** | **Moderate worry** | **High worry** | **Extreme Worry (i.e. dreaded)** |
| | Municipal solid waste facility (e.g. a landfill) | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Municipal waste incinerator | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Chemical facility | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Nuclear power facility | ☐ | ☐ | ☐ | ☐ | ☐ |

**Perceived Risks and Benefits from Technologies**

Next, please respond to statements about the risks of 4 technologies relative to their benefit to society. The same agree to disagree scale is used in all 4 tables.

| | **Technology**<br>**1) Municipal solid waste landfill** | **AGREE** | | **DISAGREE** | |
|---|---|---|---|---|---|
| | | **Strongly Agree** | **Somewhat Agree** | **Somewhat Disagree** | **Strongly Disagree** |
| 1) | I trust municipal landfill technology because its operation is federally legislated. | ☐ | ☐ | ☐ | ☐ |
| 2) | The risks from municipal landfills are well known by those exposed to them. | ☐ | ☐ | ☐ | ☐ |
| 3) | The risks from municipal landfills are well understood by scientists, governments, and operators. | ☐ | ☐ | ☐ | ☐ |
| 4) | Municipal landfills present serious risks to *my* health and safety. | ☐ | ☐ | ☐ | ☐ |
| 5) | Municipal landfills present a serious threat to *my household* (e.g. immediate family). | ☐ | ☐ | ☐ | ☐ |
| 6) | Municipal landfills present a serious threat *to my entire community.* | ☐ | ☐ | ☐ | ☐ |
| 7) | The operation of municipal landfills presents a serious threat to *future generations.* | ☐ | ☐ | ☐ | ☐ |

| | (Municipal solid waste landfill) | Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| 8) | A municipal landfill is the type of potential hazard that I cannot think about calmly, it is something I *dread* – at the level of a gut reaction. | ☐ | ☐ | ☐ | ☐ |
| 9) | If a mishap occurred, a municipal landfill could harm a lot of people. | ☐ | ☐ | ☐ | ☐ |
| 10) | If a mishap occurred, I would perceive municipal landfills as more threatening than before the mishap. | ☐ | ☐ | ☐ | ☐ |
| 11) | Municipal landfills are equally distributed (i.e. disproportional exposure for certain groups of people does not exist). | ☐ | ☐ | ☐ | ☐ |
| 12) | People exposed to municipal landfills chose to be. | ☐ | ☐ | ☐ | ☐ |
| 13) | It is fair that some are exposed to landfills while others are not. | ☐ | ☐ | ☐ | ☐ |
| | **Technology** | **AGREE** | | **DISAGREE** | |
| | **2) Municipal waste incinerator** | **Strongly Agree** | **Somewhat Agree** | **Somewhat Disagree** | **Strongly Disagree** |
| 14) | I trust waste incineration because its operation is federally legislated. | ☐ | ☐ | ☐ | ☐ |
| 15) | The risks from waste incineration are well known by those exposed to them. | ☐ | ☐ | ☐ | ☐ |
| 16) | The risks from waste incineration are well understood by scientists, governments, and operators. | ☐ | ☐ | ☐ | ☐ |
| 17) | Waste incineration presents serious risks to *my* health and safety. | ☐ | ☐ | ☐ | ☐ |
| 18) | Waste incineration presents a serious threat to *my household* (e.g. immediate family). | ☐ | ☐ | ☐ | ☐ |
| 19) | Waste incineration presents a serious threat to *my entire community*. | ☐ | ☐ | ☐ | ☐ |
| 20) | The operation of waste incinerators presents a serious threat to *future generations.* | ☐ | ☐ | ☐ | ☐ |
| 21) | Waste incineration is the type of potential hazard that I cannot think about calmly, it is something I *dread* – at the level of a gut reaction. | ☐ | ☐ | ☐ | ☐ |
| 22) | If a mishap occurred, a waste incinerator could harm a lot of people. | ☐ | ☐ | ☐ | ☐ |

| | (Municipal waste incinerator) | Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| 23) | If a mishap occurred, I would perceive waste incineration as more threatening than before the mishap. | ☐ | ☐ | ☐ | ☐ |
| 24) | Waste incinerators are equally distributed (i.e. disproportional exposure for certain groups of people does not exist). | ☐ | ☐ | ☐ | ☐ |
| 25) | People exposed to waste incinerators chose to be. | ☐ | ☐ | ☐ | ☐ |
| 26) | It is fair that some are exposed to incinerators while others are not. | ☐ | ☐ | ☐ | ☐ |

| | **Technology**<br>**3) Chemical facility** | **AGREE** | | **DISAGREE** | |
|---|---|---|---|---|---|
| | | **Strongly Agree** | **Somewhat Agree** | **Somewhat Disagree** | **Strongly Disagree** |
| 27) | I trust chemical facilities because their operation is federally legislated. | ☐ | ☐ | ☐ | ☐ |
| 28) | The risks from chemical facilities are well known by those exposed to them. | ☐ | ☐ | ☐ | ☐ |
| 29) | The risks from chemical facilities are well understood by scientists, governments, and operators. | ☐ | ☐ | ☐ | ☐ |
| 30) | Chemical facilities present a serious threat to *my* health and safety. | ☐ | ☐ | ☐ | ☐ |
| 31) | Chemical facilities present a serious threat to *my household* (e.g. immediate family). | ☐ | ☐ | ☐ | ☐ |
| 32) | Chemical facilities present a serious threat to *my entire community.* | ☐ | ☐ | ☐ | ☐ |
| 33) | The operation of chemical facilities presents a serious threat to future generations. | ☐ | ☐ | ☐ | ☐ |
| 34) | Chemical facilities are the type of potential hazard that I cannot think about calmly, it is something I *dread* – at the level of a gut reaction. | ☐ | ☐ | ☐ | ☐ |
| 35) | If a mishap occurred, a chemical facility could harm a lot of people. | ☐ | ☐ | ☐ | ☐ |
| 36) | If a mishap occurred, I would perceive chemical facilities as more threatening than I did before the mishap. | ☐ | ☐ | ☐ | ☐ |
| 37) | Chemical facilities are equally distributed (i.e. disproportional exposure for certain groups of people does not exist). | ☐ | ☐ | ☐ | ☐ |
| 38) | People exposed to chemical facilities chose to be. | ☐ | ☐ | ☐ | ☐ |

| | (Chemical facility) | Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| 39) | It is fair that some are exposed to chemical facilities while others are not. | ☐ | ☐ | ☐ | ☐ |

| | Technology<br>4) Nuclear power facility | AGREE | | DISAGREE | |
|---|---|---|---|---|---|
| | | Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |
| 40) | I trust nuclear power because its operation is federally legislated. | ☐ | ☐ | ☐ | ☐ |
| 41) | The risks from nuclear power are well known by those exposed to them. | ☐ | ☐ | ☐ | ☐ |
| 42) | The risks from nuclear power are well understood by scientists, governments, and operators. | ☐ | ☐ | ☐ | ☐ |
| 43) | Nuclear power facilities present a serious threat to *my* health and safety. | ☐ | ☐ | ☐ | ☐ |
| 44) | Nuclear power facilities present a serious threat to *my household* (e.g. immediate family). | ☐ | ☐ | ☐ | ☐ |
| 45) | Nuclear power facilities present a serious threat to *my entire community.* | ☐ | ☐ | ☐ | ☐ |
| 46) | The operation of nuclear power facilities presents a serious threat to future generations. | ☐ | ☐ | ☐ | ☐ |
| 47) | Nuclear power facilities are the type of potential hazard that I cannot think about calmly, it is something I *dread* – at the level of a gut reaction. | ☐ | ☐ | ☐ | ☐ |
| 48) | If a mishap occurred, a nuclear power facility could harm a lot of people. | ☐ | ☐ | ☐ | ☐ |
| 49) | If a mishap occurred, I would perceive nuclear power facilities as more threatening than I did before the mishap. | ☐ | ☐ | ☐ | ☐ |
| 50) | Nuclear power facilities are equally distributed (i.e. disproportional exposure for certain groups of people does not exist). | ☐ | ☐ | ☐ | ☐ |
| 51) | People exposed to nuclear power facilities chose to be. | ☐ | ☐ | ☐ | ☐ |
| 52) | It is fair that some are exposed to nuclear power facilities while others are not. | ☐ | ☐ | ☐ | ☐ |

**Local Land Use Awareness**

Now, I would like you to respond to some questions about a current land use change in your community. In addition to the previously used agree to disagree scale, this section will also require several yes and no answers.

| | | YES | NO |
|---|---|---|---|
| 53) | I am aware of the operation of the Ottawa Landfill/Green Lane Landfill at 2531 Carp Rd., Ottawa, Ontario. | ☐ | ☐ |
| 54) | I am aware of the proposed expansion of this facility? | ☐ | ☐ |
| 55) | I am aware of controversy surrounding the expansion? | ☐ | ☐ |
| 56) | I am against the expansion of the existing landfill? | ☐ | ☐ |
| 57) | The expansion of the facility threatens the health and safety of me and my family? | ☐ | ☐ |
| 58) | I have complained to officials about the expansion proposal (e.g. municipality, MP, or the facility operators). | ☐ | ☐ |
| 59) | I have attended a public meeting about the expansion proposal? | ☐ | ☐ |
| 60) | I am a member of an activist group lobbying against the expansion? | ☐ | ☐ |

I want to end this section with 5 agree/disagree statements.

| | Statement | AGREE | | DISAGREE | |
|---|---|---|---|---|---|
| | | Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |
| 61) | I feel that the use of landfills to dispose of waste is necessary, but I don't want a landfill in my community. | ☐ | ☐ | ☐ | ☐ |
| 62) | The *benefits* of the expansion to the Greater City of Ottawa/Toronto outweigh the locally concentrated *burdens* of the landfill | ☐ | ☐ | ☐ | ☐ |
| 63) | Landfills should not be expanded beyond the originally promised lifetime of the facility. | ☐ | ☐ | ☐ | ☐ |
| 64) | It is unfair to expand a landfill if neighboring communities have not yet had their turn at hosting a landfill. | | | | |

| | Statement | AGREE | | DISAGREE | |
|---|---|---|---|---|---|
| | | Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |
| 65) | A community should have the right to refuse a landfill expansion by way of a vote. | ☐ | ☐ | ☐ | ☐ |

**Views About Society**

Next I would like to ask you some questions about society and nature in general using the same *strongly agree* to *strongly disagree* scale. Please select that which most accurately characterizes your feelings.

| | Statement | AGREE | | DISAGREE | |
|---|---|---|---|---|---|
| | | Strongly agree | Somewhat agree | Somewhat disagree | Strongly disagree |
| 66) | If people in this country were treated more equally we would have fewer problems. | ☐ | ☐ | ☐ | ☐ |
| 67) | Those who get ahead should be taxed more to support the less fortunate. | ☐ | ☐ | ☐ | ☐ |
| 68) | Discrimination is a very serious problem in our society. | ☐ | ☐ | ☐ | ☐ |
| 69) | We have gone too far in pushing equal rights in this country. | ☐ | ☐ | ☐ | ☐ |
| 70) | The environment is very fragile and the slightest human interference can cause major problems. | ☐ | ☐ | ☐ | ☐ |
| 71) | If things continue on their present course we will soon face a major ecological catastrophe. | ☐ | ☐ | ☐ | ☐ |
| 72) | In a fair system people with more ability should earn more. | ☐ | ☐ | ☐ | ☐ |
| 73) | In this country, the brightest should make it to the top. | ☐ | ☐ | ☐ | ☐ |
| 74) | Social Security tends to stop people from trying harder to succeed. | ☐ | ☐ | ☐ | ☐ |
| 75) | The environment is very adaptable and will recover from any harm caused by people. | ☐ | ☐ | ☐ | ☐ |
| 76) | We do not need to worry about environmental problems because science and technology will be able to solve them. | ☐ | ☐ | ☐ | ☐ |
| 77) | The environment is quite adaptable and will recover from any damage caused by us. | ☐ | ☐ | ☐ | ☐ |

| | | Strongly agree | Somewhat agree | Somewhat disagree | Strongly disagree |
|---|---|---|---|---|---|
| 78) | Lack of respect for authority is one of our most serious social problems. | ☐ | ☐ | ☐ | ☐ |
| 79) | I am stricter than most people about what is right and wrong. | ☐ | ☐ | ☐ | ☐ |
| 80) | People should be rewarded according to their position in society. | ☐ | ☐ | ☐ | ☐ |
| 81) | We should have stronger armed forces than we do now. | ☐ | ☐ | ☐ | ☐ |
| 82) | With expert management, we can prevent major environmental problems. | ☐ | ☐ | ☐ | ☐ |
| 83) | To avoid environmental disasters it is necessary to pay more attention to the advises of specialists. | ☐ | ☐ | ☐ | ☐ |

| | | *Very* conser-vative | Conservative | Moderate | Liberal | *Very* Liberal |
|---|---|---|---|---|---|---|
| 84) | In general, would you describe your political views as? | ☐ | ☐ | ☐ | ☐ | ☐ |
| 85) | Is there anything else you wish to add about society and nature in general? | | | | | |

**Socio-demographic Information**

Finally, I just need some information about you and your household for analytical purposes.

| | | | | |
|---|---|---|---|---|
| 86) | How long have you lived in your current home? | Under 3 years ☐ | Between 3 and 10 years ☐ | Greater than 10 years ☐ |
| 87) | How long have you lived in (insert name of city)? | Under 3 years ☐ | Between 3 and 10 years ☐ | Greater than 10 years ☐ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 88) | I want to remind you that this survey is *anonymous* and *confidential* when I ask, what is your before tax household income: | Less than $20,000 ☐ | 20,000-$49,999 ☐ | $50,000-$79,999 ☐ | $80,000-$119,999 ☐ | $120,000 and greater ☐ | don't know/ refused ☐ |

| 89) What is the value of your home? (most recent tax assessment is best if known) | Less than $100,000 ☐ | 100,000-$199,000 ☐ | $200,000-$299,000 ☐ | $300,000-$399,00 ☐ | $400,000 and Greater ☐ | don't know/ refused ☐ |
|---|---|---|---|---|---|---|

| 90) Gender | Male ☐ | Female ☐ |
|---|---|---|
| 91) Ethnicity (please print in space provided). | | |

| 92) Highest level of completed education | Less than high school ☐ | High school diploma ☐ | College Diploma ☐ | University Degree ☐ | Post-graduate studies ☐ |
|---|---|---|---|---|---|

| 93) Your Age | 18 to 24 ☐ | 25 to 44 ☐ | 45 to 64 ☐ | 65 + ☐ |
|---|---|---|---|---|

**Is there anything else you would like to add about this topic?**

_____

_____

_____

_____

_____

**Thanks for your participation!**

(If you are the lucky winner of the $150 certificate draw, it will be mailed to you)

# APPENDIX B: NON-MEDICAL ETHICS APPROVAL


**Office of Research Ethics**
The University of Western Ontario
Room 4180 Support Services Building, London, ON, Canada N6A 5C1
Telephone: (519) 661-3036 Fax: (519) 850-2466 Email: ethics@uwo.ca
Website: www.uwo.ca/research/ethics

**Use of Human Subjects - Ethics Approval Notice**

**Principal Investigator:** Dr. J. Baxter

**Review Number:** 154633B **Review Level:** Full Board

**Review Date:** September 5, 2008

**Protocol Title:** The facility siting dilemma: A comparative case study of risk perception, fiduciary inequity, and proximity to waste facility expansions in Ottawa-West and London-South, Ontario.

**Department and Institution:** Geography, University of Western Ontario

**Sponsor:** SSHRC-SOCIAL SCIENCE HUMANITIES RESEARCH COUNCIL

**Ethics Approval Date:** October 17, 2008 **Expiry Date:** July 31, 2009

**Documents Reviewed and Approved:** UWO Protocol, Letter of Information and Consent, Self Administered Mail Out Survey, Thank you / Reminder Letter, Lottery Winner Notification Letter.

**Documents Received for Information:**

This is to notify you that The University of Western Ontario Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the applicable laws and regulations of Ontario has granted approval to the above named research study on the approval date noted above.

This approval shall remain valid until the expiry date noted above assuming timely and acceptable responses to the NMREB's periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the UWO Updated Approval Request Form.

During the course of the research, no deviations from, or changes to, the study or consent form may be initiated without prior written approval from the NMREB except when necessary to eliminate immediate hazards to the subject or when the change(s) involve only logistical or administrative aspects of the study (e.g. change of monitor, telephone number). Expedited review of minor change(s) in ongoing studies will be considered. Subjects must receive a copy of the signed information/consent documentation.

Investigators must promptly also report to the NMREB:

a) changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely affect the safety of the subjects or the conduct of the study.

If these changes/adverse events require a change to the information/consent documentation, and/or recruitment advertisement, the newly revised information/consent documentation, and/or advertisement, must be submitted to this office for approval.

Members of the NMREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the NMREB.

Chair of NMREB: Dr. Jerry Paquette

| Ethics Officer to Contact for Further Information | | | |
|---|---|---|---|
| ☒ Grace Kelly | ☐ Janice Sutherland | ☐ Elizabeth Wambolt | ☐ Denise Grafton |

*This is an official document. Please retain the original in your files.*

cc: ORE File