4-18-2019 3:00 PM

Weathering Storms and Flooded Waters: Anthropological Perspectives of Policy and Risk in Toronto, Ontario

Jennifer Spinney, *The University of Western Ontario*

Supervisor: Pennesi, Karen E., *The University of Western Ontario*
: Clark, A. Kim, *The University of Western Ontario*
: Baxter, Jamie, *The University of Western Ontario*

A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Anthropology

ABSTRACT

This dissertation examines how the interactive processes of policy construct social relationships, influence expert and lay perceptions of risk, and contribute to practices of risk management and decision making. In the context of weather and flooding in Toronto, Ontario, I first show how meteorologists at Environment and Climate Change Canada enact their roles as experts and attain operational success while adhering to policy constraints during 'non-severe' weather perceived as risky. Then, through an analysis of face and drawing on the concept of Goffman's interaction ritual and Collins's interaction ritual chain, I illustrate the role that ambiguous river flood situations play in shaping risk and policy interactions and decision making for flood forecasters at Toronto and Region Conservation Authority as well as various key recipients of their information. Finally, at the level of discourse, I compare *policied* river flood risk and *unpolicied* non-river flood risk in Toronto and uncover the entanglement of policy with organized government irresponsibility and heterogeneous public social realties. The three analyses encapsulate different, yet related policy and risk scenarios: (1) when official policy exists, but the weather does not meet risk threshold criteria; (2) when official policy exists and the circumstances meet risk threshold criteria but there is uncertainty related to the atmospheric conditions which complicates the policy negotiation process; and (3), when no official policy exists and people, who are neither experts in meteorology nor hydrology, are left to identify and manage risk on their own. Through a combination of participant observation, semi-structured interviewing and survey administration, the findings contribute to anthropology of policy and risk literature by illuminating the influential role of interaction in shaping these concepts and their related processes, and

the effect interaction has in policy-work for propagating risk in unintended ways. The interconnections uncovered here have important implications for weather and flood policy-makers as well as policy implementers in Toronto as they look toward enhancing policy and risk management initiatives for the protection of the publics they serve.

Keywords: anthropology of risk, anthropology of policy, expertise, interaction, interaction ritual chain, face, discourse, decision making, risk communication

DEDICATION

For Marco.

No mountain is too high if you just keep climbing.

ACKNOWLEDGEMENTS

Near to the culmination of this long process it is difficult to find words that appropriately convey my gratitude to all the individuals who have assisted me in this journey.

There have been many who have inspired, guided, and supported me during the development of this project and dissertation. First and foremost my supervisor, Dr. Karen Pennesi. To Karen I am deeply grateful for her patience, her consistent encouragement, and her useful constructive recommendations. Many times over the years Karen led me to the threshold of my mind; always encouraging me to push a little further and dig a little deeper in my research and in my understanding. Karen, thank you for being an incredible teacher. You have expanded my thinking and influenced my development as a scholar beyond measure.

Sincere thanks should also be given to my advisor, Dr. Kim Clark, for the departmental support she gave me as a new mom entering the program and for her understanding as I handled some of life's trickier moments. I appreciate Kim for the interest she expressed in my project. In a department where few, if any, study anthropology in the context of weather, her intrigue in my project fueled my passion for the research and reassured me that this was an anthropological ride worth taking. As an advisor, I am thankful to her for her early encouragement to think anthropologically. "Yes, Jen. Meteorologists are producing weather information and people are consuming it in different ways. But what makes this anthropological?" Kim's words resonated, and gratefully so. They have had a profound impact on the approach I took with this project, in the writing of the dissertation, and most certainly they will guide me in the years to come.

The dissertation would not be what it is were it not for the collaborative arrangements that were made with organizations in Toronto who produce weather and flood information. To that end, I must extend my deepest thanks to Geoff Coulson and Rebecca Wagner at Environment and Climate Change Canada's (ECCC) Downsview Office who endorsed this undertaking, as well as Laurian Farrell from Toronto and Region Conservation Authority (TRCA) whose initial support for this project has been extended more recently by Sameer Dhalla, Dan Hipple, and Rehana Rajabali. These individuals welcomed me to their offices where I sat alongside meteorologists and flood forecasters learning about the worlds of weather and flood forecasting, which helped me tremendously as I made sense of their everyday practices and developed protocols to take to other sites in the field.

In saying this I must also acknowledge the meteorologists and flood forecasters who embraced me, the curious student. My fieldwork experience was made so much more enjoyable by the time I spent sitting next to all of you. A heartfelt thanks goes out especially to severe weather meteorologist, Rob Kuhn. "Kuhny" is the teacher of all teachers. His enthusiasm for the weather is infectious and his conscientious spirit toward forecasting is admirable. He is the guy (although I predict many meteorologists have this in common) who easily recalls a winter storm system that affected Toronto back in the

1980s, right down to the amount of snowfall and how long the drive was into work that day. As much as he and the other meteorologists taught me about the ins and outs of the atmosphere, on one of my late night/early morning departures from the ECCC office, Kuhny offered to walk me to my car “just to be safe”. His earnestness to help, and particularly this thoughtful gesture, I won’t soon forget. Thank you for making me feel like part of the ECCC family, Kuhny. Likewise, at TRCA, Rita Lucero always made me feel welcome and her assistance with data in the past several months has eased my map making efforts considerably.

To David, thank you for bringing the words of Albert Einstein into my workspace: “Life is like riding a bicycle. To keep your balance, you must keep moving”. Indeed, this is true, and how helpful it has been to have this reminder during the more difficult moments of this expedition. To my Mom, our Baba, your support has made a monumental difference in my ability to complete this task. To my Dad, our Opa, thank you so much for always taking Marco for bike rides or to swimming lessons or to your home to watch Curious George- what a tremendous help you’ve been! To you three and to the rest of our family I owe an enormous debt of gratitude. It has been a long road and I look forward to celebrating this achievement with you.

And, finally, I offer my thanks to Dr. Gordon McBean for his early endorsement and financial support during the data collection phase of this project. Also, to mentors and colleagues who are more like family: Dr. Eve Gruntfest, JD and JJ. Evie, I thank you for always being my biggest cheerleader. Over the years you have listened to me, challenged me and my assumptions, and have thoughtfully shared your expertise in such a way that inspired and enhanced my research pursuits. Your investment of time and energy into my academic growth and development is invaluable. To JD and JJ, thank you for helping me to stay on course and also stay the course. You both have travelled this same path and thus are uniquely capable of understanding all the highs it brings as well as the lows. I love our sunny mountainside jaunts where we talk about life as much as we do concepts of risk and uncertainty during severe weather. To be walking alongside your excellence in this journey of friendship and teamwork is a true treasure.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter One
Introduction

Background and Rationale

On any given day across Ontario, meteorologists are paying attention to where, when and how risks of severe weather might evolve. The journal entry below (Figure 1) written during time spent observing meteorologists at Environment and Climate Change Canada's (ECCC) Downsview Office illustrates this. It shows particularly well how under the watchful eye of meteorologists, concurrent weather threats across the province are assessed and managed according to threshold criteria, or policy. In other words, each of the atmospheric features pointed out in the image below represent a different risk to the weather expert, and policy is a tool dictating how each one is classified as well as what these experts can do about them. Risk management scholar Michael Power (2014: 386) refers to these types of reasoning processes employed in organizational settings, on the one hand, as guided by an "anticipationist instinct", and on the other, by a logic of auditability. The two concepts highlight the dynamics of the forecasting environment at ECCC. For example, the instincts of meteorologists generate a commitment to make sense of the atmosphere and explain the conditions so as to manage weather's associated risks. Since these practices are carried out at ECCC, it concomitantly makes the meteorologists' accounting and managing of contingent events open for examination or verification, by ECCC as well as various public groups, referred in this thesis as 'audiences', who use the information produced by these weather experts.

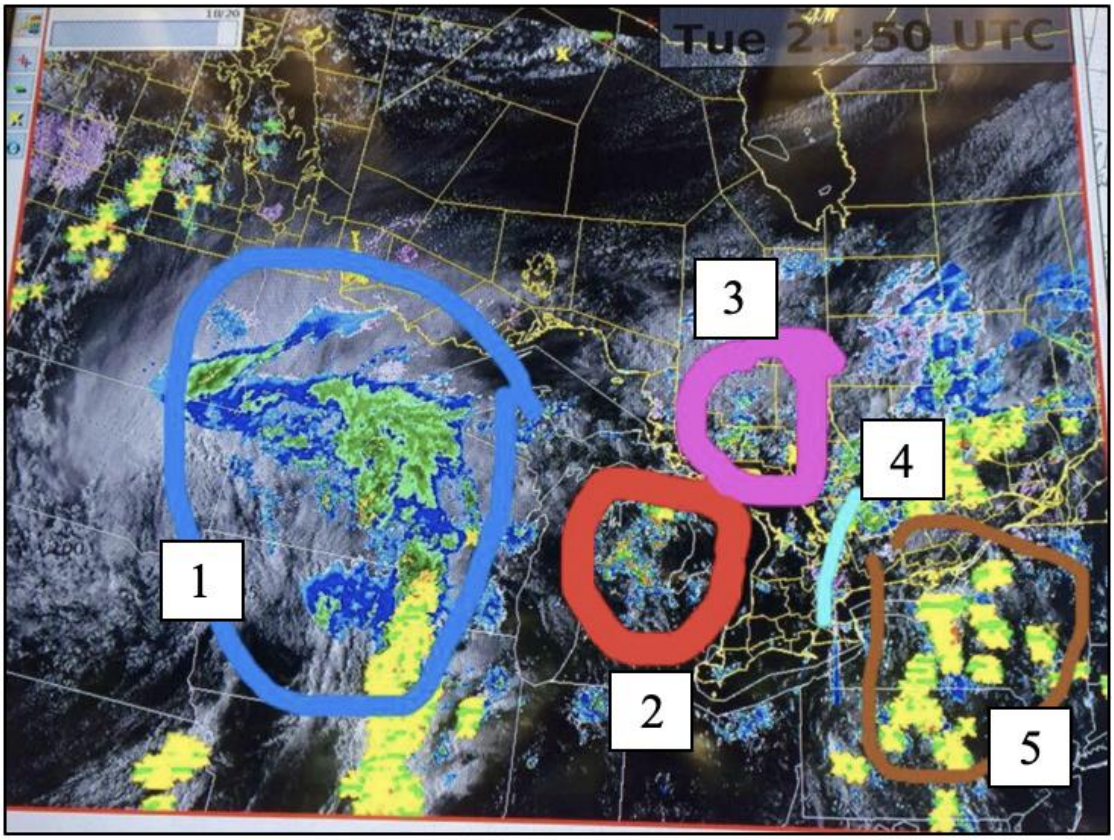


Figure 1. The Ontario atmosphere at 2:50 UTC (6:50pm EST) on Tuesday, 18 August 2015

ECCC Downsview Office
August 18, 2015

Circle 1 is the storm that is approaching northwestern Ontario from Iowa. Currently there is a Warning in effect for an area in NW Ontario for this system. **Circle 2** is a system in upper Michigan that is being watched, but not too closely.

Circle 3 is an 'ordinary, not well organized, short-lived (1/2hr or so) storm'. At first this system is assessed as posing little or no threat. As such, it is hardly being watched at all and is covered by information, such as millimetres of rain or high POP, in the public forecast. However, the motion of this kind of system is important: "If it stays for a few hours it could dump a lot of rain," the meteorologists say. Before long risk is re-assessed for this system as higher and a notification to match the risk is needed- not a regular forecast adjustment, but also not a Severe Thunderstorm Warning, since the predicted weather does not meet threshold criteria. Instead, at 8:25pm a Special Weather Statement is prepared for this system based on the radar signature. The draft includes: 'Risk of thunderstorms, through the evening, 30-40mm rainfall', words these meteorologists hope will garner the attention of the public.

The line represented by **Number 4** shows an area where a weather Advisory is in effect (around 7:40pm), based on: risk of thunderstorms and showers, categorical rain, and details of a funnel report that came in from Ontario Tornado Watch. At 8:11pm, this Advisory is upgraded to a Severe Thunderstorm Warning to account for the evolving threat associated with this system.

Finally, **Circle 5** is a system tracking northward over Lake Ontario toward Kingston area/ Prince Ed County. It is being watched the most at this point. 40 POP is currently in the public forecast for this area, but this system may require a Watch or Warning.

A great deal of scholarly research has endeavoured to understand public perceptions of risk as they relate to weather and flooding. These efforts have advanced our theoretical understanding of risk in the following contexts: communication (Casteel and Downing 2013; Lazrus et al. 2012; Sherman- Morris 2010), decision making (Demuth et al. 2012; Frisvold et al. 2013; Savelli and Joslyn 2012; Ramos et al. 2010), warning utility (Chiu et al. 2014; Demeritt et al. 2010); and 'user' perception and needs (Miranda-Moreno and Lahti 2013; Sheridan 2007; Pennesi 2011). Other works completed by physical and social scientists interested in the weather and flood interface have analyzed behavioural responses to flash flooding in the US (Doswell et al. 1996; Montz and Gruntfest 2002; Ramos et al. 2010; Wilhelmi and Morss 2013) and in other countries (Collier 2007; Gaume et al. 2004; Parker et al. 2009; Ruin et al. 2014). These studies have focused mostly on social and cultural factors in the risk perceiver's immediate environment and have neglected to consider the influence of elements earlier in the prediction process, namely the expert's subjective assessment of risk through their relation with predictive models, observations of their physical environment and interaction with each other.

Daipha (2015), Fine (2007), Henderson (2016), and Pennesi (2013) are notable exceptions to this trend in the way that their ethnographic fieldwork with meteorologists

first recognizes the inability to disassociate expert production of risk from public perception, and second, unveils experts' role in socially constructing risk and risk knowledges for public consumption vis-à-vis forecast and warning information. Taking a constructivist viewpoint where scientific knowledge is considered a human creation made with available material and cultural resources (Golinski 1998; Knorr-Cetina 1981) in this study I, too, broadened my analytical scope to capture expert production of risk, the communication of risk and the contribution these elements have on public understanding. Doing so required a studying up (Nader 1974) and a studying out, or moving beyond a single field site (Gupta and Ferguson 1997). It necessitated a tilting of the research field (Gusterson 1997) and a studying through (Reinhold 1994) of perceptions and decisions within and across multiple institutional environments. This approach facilitated my ability to privilege the understandings of participants in this study, the knowledge born of their experience and derived from their lived, everyday involvement in producing, communicating and using weather and flood risk-related information.

To that end, in 2014 I reached out to ECCC and Toronto and Region Conservation Authority (TRCA), expert groups in Toronto, Ontario responsible for producing weather and flood information. I expressed my interest in studying meteorologists and flood forecasters, or entrenching myself as much as possible into their daily forecast and warning operations. During conversations with ECCC and TRCA, the groups conveyed their primary interest in generating greater understanding of their audiences' (users' and recipients') needs for information. After several months of meeting and pitching the project, informal partnerships were created with each organization and the idea for my doctoral research project evolved into a collaboration

among myself, ECCC and TRCA where each group's goals would be met. With the two organizations on board, the study grew to include several related groups involved in weather and flood prediction, such as the expert producers of weather and flood information representing these organizations, the on-air meteorologists or communicators (specialized conduits of information) as well as public users or intended recipients.

By May of 2015, I had embedded myself in the ECCC forecast office at Downsview, spending anywhere from two to seven hours per day with meteorologists. While there, I observed them as they observed the atmosphere and I made every effort to understand the way they were understanding the tools they used to gain situational awareness, such as surface plots, the mesoscale numerical weather prediction models, and *tephis* (diagrams used in weather analysis and forecasting), for example. From their assessments of the atmosphere, I studied how meteorologists built and massaged their forecasts on *Scribe*, the in-house forecasting software program, and also how they constructed their Warning messages on *Ninjo*, a different software program used for generating these elevated risk messages. Over the course of these observations, I surveyed meteorologists to understand who they felt their target audience was as well as challenges they faced in communicating risk information (Appendix L for sample). The results of this survey informed the development of interview protocols used with public participants.

Since Toronto was holding the 2015 Pan American and Parapan American Games (TO2015) during the summer of 2015, and since ECCC was providing a specialized forecasting service for the Games, I decided to take the unique opportunity to focus part of my investigation on weather prediction during TO2015, which meant in July and

August my observations shifted mostly to the TO2015 Main Operations Centre (MOC). While at the MOC, I paid close attention to the process of communication, specifically how meteorologists at ECCC communicated forecast conditions to meteorologists working at this temporary outpost, who then assessed risk, created Watches and Warnings as they deemed necessary, and then communicated the information to Outdoor Sport Managers at sporting venues across southwestern Ontario, who in turn used the information to make decisions regarding stops, delays and rescheduling of gameplay. During my time at the MOC, I was introduced to the Manager of Sport who then connected me with nine Outdoor Sport Managers of a variety of sports, including beach volleyball, open water canoe and rowing, along with baseball and tennis, to name several. These nine Outdoor Sport Managers agreed to participate and were interviewed during the fall of 2015 and winter of 2016. Interviews focused on Outdoor Sport Managers' needs and uses for weather information, their understanding of weather knowledge, and also decision-making behaviour regarding different risk messages they received, such as the Special Weather Statement, Severe Thunderstorm Warnings, and lightning notifications via a smart-phone lightning application created specifically for their use during TO2015. This group of Outdoor Sport Managers comprises part of my general public sample ($PUB_{1\text{-}9}$).

Given the perspectives shared by Outdoor Sport Managers, I prepared and administered a second survey for ECCC meteorologists through surveymonkey.com that nearly mimicked the interview protocol utilized with $PUB_{1\text{-}9}$. However, with experts, I flipped the queries to focus on their definitions for certain weather terminology, how they imagined their audience was interpreting each notification, and what they imagined their

audience to be doing with the information. The points made by each ECCC meteorologist during observations were matched to the greatest extent possible with both the first and second round of survey responses; their pseudonyms correspond to $ECCC_{1\text{-}26}$ in the dissertation.

Upon the conclusion of TO2015, I began observing flood forecasters at TRCA by making trips to their office to watch as they created their daily flood risk assessment, to attend the forecast and warning group's monthly meetings, to participate in flood simulation exercises, and to observe their risk assessment and decision-making behaviour during rainy weather. In late October of 2015, Toronto experienced a small-scale flood event, which provided a useful case to comprehensively investigate urban river flood prediction in the City. Similar to the survey administered with ECCC meteorologists, in early 2016 I surveyed TRCA flood forecasters to learn who they believed their target audience was as well as challenges they face in communicating risk information (Appendix L for sample). The TRCA survey differed from the ECCC survey in one major respect, however, in that flood forecasters were specifically asked to define urban flooding, give their perspectives as to the causes of urban flooding and then also to indicate who they perceived as responsible for providing advanced or early warning for this type of flooding. Building from the insights of ECCC meteorologists surveyed, TRCA perspectives also informed the development of public interview protocols. TRCA flood forecasters make up the second group of experts who participated in this study and, again, the points made by each during observations were matched, to the greatest extent possible, with survey responses; their pseudonyms correspond to $TRCA_{1\text{-}12}$ in the dissertation.

During the spring and summer of 2016 and with my protocols prepared, I began interviewing and surveying representatives of public and private organizations or businesses located across Toronto who were identified by TRCA as key recipients of their flood information. Of those I reached out to, 15 agreed to participate; these participants' pseudonyms correspond to $INST_{1-15}$ in the dissertation. During the same period of time, I solicited the interest of on-air broadcasters either through email or Tweeting to their Twitter feeds. In total, nine media representatives were interviewed or surveyed; these participants' pseudonyms correspond to $COMM_{1-9}$. And finally, during this same time-period and culminating in the fall of 2016, I requested the interest of residents of Toronto by approaching individuals in cafes, at local outdoor spaces, and also by posting a call on my Facebook newsfeed. In total, 12 residents agreed to participate; these participants comprise the second portion of my general public group and their pseudonyms correspond to PUB_{10-21} in the dissertation.

The interview and survey protocols (Appendices J and K for sample) were made up of four different topical themes, including: Weather and Flood Scenarios, Weather Knowledge, Urban Flood specific and Demographic Information. For the section on Weather and Flood Scenarios, all protocols were designed so that each participant in each group received the same scenario and answered the same core questions. For example, participants in each group were presented with a handful of either: an ECCC Rainfall Warning, an ECCC Severe Thunderstorm Warning, an ECCC Special Weather Statement, a Google image of flooding on the 401, a TRCA Flood Warning and/or a TRCA Flood Watch. Upon receiving the scenario each participant answered questions like: What are the main weather threats discussed in this notification? What are you doing

with this information? Has the notification been issued with enough time to prepare/act? Is this notification intended for you? To the greatest extent possible, the same scenarios were presented across groups. Decisions for which scenario to present were based on considerations for participants' time, the evolution of research objectives, and publics' uses of certain notifications over others (see Table 1 for overview).

Table 1. Overview of weather scenarios presented to each participant group by notification

	ECCC Rainfall Warning	ECCC Severe Thunderstorm Warning	ECCC Special Weather Statement (SWS)	TRCA Flood Outlook	TRCA Flood Warning	Google Image of Flooding
ECCC Meteorologists			X			
TRCA Flood Forecasters				X		
Institutional Represent-atives		X		X	X	
Communi-cators	X	X			X	X
General Public$_{1\text{-}9}$			X			
General Public$_{10\text{-}21}$		X	X		X	

The Weather Knowledge section of the protocols teased apart publics' understanding of weather knowledge, and included questions specific to the terminology utilized by experts in the above notifications. To that end, all members from each public group in this section of the interview were asked questions like: What does '*frontal*

system' mean to you? What does '*localized rainfall'* mean? What does '*low pressure system'* mean? What is the difference between a '*non-severe'* and a '*severe*' thunderstorm? The Urban Flood specific section, with its focus on urban flooding included questions such as: Define 'urban' flood. What causes flooding of residential roadways and basements? What causes flooding in urban areas away from rivers? Which group or organization do you imagine is responsible for providing flood information as it relates to flooding of roads, residences and basements away from rivers?

Altogether, my fieldwork process included participant observation and observation, semi-structured one-on-one interviewing and survey administration over a 17-month period (Bernard 2002) and resulted in numerous booklets of field notes as well as approximately 1450 minutes of recorded talk that was transcribed verbatim and qualitatively coded and analyzed using Atlasti.

Early on in the data collection and analysis period, my investigation uncovered different ways predictive models informed ECCC expert production of risk knowledge. This often presented itself by meteorologists bestowing power onto predictive models and personifying the model as the thinker and doer behind the weather. The attribution of human character onto predictive models was a common occurrence as the examples below from observations with ECCC meteorologists illustrate:

ECCC Downsview Office[1]
May 22, 2015
Elon: *it's* {the model} too much -- it has been all spring -- it's just showing too wet.

September 22, 2015
Norma: ECMWF <The European Centre for Medium-Range Weather Forecast>
next week *brings* the front in way faster than GFS does.

[1] See Appendix C for a Transcription Key, which is applicable for the entirety of the dissertation.

September 22, 2015
Sam: I looked elsewhere --
just to have a feel for what the *other models were thinking*.
The *models are telling me* it won't thunderstorm
but my brain is telling me it will.

In these examples, the representations of the atmosphere as shown in the models are communicating with ECCC meteorologists on the forecast floor by showing them, bringing them certain features, or telling them what is happening. In some cases, meteorologists' characterization of the atmosphere and their subsequent production of information was based entirely on the predictive model, as was illustrated by concerns raised by Hazel about another's forecast for overnight minimum temperatures. During observations on September 23, 2015 she said:

ECCC Downsview Office
September 23, 2015

Hazel: the overnight lows were consistently lower than the model lows.
For example -- yesterday's {model} run had Armstrong, Ontario's overnight low as + 3°C.
Sadie created a forecast for Armstrong's overnight low to be +2°C --
and it was actually -3°C.
We pretty much went with the model.

Therefore, in much the same way as Daipha (2015) explains in her study of meteorological decision making under uncertainty, predictive models were shown as presenting ECCC meteorologists with a 3D picture or a collage of the atmosphere. This collage described the situation for meteorologists, and though it did not render meteorologists in a position of complete surrender in all situations, the representation of the atmosphere in the predictive models did in fact influence their decision to mitigate any foreseen unfavourable event with a forecast or warning, depending on the context of the weather scenario. Altogether, as a link connecting various versions of the future

weather conditions with meteorologists who interpret and make judgments upon them, preliminary findings supported my notion that meteorologists liaise with predictive models and each other to subjectively create risk information for their audiences.

At the same time, while these early findings seemed to support my research intentions, it quickly became obvious that there was more about the social organization of the expert environment at play when it came to their production of risk. One ECCC meteorologist hinted at it in Survey 1 when he shared:

ECCC Survey 1

Samuel: We need a way to teach the difference between a non-severe thunderstorm and a severe thunderstorm.
For many people -- 'severe' is subjective --
based on their experience.
I have talked to people who say "this is the worst thunderstorm I have ever seen"
but it may still not be severe based on our criteria.

If observations of ECCC meteorologists' interaction and their focus on the rules during Warning development was not enough, Samuel's comment cemented for me the power of threshold criteria, or the official rules couched within ECCC policy, on how risk knowledges are subjectively negotiated and communicated to the public audiences. Thus, while still addressing the needs of my collaborators, the anthropological component of the research project took a major turn to focus on the socially organizing function of policy, or how policy and the interactive processes of policy-work construct social relationships, influence expert and lay perceptions of risk, and contribute to practices of risk management and decision-making in weather and flood contexts.

The central focus of the dissertation is the relationship between policy and risk. In it I draw on Nielsen's (2011: 69) definition of policy as a relational triad of

interconnected themes that include: political rationalities, every day practices and methods introduced to govern people, and the perceptions and experiences of the people towards whom the rationalities are directed. Following in the same vein as Nielsen's relational triad and in the context of weather and flooding, I distinguish, first, among warning policy as a set of official rules which represent specific ideals, second, the warning policy implementation process as the negotiation of these rules, and third, the manifestations of these rules as the appropriation of policy, which includes the agentive act of translating policy into the experts' own image (Nielsen 2011: 73) vis-à-vis the creation and dissemination of weather or flood information. Thus, when it comes to weather and flooding hazards, policy work includes expert processes of negotiation, implementation and appropriation that are then taken up relationally into any number of social and organizational environments. In other words, experts bring policy to life through verbal interaction and electronic communication over traditional and social media platforms, and from there, policy-based information is or will be interpreted and responded to depending upon the context into which it is received.

With this description in mind, I approach policy as emerging from the everyday lived experiences of individuals. My standpoint is that from these experiences individuals develop rationalities that become the foundation for policy and its related ideals that then come to stand for official rules. Having said this, I similarly recognize that there is no easy way of knowing where a rationality stems from; often there is no single point of origin for political rationality, no individual clearly situated within one rationality, and no single policy force, but rather a multitude of experiences and forces that function to coalesce policy attitudes. Policy and our ideas about what it stands for are rooted in a

long history of these everyday experiences. In the context of critiquing the term 'quality' on education policy agendas and discourses, Elise Hunkin (2016) points to the importance of a term's historical origins on contemporary social life. According to Hunkin, teasing apart a term brings to light the relative truth that has been constructed over time surrounding it; doing so offers another useful way for "seeing and reading the present" (2016: 37). Here I consider Hunkin's perspective on genealogical accounting for making visible the embeddedness of policy in our everyday lives. This includes its related processes that have evolved over time and can still be felt today, such as our expectations to be *policied* and in our dependence upon policy as a guide for sense-making and action. Hunkin's viewpoint adds important context for the upcoming analyses of policy processes in the context of weather and flooding in Toronto.

I characterize policy implementation and appropriation similar to Nielsen (2011), and also similar to the way that anthropologist Trouillot (2003: 80-81) described, as a mechanism by which government ideals are enabled and carried out at multiple sites. In the forthcoming analyses I focus on policy work carried out by government experts, explore the function of governance through weather and flood policy, and demonstrate how this is done through policy tools with particular results. Thus this is an effort, much like Trouillot's, to understand more deeply the effects of 'the state'. In saying so, however, in this dissertation I shift Trouillot's vision to organizational spaces mostly and use policy work to track and measure the occurrence and extent of identification and spatialization effects related to government practices of weather and flood warning prediction. In my exploration of policy, I also characterize its related processes of implementation and appropriation as reflective of goals which inspire allegiance or set

out clear action (Shore and Wright 1997: 16); as an assemblage, manifesting itself in different social and cultural forms, different social, geographic and political spaces, at different times, and at different ideological scales (Shore and Wright 2011; Wedel and Feldman 2005; Wedel et al. 2005; Wright 2006); and as embedded within particular social and cultural worlds (Shore and Wright 2011: 1; Wedel et al. 2005: 40) within varying institutional frameworks and observer viewpoints (Power 2007: 111).

Beck (1992), Boholm (2015), Douglas (1992), and Kasperson's group (1988) contributions to risk theory, on the other hand, show risk as an inescapable feature of our modern society yet simultaneously a constructed perception that evolves relationally. While in the chapters I focus on how risk operates in practice and in interaction, my approach is grounded in a stance wherein risk is generally defined as a danger to someone or to something that bears value. Zinn (2008) offers a useful historical account for the development of the notion of risk. While he points out there is no clear etymological origin for the term, he highlights (Zinn 2008: 7-8) various epistemological viewpoints of risk in different disciplines. These include, for example, risk as real and objective from the technical risk assessment and insurance perspective and risk as subjectively biased from the psychometric and rational choice paradigms. Additionally, Zinn includes Beck's risk society work, or the idea that risk is both real and socially constructed. He adds to this list of epistemological viewpoints Douglas's cultural theory perspective, or the idea that risk is socially transformed. Finally, he includes Foucault's governmentality approach, or that risk is socially constructed and where events are risks insofar as they are part of a calculative technology. Together, these ideas of policy and risk serve as a useful frame and are utilized to different degrees in the pages that follow. Building from this

theoretical foundation, the work presented here is mostly structured around theories of interaction and discourse, particularly those stemming from the work of Goffman (1959, 1967) and van Dijk (2014) since their scholarship explains well the on-the-ground workings of policy, and accounts for how risk assessments, perceptions, management and decision making in various weather and flood situations are developed relationally through face-to-face interaction and through discursive practices.

Overview of the Chapters

The dissertation is comprised of three main chapters, each focusing on different aspects of policy, risk and interaction. In Chapter Two, I examine ECCC meteorological expertise during 'severe' and 'non-severe' weather and the influence of interaction and policy on perceptions of risk and operational success. I mostly centre my analysis on Goffman's classical perspective of symbolic interaction, specifically presentation of the self (1959) and frame analysis (1974), and also utilize perspectives from contemporary scholars who draw on his approach (Benford 2013; Schwalbe 2013). Goffman's theoretical approach has explanatory power for my data in so much as I show how participants in interaction take one another's actions and utterances into account as meaning is jointly created, yet simultaneously where these meanings and related decision making are couched within certain social, organizational and institutional structures and rules. Capturing multiple micro-scale interactions among meteorologists on the forecast floor enabled me to investigate relational aspects of face, self-presentation and expert identity and examine their influence on meteorologists' achieving organizational "hits"[2] and bringing about positive social impact for the audiences they serve. In this chapter, I

[2] A "hit" is a performance metric contributing to the organization's overall performance standings and indicative that the weather product was issued in the right time and that the weather reached necessary threshold conditions.

also show how meteorologists frame 'non-severe' weather risk in their pursuit of success, and subsequently draw on mental models theory (Johnson-Laird 2005; Quinn 2005; van Dijk 2014), Austin's performativity of language (1962), and also on the concepts of institutions (Douglas 1986) and negotiated order (Fine 1984; Strauss 1993) to account for the various responses to 'non-severe' weather notifications. Moreover, I draw on these works to demonstrate how the behaviour of public audiences, specifically Outdoor Sport Managers, confirms the influence of these deep rules in the management of risk.

Chapter Three is also an examination of policy and risk at the local level, but it focuses on TRCA urban river flooding and the multi-sited management of ambiguous urban river flood risk during a small-scale event on October 28, 2015 in Toronto. Chapter Three's examination utilizes Goffman's (1967) concept of face and examines face in interaction for the purpose of highlighting the relational, social, and contextual nature of TRCA Flood Warning generation. Similar to the interpretive-structuralist frame of Chapter two, through an analysis of TRCA forecaster face-to-face interaction, in Chapter three I show the group's efforts to maintain multiple faces with the purpose of accomplishing multiple interactional goals. At the same time, I propose in the chapter that based on an existing arrangement for engagement between TRCA flood forecaster and 'key recipients' of their information, interaction between TRCA and its key audience (institutional representatives) represents a type of interaction ritual (IR) chain (Collins 2004) where producers of flood information and those who have expressed their desire or need for it are obliged and expected to behave in particular ways. I was motivated to follow Collins's conceptual framing of the IR chain for my analysis of flood forecaster-'key recipient' inter-organizational interaction since his efforts demonstrate how micro-

events and the behaviour of individuals is determined by where they are located in the larger network of encounters around them in time and space. To that end, my micro-level, multi-sited analysis of TRCA and 'key recipients' risk-related decision making on October 28, 2015 reveals the ways these groups lived up to (or not) the obligations and expectations that were established in their interaction order.

Chapter Four represents a shift from micro-scale analyses of policy and risk across multiple sites to an examination of policy, risk and interaction at the level of discourse. Using a non-river flood disaster in Toronto as a backdrop, I investigate the nature and implications of *policied* (urban river flood) and *unpolicied* (urban non-river flood) risk in the City. Building from the theme of *impossibility* and drawing mostly on van Dijk's (2014) conceptual approach to discourse, mental models and knowledge, I show how particular alternative risk management possibilities have been made possible in the discourse, and simultaneously how such social constructions of impossibility have contributed to a kind of social acceptability where early non-river flood warning exists beyond the sphere of public accountability.

The three analyses encapsulate different, yet related policy and risk scenarios: when official policy exists, but the weather doesn't meet risk threshold criteria; when official policy exists and the circumstances meet risk threshold criteria but there is uncertainty related to the atmosphere and hydrological impacts; and finally, when no official policy exists and people, who are neither experts in meteorology nor hydrology, are left to identify and manage risk on their own. Following the main chapters, I conclude in Chapter 5 by summarizing what these different investigations teach us about policy

and risk and the contributions these research findings make to the anthropology of policy and risk literature.

References

Austin, J.
1962 *How to do things with words*. Cambridge, Mass: Harvard University Press.

Beck, U.
1992 *Risk society: Towards a new modernity*. Sage Publications: London, California, New Delhi.

Benford, R.D.
2013 Social movements and the dramatic framing of social reality. In *The Drama of social life: A dramaturgical handbook.* C. Edgley (ed). Ashgate Publishing Company. Pp. 139-155.

Boholm, Å.
2015 *Anthropology and Risk*. Routledge: London and New York.

Casteel, M.A. and J.R. Downing
2013 How individuals process NWS weather warning messages on their cell phones. *Weather, Climate, and Society.* Vol 5(3): 254- 265.

Chiu, C., S. Vagi, A. Wolkin, J. Martin, and R. Noe
2014 Evaluation of the National Weather Service Extreme Cold Warning Experiment in North Dakota. *Weather, Climate, and Society.* Vol. 6(1): 22-31.

Collier, C.G.
2007 Flash flood forecasting: What are the limits of predictability? *Quarterly Journal of the Royal Meteorological Society*. Vol. 133(622): 3-23.

Collins, R.
2004 *Interaction ritual chains.* Princeton University Press.

Daipha, P.
2015 *Masters of Uncertainty: Weather Forecasters and the Quest for Ground Truth.* Chicago: University of Chicago Press.

van Dijk, T.A.
2014 *Discourse and knowledge: A sociocognitive approach.* Cambridge University Press.

Demeritt, D., S. Nobert, H. Cloke, and F. Pappenberger
2010 Challenges in communicating and using ensembles in operational flood forecasting. *Meteorol. Appl.* Vol. 17(2): 209-222.

Demuth, J. L., R. E. Morss, B. H. Morrow, and J. K. Lazo
2012 Creation and communication of hurricane risk information. *Bull. Amer. Meteor. Soc*. Vol. 93(8): 1133-1145.

Doswell, C. A. III, H.E. Brooks, and R.A. Maddox
1996 Flash flood Forecasting: An ingredients-based methodology. *Wea. Forecasting*. Vol. 11(4): 560–581.

Douglas, M.
1992 *Risk and Blame*. London and New York: Routledge.

Fine, G.A.
2007 *Authors of the Storm: Meteorologists and the Culture of Prediction*. University of Chicago: Chicago and London.

1984 Negotiated orders and organizational cultures. *Ann. Rev. Sociol.* Vol. 10: 239-262.

Frisvold, G.B. and A. Murugesan
2013 Use of weather information for agricultural decision-making. *Weather, Climate, and Society*. Vol. 5(1): 55–69.

Gaume, E., M. Livet, M. Desbordes, J.P. Villeneuve
2004 Hydrological analysis of the river Aude, France, flash flood on 12 and 13 November 1999. *Journal of Hydrology*. Vol. 286(1-4): 135-154.

Goffman, E.
1974 *Frame analysis: An essay on the organization of experience.* New York: Harper and Row.

1967 *Interaction Ritual: Essays in Face-to-Face Behaviour*. Garden City, N.Y: Doubleday.

1959 The presentation of self in everyday life. Garden City, N.Y.: Doubleday.

Golinski, J.
1998 Introduction: Challenges to the Classical View of Science. In *Making Natural Knowledge: Constructivism and the History of Science.* Cambridge University Press. Pp. 1-12.

Gupta, A. and J. Ferguson
1997 Discipline and Practice: "the Field" as site, method, and location in Anthropology. In A. Gupta and J. Ferguson (eds). *Anthropological Locations: Boundaries and Grounds of a Field of Science*. Berkley: University of California Press. Pp. 1-46.

Gusterson, H.
1997 Studying up revisited. *Political and Legal Anthropology Review*. Vol. 20(1): 114-119.

Henderson, J.J.
2016 '"To Err on the Side of Caution:" Ethical Dimensions of the National Weather Service Warning Process'. Unpublished dissertation manuscript. Virginia Tech.

Hunkin, E.
2016 Deploying Foucauldian genealogy: Critiquing 'quality' reform in early childhood policy in Australia. *Power and Education*. Vol. 8(1): 35-53.

Johnson-Laird, P.N.
2005 Mental models in thought. In Holyoak, K. & Sternberg, R.J. (Eds.) *The Cambridge Handbook of Thinking and Reasoning*. Cambridge: Cambridge University Press. Pp. 179-212.

Kasperson, R.E., R. Ortwin, P. Slovic, HS Brown, J. Emel, R. Goble, JX Kasperson, and S. Ratick
1988 The Social Amplification of Risk: A Conceptual Framework*." Risk Analysis*. Vol. 8(2): 177-187.

Knorr-Cetina, K.
1981 *The Manufacture of Knowledge: An Essay on the Constructivist and Contextual Nature of Science*. Oxford: Pergamon.

Lazrus, H., B. Morrow, R.E. Morss, and J.K. Lazo
2012 Vulnerability beyond stereotypes: Context and agency in hurricane risk communication. *Weather, Climate, and Society*. Vol. 4(2): 103-109.

Miranda-Moreno, L.F. and A.C. Lahti
2013 Temporal trends and the effect of weather on pedestrian volumes: A case study of Montreal, Canada. Transportation Research Part D: Transport and Environment. Vol. 22: 54-59.

Montz, B.E. and E. Gruntfest
2002 Flash flood mitigation: Recommendations for research and applications. *Environmental Hazards*. Vol. 4: 15–22.

Nader, L.
1974 Up the Anthropologist: Perspectives gained from studying up. In *Reinventing Anthropology*. D. Hymes (ed). New York: Vintage Books. Pp. 284-311.

Nielsen, G.B.
2011 Peopling policy: On conflicting subjectivities of fee-paying students. In *Policy worlds: Anthropology and the analysis of contemporary power.* Eds Shore, Cris, Susan Wright and Davide Però. Bergahn Books: New York, Oxford. Pp. 68-85.

Parker, D.J., S.J. Priest, and S.M. Tapsell
2009 Understanding and enhancing the public's behavioural response to flood warning information. *Meteorol. Appl.* Vol. 16(1): 103-114.

Pennesi, K.
2013 "Predictions as Lies in Ceará, Brazil: the intersection of two cultural models." Anthropological Quarterly Vol. 86(3):759-790.2011.

2011 Making forecasts meaningful: explanations of problematic predictions in northeast Brazil. Weather, Climate, and Society. Vol. 3(2): 90- 105.

Power, M.
2007 Putting categories to work: The invention of operational risk. In *Organized uncertainty: designing a world of risk management.* Oxford University Press. Pp. 103-127.

Quinn, N.
2005 Introduction. In N. Quinn (ed). *Finding culture in talk: A collection of methods*. New York: Palgrave Macmillan. Pp. 1-34.

Ramos, M-H, T. Mathevet, J. Thielen, and F. Pappenberger
2010 Communicating uncertainty in hydro-meteorological forecasts: Mission impossible? *Meteorol. Appl.* Vol.17(2): 223-235.

Reinhold, S.
1994 Local conflict and ideological struggle: Positive images and Section 28. *Unpublished D. Phil thesis in Social Anthropology*. University of Sussex. Pp. 477.

Ruin, I., C. Lutoff, B. Boudevillain, J. Creutin, S. Anquetin, M. Bertran-Rojo, L. Boissier, L.
Bonnifait, M. Borga, L. Colbeau-Justin, L. Creton-Cazanave, G. Delrieu, J. Douvinet, E. Gaume, E. Gruntfest, J. Naulin, O. Payrastre, and O. Vannier. 2014. Social and hydrological responses to extreme precipitations: An interdisciplinary strategy for post-flood investigation. *Weather, Climate, and Society*. Vol. 6(1): 135-153.

Savelli, S. and S. Joslyn
2012 Boater safety: Communicating weather forecast information to high-stakes end users. *Weather, Climate, and Society*. Vol. 4(1): 7–19.

Schwalbe, M.
2013 "Situation and structure in the making of selves". In *The Drama of social life: A dramaturgical handbook.* C. Edgley (ed). Ashgate Publishing Company. Pp. 75-92.

Sheridan, S.C.
2007 A survey of public perception and response to heat warnings across four North American cities: an evaluation of municipal effectiveness. *International Journal of Biometeorology* Vol. 52: 3-15.

Sherman-Morris, K.
2010 Tornado warning dissemination and response at a university campus. *Natural Hazards*. Vol. 52(3): 623-638.

Shore, C. and S. Wright
2011 Conceptualizing policy: Technologies of governance and the politics of visibility. In *Policy worlds: Anthropology and the analysis of contemporary power.* Eds Shore, Cris, Susan Wright and Davide Però. Bergahn Books: New York, Oxford. Pp. 1-25.

1997 Policy: A new field of anthropology. In *Anthropology of policy: Critical perspectives on governance and power.* Eds. C. Shore and S. Wright. Routledge: London and New York. Pp. 3-42.

Strauss, A.
1993 *Continual permutations of action*. Routledge.

Trouillot, M.
2003 *Global Transformations: Anthropology and the Modern World*. New York: Palgrave Macmillan.

Wedel, J.R. and G. Feldman
2005 Why an anthropology of public policy? *Anthropology Today*. Vol. 21(1): 1-2.

Wedel, J.R., C. Shore, G. Feldman and S. Lathrop
2005 Toward an anthropology of public policy. *The ANNALS of the American Academy of Political and Social Science.* Vol. 600(1): 30-51.

Wilhelmi, O. and R.E. Morss
2013 Integrated analysis of societal vulnerability in an extreme precipitation event: A Fort Collins case study. *Environmental Science and Policy*. Vol. 26: 49-62.

Wright, S.
2006 Anthropology of Policy. *Anthropology News*. Pp. 22.

Zinn, J.O.
2008 Introduction: The contribution of sociology to the discourse on risk and uncertainty. In *Social theories of risk and uncertainty: An introduction*. MA; Oxford: Blackwell Publishing. Pp. 1-17.

Chapter Two
When 'non-severe' weather is still 'severe': Meteorological expertise and the influence of interaction on perceptions of risk and operational success

Introduction: Making the Right Decision is Always a Fine Line

ECCC Downsview Office[3]
June 15, 2015

2 Elon: Should we go with a Special Weather Statement or a Severe
3 Thunderstorm Watch?
4 Elaine: It won't be the same as yesterday.
5 It's never the same.
6 Elon: It might be rounds {of showers} with a block of nothing in between. (.)
7 Do we even have a chance of showers {in the forecast}?
8 Elaine: Yeah -- we do.
9 An air mass this moist is a pretty efficient rain producer.
10 Elon: ((hands to face with a concerned look in eyes))
11 What should we do about the rain?
12 Elaine: It's always a fine line.

On June 15, 2015 Environment and Climate Change Canada (ECCC) meteorologists Elon and Elaine are discussing rainfall (Appendix C for Transcription Key) as the major weather issue for the day, from Windsor to Sarnia and across to Hamilton. Their exchange is centred around which ECCC notification should be issued: a Severe Thunderstorm Watch or a Special Weather Statement (SWS), and highlights the operational anguish on the forecast floor. In other words, Elon and Elaine are assessing weather risk and whether or not conditions in these southwestern Ontario regions are favourable for the development of severe thunderstorms with short-duration, heavy rainfall that will produce 50mm within one hour. If the answer is yes and the 'severe' conditions meet ECCC policy's rigid, black and white boundaries or threshold criteria,

[3] Line numbers in Chapter 2 are specific to Chapter 2. See Appendix C for a Transcription Key, which is applicable for the entirety of the dissertation.

standard operating procedures dictates a Severe Thunderstorm Watch is to be issued. If the answer is no, and rain is not predicted to meet the 50mm mark, the conditions are 'non-severe' by official standards and a Severe Thunderstorm Watch cannot be issued since it will not verify as a "hit", a metric used to evaluate organizational success. The problem lies in the fact that 'non-severe' weather can still be impactful, and thus risky, and when conditions do not meet 'severe' standards, meteorologists are left on their own to balance the constraints of policy, atmospheric uncertainty, and the perceived needs of users. Making the right decision in these 'non-severe' circumstances is critical for operational success, but this is an accomplishment not so easily attainable as the hands-to-face anguished look given by Elon in the opening vignette confirms.

When weather does not meet ECCC's 'severe' threshold criteria and conditions are officially considered 'non-severe', meteorologists sometimes feel the right decision is issuing an alternative notification to account for what they have assessed as risky and potentially impactful weather. Much like forecasting and traditional warning generation, the construction of these notifications is an interactional undertaking. Meteorologists are relating with the weather as presented by models, charts and graphs, and also with policy guidelines to construct accurate and timely risk messages. However, the interactional process is as much, if not more so, about relating with colleagues on the forecast floor, and the mental image they perceive users have of them as well as the mental image they have of their users. These face-to-face conversations, the ideas meteorologists believe their users have of their meteorological expertise and the perceptions they hold regarding what type of information users need, play a paramount role in the construction of their notifications. As weather events unfold and risk notifications are being constructed, I

argue here that these interactions frame the management of the weather event, which has implications for meteorologists' ability to achieve operational success.

This chapter centres on the notion of operational success and the interactional construction and management of risk in the context of 'severe' and 'non-severe' weather situations. In it I mostly follow Schwalbe's (2013) adaptation of Goffman's dramaturgical approach to social interaction and consider the construction and response to the weather risk scenario as a social encounter framed relationally between ECCC meteorologists, who express certain presentations of self, and the social organization governing their every day forecast and warning practices. Goffman's dramaturgy is the idea that people's day-to-day lives can be understood as resembling performers in action on a theatre stage. In keeping with Goffman (1959), I make the case here that meteorologists doing policy-inspired work make presentations of self for multiple audiences, and where notions of the meteorological 'self' and the experts' meteorological work is a product of interaction and generated by others' interpretations of this presentation. Put another way, in the situated interactional encounters that take place within and across social spaces, meteorologists' identities as experts and their meteorological construction of traditional and alternative risk notifications, are generated jointly between participants in interaction. Analyzing examples of interaction on the forecast floor and then comparing the expert production and public consumption of two alternative risk notifications utilized by meteorologists at ECCC in 'non-severe' weather situations: the Special Weather Statement (SWS) and a lightning prototype (LP) notification demonstrates the influence of these inter-connections on the relational production of sense-making in these contexts.

The interactional approach to the construction of alternative risk notifications is complemented by a discussion on the use or uptake of these notifications as explained by mental and cultural models as well Austin's performativity of language (1962), which I utilize here to account for why these risk framing strategies summoned the desired public response with varying degrees of effectiveness.

By focusing on the interactional framing of risk within the constraints of policy in the context of weather and the myriad ways and reasons for audiences attending to these alternative notifications, we begin to see more clearly the triangulated relationship among policy, interactions and operational 'success' during risk situations. Such an endeavour offers a necessary perspective of risk, its perception and management from earlier in the prediction process and is especially helpful as we seek to understand why some audiences respond to risk information while others do not.

The Interplay of Policy, Risk and Interaction for Operational Success

Policy is a guide to action that shapes, controls and regulates people and ideas (Martin 1997: 183). At ECCC, policy is used as a tool to create classifications and categories, as well as spatial boundaries for these designations, along collective lines wherein meteorologists in their everyday practices produce and reproduce official rules through forecast and warning processes. Anthropologist Michel-Rolph Trouillot (2001: 126) would refer to such structural ordering brought on by policy work as examples of the identification and spatialization effects of the state. In other words, ECCC meteorologists, considered here the subjects of ECCC weather policy, are considered homogeneous members of a specific community located and working within a site. At this site, or on the forecast floor, policy is used to govern their behaviour. And in the meteorologists' interpretation, appropriation and implementation of policy, the ideals upon which the

official policy was created are reified. Furthermore, ECCC policy has defined the spatial boundaries for which meteorological work is carried out. In other words, jurisdictional and conceptual boundaries have been identified through ECCC policy which are linked to meteorologists' responsibility of providing service, although these same conceptualizations and jurisdictions are not always recognized or understood in the same way by audiences on the ground. Relating Trouillot with anthropology of policy scholars, the political ideal bound within ECCC policy reveals how ECCC official guidelines and rules belong to and are embedded within particular social and cultural worlds or domains of meaning (Shore and Wright 2011: 1). Thus connected to identification and spatialization, the classificatory schemes ECCC policy is built upon function to socially organize meteorologists' actions, construct social relationships between themselves, the organization they represent, and their colleagues, and also helps build their social identities as successful meteorological expert. By tracking the flow of policy through the deployment of weather notifications and the responses made by audiences, I show how policy can be used to locate processes of governing in our everyday lives.

ECCC 'severe' weather policy is intended to behave in the traditionalist sense in so much as it is structured, orderly, and considered a rational set of flows and procedures that move systematically (Stone 1988) to provide publics advanced notice of inclement weather. In a straightforward way, if meteorologists predict an approaching weather system will generate either wind gusts of 90km/hr or greater, or hail of 2cm or larger in diameter, or rainfall of 50mm or more in one hour, the weather would be considered 'severe' and 'warning' level, and a 'Severe Thunderstorm Warning' (STW) would be

issued. Composed of mostly canned[4] statements, a STW has added consistency and structure in its issuance. Much like what Gordon and colleagues (1997) describe of the policy process, and echoing Stone (1988), the practice of warning generation during 'severe' weather is mostly neat and linear, and comprised of problem identification and implementation of a solution. More recently, anthropologist Boholm (2015: 104) speaks of this ideal, commenting that under this model of risk management, policy can be made applicable to any risk in any context. She follows that within this idealized risk management scenario every risk can be approached within a single framework, by a single procedural logic that moves in sequence from identification, analysis and evaluation through treatment and monitoring. Yet, Boholm's contribution here is to problematize this traditionalist idealization and instead to argue that more attention should be paid to the contextualized nature of risk management. Answering her call, in this chapter I pay attention to the complex processes that meteorological experts and audiences engage in during 'non-severe' risk situations, along with their diverse goals and competing priorities as each makes sense of and assesses risk. Doing so reveals the everyday risk relations that are influenced by policy and makes more visible the often opaque structures of policy and governance in the context of risk.

When the atmosphere does not present so much certainty, however, and weather falls on the cusp of threshold criteria, or just shy or below 'severe' weather standards, the absence of an official policy alternative to convey high risk in 'non-severe' situations leads meteorologists to develop their own informal policies and conventions for how these risk situations should be managed. Defined as institutions (Douglas 1986: 46), these

[4] Refers to the pre-generated text that populates in the body of the warning message

informal rules and conventions operate to guide meteorological perceptions in the organizational forecast and warning setting. Much like Douglas describes, institutions allow meteorologists to sift through information and lead to their coordinated actions, the emergence of consensus and the development of expectations for these experts as they navigate weather, policy and risk on the forecast floor. Altogether, I show how meteorological experts build upon formal policies of 'severe' weather in 'non-severe' weather situations and through the enactment of informal forecast floor conventions and reasoning transform their assessment of 'non-severe' weather risk into a notification intended to amplify perceptions of risk and willingness of response among audiences. Here, meteorologists are flipping the positivistic perspective of risk and policy Boholm (2015: 105) mentions on its head to consider alternative meanings, interpretations, interests, values and ethics. Reflected upon in this way, policy and its related institutions on the meteorological forecast floor are major decision processors in weather risk environments and have a significant hold on classifying weather risk (Douglas 1992: 58).

In this chapter, I follow Boholm's (2015: 15) definition of risk as a contextually situated and relationally established concept and link this conceptual frame to somebody or something of value in danger or under threat. Therefore, more nuanced than simply an individual reaction and response to threat (Beck 2009), here I consider risk as a learned phenomenon connected with perceived importance and merit, and where its perception and management are a situated practice, embedded in specific social and institutional contexts (Boholm 2003). From this conceptual path, risk is considered here an inherently subjective phenomenon, and in the expert meteorological setting, as a blending of science, judgement and cultural factors (Slovic 1999). Such blending is in keeping with

the concept of the *scientization of risk* (Beck 1992), which refers to the contribution of social aspects into assessments of risk and is representative of scientific work as a social activity (Jagtenberg 1983: 6; Jasanoff 2010: 251; 2004). This is a position where STS scholars would contend meteorologists creatively adapt to situations in their production of expert knowledge (Daipha 2015: 4), and in so doing, have the ability to construct social realities that align with their particular viewpoints, especially during non-severe but risky weather (Latour and Woolgar (1986[1979]). Altogether, in the following pages I show how meteorologists situated in their organizational environments *scientize* risk in 'non-severe' weather situations by relying upon their understanding of the atmosphere, their perception of risk, the mental image they perceive publics have of them and vice versa to help construct alternative risk notifications.

Risk is a topic that has been studied empirically by many scholars who have measured various factors contributing to the ways it is differently perceived, including psychological characteristics such as optimism bias (Joffe 2003); explanations of biases (Epley and Gilovich 2006); and heuristics or the mental shortcuts intended to reduce complexity. Scholars have also looked at the effects of anchoring on risk judgements (Alahakami and Slovic 1994; Finucane et al. 2000; Leiserowitz 2006; Slovic et al. 2007; Tversky and Kahneman 1974); how trust and other emotions inform judgement (Clore and Huntsinger 2007; Lerner and Keltner 2001; Siegrist and Cvetkovich 2000), as well as the influence of revealed and expressed preferences for acceptable levels of risk (Starr 1969; Fischoff et al. 1978). In their conceptual framework, Kasperson and colleagues (1988) attempt to link the technical assessment of risk with psychological, social and cultural factors demonstrating in their approach that risk perception is either amplified or

attenuated as risk information travels from one amplification station to the next. More recently, Boholm and Corvellec (2011) have shown the value of an ethnographic look at risk, revealing its contextual features and drawing on these to explain how risk is assessed and investigated, and how it is managed in planning, regulation, and also how it is communicated in society.

Furthermore, for the last several decades, scholarly efforts have sought to uncover influential factors contributing to perceptions of risk as they relate to public consumption of risk information in the weather context. For example, studies have looked closely at user perceptions of 'severe' weather events (Spinney and Pennesi 2010), at public differentiation of weather products (Silver and Conrad 2010); at the communication of weather information (Sherman-Morris 2010; Lazrus et al. 2012; Casteel and Downing 2013), public decision making (Demuth et al. 2012; Frisvold et al. 2013; League et al. 2010; Ramos et al. 2010; Savelli and Joslyn 2012), the capacity for publics to adapt in times of unpredictable weather (Hayden et al. 2017), as well as warning utility or public uptake (Chiu et al. 2013; Demeritt et al. 2010; Lazo et al. 2009). Researchers have also looked at the relationship among the production of weather information, individual perceptions, and decision making (Morss and Hayden 2010; Pennesi 2011; Ruin et al. 2013; Wong and Yan 2002). Using an ethnographic approach, Daipha (2015) and Fine (2007) address the bureaucratic obstacles surrounding the weather forecast and warning process, the ritualized interaction of meteorological work in an institutionalized environment, and the combination of these two on decision making. Altogether the existing research emphasizes the presence of multiple factors influencing public interpretation and uptake of risk information as well as the points of connection among

different actors in the weather prediction process. Not as prevalent, however, are studies that focus on *why* audiences have these differing perceptions or how *the why* influences relational constructions of risk and decision-making behavior (Houser 2018, Lazrus 2009 and McNeely and Lazrus 2014 to name a few).

One of the *whys* behind the relational construction of risk is accounted for by mental and cultural models theory. Van Dijk (2014: 23) explains a mental models approach to sense-making as the cognitive process audiences use to understand events and actions from their daily experiences. Similar to the contributions made by Johnson-Laird (2005) and Stevens and Gentner (1983), mental models guide reasoning, organize thoughts and emotions, and provide a structure that allows individuals to understand and imagine the world they live and work in. These mental constructions are built through interaction (Norman 1983: 7), stored in our episodic memory and may be combined in larger, hierarchically more complex models of thinking (van Dijk 2014: 50). The knowledge that evolves from our mental models comes to reflect reliable and correct patterns of reasoning and representations of the world, as Van Dijk (2014: 24) contends. Cultural models, on the other hand, are described as the shared understanding of the world that has been learned and internalized by a group of people (Quinn 2005: 3). Cultural models are broadly held by society, but can also be held by multiple types of social groups and communities, such as ideological or epistemic groups (van Dijk 2014: 111), of which ECCC meteorologists belong.

The differing mental and cultural models held by audiences have to do with how words and ideas are arranged in our minds. This process of arranging and its influence on the everyday, ordinary analysis of experience harkens back to the seminal writings of

Benjamin Whorf (1956). In what is contemporarily one of the most notable examples of the relationship between linguistic meaning and the behavior of people, Whorf showed in this classic piece how situations are patterned, understood and responded to based on the meanings we associate with language. Specifically, through the example of gasoline drums, Whorf demonstrated how the word "empty" conveyed a lack of hazard, whereas in reality an empty gasoline drum still poses considerable physical hazard because it contains explosive vapor. The example confirmed the inter-connections between language, thought and behavior, and demonstrates the influence of these elements on the construction of mental models. Furthermore, the insight he offered in this early example is useful for the upcoming explanation regarding the interpretation and responses made by ECCC audiences during ECCC's management of 'non-severe' weather since it highlights how our conditioned understandings of language sometimes inadvertently amplify risks to danger.

An individual's mental model influences the pragmatic force of ECCC policy-inspired risk information. Drawing on Austin's (1962) performativity of language, in this chapter I show how the issuance of alternatives to manage 'non-severe' weather is an illocutionary act. Here, I refer to an illocutionary act as an instance of a culturally-defined speech act type (Searle 1969), one characterized by a particular illocutionary force; for example, promising, advising, or warning. In this case, by issuing risk notifications meteorologists are performing this act with the intention of amplifying attention to risk and bring about positive social impact. Linking this perspective to the analysis of mental models and risk perception is helpful in so much as together they assist in the forthcoming explanation on how ECCC meteorologists construct risk in 'severe' and

'non-severe' weather situations and also how different public user groups make sense of, and respond to, ECCC risk constructions.

Finally, much like Strauss and Quinn (1997: 3) who assert interaction as an essential mediating force in meaning creation, this study draws on theory of interaction and highlights it as a necessary, overarching feature in policy work, risk construction, social organization and identity creation. Several contemporary scholars have contributed to the discussion of interaction and its influence on meaning creation. Linguist Paul Chilton (2004), for example, describes interaction as critical for developing coherence in discourse; Smith (2005) points to texts as a form of interaction, or those words and images bearing ideas that have the capacity to coordinate and generate standardization of meaning and practice; years earlier Bakhtin (1981: 291) and Kristeva (1984) pointed our attention toward an individual's interaction with their past and how understandings from the past influence current ways of thinking; sociologist Goffman (1967) emphasized the role of face-to-face interaction, specifically that of face, on meaning creation; socio-linguist Gumperz (1977) looked more closely at linguistic features of face-to-face exchanges, such as contextualization cues and indexicality, to show how people make meaning through interaction. Empirically, anthropologists studying weather and climate in North America and abroad have shown how meaning is created jointly across space and time between participants in the interaction and based upon the relationship that is held between them (Roncoli et al. 2011; Pennesi 2011, 2013; Taddei 2012). Altogether, these scholars illustrate that understanding is made possible through interaction; it becomes a socially-situated blending of one's present with their past, of people engaging across and within institutional or community boundaries, an outcome of engagement at

different spatial scales and in different ways, reflective of social organizations and identities as well as paramount in their production.

I ground this study primarily in Goffman's symbolic-interaction perspective, particularly his scholarly contributions on presentation of self and frame analysis (1959; 1974). While his approach does not attend to intentionality and agency in decision making, I emphasize Goffman's work because it highlights well the situated and situational nature of interaction. In this chapter, I extend his dramaturgical approach, which is described by sociologist Peter Manning (2014: 271) as using theatrical metaphor to explore how the communication of messages to an audience conveys information and creates impressions that shape social interaction. This metaphor is helpful for illustrating the nature and purpose of meteorological interaction on the forecast floor, or that their creation of risk information is a type of improvisational policy-inspired performance for multiple audiences and where the audiences must then interpret the performance that has been framed for them. I make this argument by drawing heavily on more recent scholarship, such as the perspectives offered by Schwalbe (2013) and Benford (2013) whose work on the self and framing illustrate the continued relevance of Goffman to understanding situations, structures and meaning creation through interaction. In the following pages, I combine this interactional perspective on sense-making with a mental and cultural models perspective, and I supplement these two when appropriate with insights from risk, policy and linguistic anthropology literature to explain constructions of risk during the pursuit and achievement of operational success on the forecast floor.

Methods

With its focus on risk, policy and interaction in the context of weather, the methods employed for this study concentrated on the face-to-face interactions between and among

ECCC meteorologists on the forecast floor, as well as users' interactions with various risk messages issued by ECCC meteorologists. To that end, ECCC's office located in Downsview, Ontario was selected as a site of investigation, since meteorologists working at the 24/7 forecast office are responsible for providing forecasts and warning for the entire province of Ontario, including the City of Toronto. Areas in Toronto that experience 'severe' and 'non-severe' weather along with its associated impacts, were also selected as sites for data collection and analysis. Data were collected over a 17-month period used a combination of observation, survey administration, and face-to-face interviews with producers and users of weather and flood information.

Meteorologists were purposively chosen based on their official role as weather experts with Canada's national weather agency, ECCC, and time was spent focused on shadowing operational procedures and meteorological interaction during forecast and warning creation, an endeavour which resulted in several books of handwritten field notes. Observations with this group focused on their behaviour in their natural work setting, where understandings could be derived, and grounded in, their spoken words and interactions (Bernard 2002; Sandstrom, Martin and Fine 2010: 21). I combine data collected from observation with ECCC meteorologists at their Downsview office with observations of ECCC meteorologists, who worked at the satellite office embedded in the TO2015 Pan Am (PA) and Parapan Am (PPA) Games' Main Operation Centre, between May and October of 2015. Overall, 45 visits were made on 'severe' weather, 'non-severe' and sunny-weather days, with each visit lasting between two and seven hours.

In this paper, I also draw on survey and interview data to complement my understandings of everyday forecasting operations captured during observations. First, a

paper survey was administered to ECCC meteorologists in May of 2015 (Appendix L for sample), which asked this group what they imagined their publics' needs and uses for weather information were, along with what they perceived publics (mis)understood about weather information. Responses to this survey were retrieved in April of 2015 and informed the development of an interview protocol for the first group of public participants, Sport Managers at TO2015, and conducted face-to-face one-on-one interviews between July and October 2015. This interview protocol measured Sport Managers' understanding, reaction and response to a number of ECCC issued products including forecasts, Warnings, Watches, and a Special Weather Statement to name several. During interviews, participants were also asked about terminology and requested to define terms found within these products, such as '*low pressure system'*, '*scattered thunderstorms'*, '*is possible'*, '*frontal system'*, and '*afternoon*'.

In January of 2016, I returned to ECCC meteorologists and administered a second survey with this group, this time accessible electronically through a web link to surveymonkey.com. This second survey replicated to a great extent the interview protocol used with Sport Managers and was administered to elicit comparative data with respect to ECCC issued products and terminology and to develop a sense for what ECCC meteorologists imagined end-users were paying attention to in the different weather products they issued. The interview protocol used for Sport Managers was revised slightly for a second group of public participants, Toronto residents, and interviews with this second group took place during the summer and fall of 2016. The revision maintained the core features of the original protocol, for example it included the

presentation of ECCC weather products and terminology, however it also included an additional section on general weather knowledge.

From interview and survey data, the perspectives of 26 ECCC meteorologists are included here. The group is comprised of both male and female operational meteorologists, who have a range of operational experience. Some are recent graduates and are newer to the organization, whereas others have worked with ECCC for over 30 years. Many have worked in other ECCC forecasting offices, while others in the group have been at the Downsview office since graduating from school. Severe weather meteorologists act as supervisors and represent the more senior forecasters on the forecast floor. These are the folks responsible for creating 'severe' weather warnings, 'non-severe' alternatives as well as public extended forecasts. This group is compared with the perspectives of 21 adult members of the public: nine outdoor Sport Managers from TO2015 PA and PPA Games (three males and six females) who were selected purposively, along with 12 residents of the City (three males and nine females) who conveniently agreed to participate in face-to-face interviews. The public sample included men and women with a range of educational backgrounds, ages, length of residence in Toronto, and familiarity with sport as well as with weather information. All face-to-face and telephone interviews were audio-recorded, producing approximately 770 minutes of recorded talk, which was transcribed verbatim and analyzed with Atlasti, a qualitative software analysis program. Consent was granted by all participants of this study, either through their signature, by way of completing the online survey, or through their verbal consent. ECCC meteorologists and public participants have been referred to by pseudonyms in this study to ensure their anonymity (Appendix A).

Meteorologists and Operational Success

Operational success is grounded in ECCC meteorologists' relationship with the weather. Understanding and mastering what the weather is telling meteorologists is a talent and skill they use as they navigate policy, the mental image publics have of them and the mental image they have of their publics. Their achievement of operational success is demonstrated by verbal expressions or facial gestures indicative of triumph or disappointment, as the examples below convey.

Meteorological Mastery and Its Influence on Success

The relationship meteorologists have with the weather helps in their mastery of understanding and telling its story. Despite the highly localized nature of scientific weather prediction processes across forecast offices and international borders (Daipha 2015, Fine 2007), one general commonality found in this expert group is the unique relationship each has with the weather, one that often extends far beyond their official duties and requirements as forecasters. For many, work is not only about issuing forecasts on-time or watches and warnings in enough time, but instead is centred on carrying out an organizational-turned-deeply-personal mission for protecting life and property, a role similar to emergency first responders as evidenced by one severe weather meteorologist who said: "I feel like we're firemen at a firestation -- waiting for a fire in the hole." For these scientific experts, waiting for that fire in the hole is what weather prediction is all about. Often working 12-hour shifts and taking minimal breaks, many eat lunch at their desks, and many stay long after they are required when the weather calls for it. Members of this group describe the weather in human ways, noting a front's *beauty* or a thunderstorm as appearing *impressive*. Such intimate characterizations are suggestive of meteorologists' closeness with the weather and familiarity to it. Likewise, and similar to

Fine's report (2007: 5), ECCC meteorologists consistently give agency and motivation to physical features of the atmosphere, such as when they say:

ECCC Downsview Office
Fieldnotes

a. you can see *it* {the atmosphere} *trying to improve*
b. the cold air *spills in* causing pressure to rise
c. *it* {the weather} may still *explode*
d. that big meso-convective cyclone just *blew up*
e. the weather is a *moisture robber*
f. the meso-convective cyclones are *pulsing up*
g. the storm system is about to *spank* them {referring to location} again

Once off-shift, meteorologists continue to refer with ease in conversation to dew points at the cabin, or water temperatures in degrees Fahrenheit at the lake, or the cumulus cloud cover and the little potential for thunderstorms during their recreational league baseball games. These examples demonstrate how weather transcends organizational boundaries into the meteorologists' everyday life as private citizen. One could reasonably argue then that severe weather meteorologists have the tendency to work as well as live and breathe the weather, a notion supported by one meteorologist who commented: "it is in our heads". With weather so deeply engrained in who they are as scientific experts and private citizens, it is unsurprising to consider how organizational notions of 'severe', 'non-severe', and thus 'risky' and 'non-risky', respectively are further negotiated through their relational interactions and experiences.

The Combined Role of Policy and Positive Social Impact on Success

When it comes to 'severe' weather warning policy, meteorologists are considered organizationally successful if the notification they issue meets at least one of ECCC's threshold criteria, outlined as 'a set of defined weather or environmental parameters, and their associated values, related to a known hazard that are used as a level marker for the beginning of and ending of a weather or environmental instance of a hazard and was

issued with 30 minutes of lead time'. In these cases, the notification issued by the meteorologist verifies as a "hit" and it contributes to the organization's overall performance standings. For ECCC meteorologists, as much as policy guides decision-making behaviour in different weather situations, and they do desire for their notifications to verify organizationally, successful management of weather risk is less often about which official category the weather falls into and is more often about producing information that adds value by bringing about positive social impact. Positive social impact is defined here as offering advanced warning and users' or audiences taking appropriate response measures to protect themselves from harm. In these ways, meteorologists are fueled by their dedication and commitment to the ECCC organizational mission and pursuit for operational success vis-à-vis the appropriate management of 'severe' and 'non-severe' weather risk. They demonstrate this as a 'need to be correct', which plays out in different ways depending on the weather scenario unfolding before them. Consider the three examples below captured during observations with ECCC meteorologists, the first referring back to the opening vignette in this paper:

Example 1: "What should we do about the rain?"

On June 15, 2015 and during my observations at ECCC's Downsview office, I notice Elon and Elaine discussing rainfall as the major weather issue for the day, from Windsor to Sarnia and across to Hamilton. The day before, on June 14, 2015, 42mm of rain fell in Windsor. It came across from Detroit and intensified. From my fieldnotes (and expanding upon the opening vignette of this chapter) of this interaction, Elon begins:

ECCC Downsview Office
June 15, 2015

1 Elon: Only Windsor and Sarnia have the risk for today.

2 {Should we go with} a Special Weather Statement or a Severe
3 Thunderstorm Watch?
4 Elaine: It won't be the same as yesterday.
5 It's never the same.
6 Elon: It might be rounds {of showers} with a block of nothing in between.
7 Do we even have a chance of showers {in the forecast}?
8 Elaine: Yeah -- we do.
9 An air mass this moist is a pretty efficient rain producer.
10 Elon: ((hands to face with a concerned look in eyes))
11 What should we do about the rain,
12 Elon: It's always a fine line.
13 Elaine: It's just that the air is so moist.

The exchange in Example 1 demonstrates how interaction between colleagues and the desire to be perceived as correct shapes severe weather meteorologists' perceptions and management of weather risk, which contribute to their feelings of success. For Elon, success hitches on two problems in this weather scenario: first, the initial band of precipitation tracking over southwest Michigan toward Windsor, Sarnia and across to Hamilton is supposed to roll through and then diminish before a second system comes through during the evening. Thus, the atmosphere is not presenting a clear and certain scenario of steady rainfall, with certain impacts; it is one of the blurry in-between events that fall in the grey middle, which make producing a warning that generates positive social impact uncertain.

Second, and coupled with this uncertainty of impacts, is the constraint imposed by policy which makes ensuring the appropriate selection of a product tricky. In Line 2-3 of Example 1 we see evidence of this when Elon questions which alert would be more appropriate. Despite the rain likely meeting threshold criteria, Elon's perception of 'severe' risk is diminished since there looks to be a break between the two weather systems (Line 6) long enough for the fallen rain to dissipate and be absorbed by the ground/rivers/sewer systems, thus resulting in little or no social impact. In other words,

even if the conditions meet the 50mm threshold criteria, Elon is hesitant to issue a notification because his perception is that the rain will be absorbed resulting in minimal impact, and thus limited public utility of a risk message. Elon's distress in Lines 10 and 11 is noticeable when he asks: "what should we do about the rain?" On the morning of June 16, 2015, Elaine returned for the second of two day shifts and received a brief that detailed Windsor as only receiving minimal rain the evening before, Sarnia a little more, whereas Goderich received the most at 42mm. Goderich was not included in the geographic boundary of the Severe Thunderstorm Watch, and combined with the little rain that fell in the regions that were included in the Watch boundary, the notification did not verify as a "hit". This news left Elaine visibly disappointed, her face overcome with an expression resembling more of a self-castigation.

The face-to-face interaction documented in Example 1 reveals that Elon and Elaine's pursuit of success emphasizes the organizational and personal value of their efforts. Put another way, during the exchange each is presenting themselves and assessing their performance of their occupational role based on their perceived value to operations. Elon's 'hands to face' demonstrates the anguish and need to be correct, and that being correct is equivalent to adding good value. For Elaine, on the other hand, the disappointment she feels when she learns she was incorrect about the previous day's weather situation exemplifies her perception that her efforts added little value. Schwalbe (2013: 82) highlights this self-efficacy dimension in his discussion on situations, structures and the making of selves. He points to the notion that the ideas we have about ourselves are formed through self-perception and the belief one holds regarding their ability to succeed.

Example 2: ECCC meteorologists at the MOC: "We told them it would rain"

In another instance, on the afternoon of August 11, 2015 during the TO2015 Parapan American (PPA) Games, ECCC meteorologist Nash is embedded at the Main Operation Centre (MOC) and running a weather communication triage of sorts with the TO2015 Sport Delegate and the tennis Sport Manager located at the tennis venue. The excerpt from my field notes and the description that follows highlights Nash's interactive pursuit of operational success that day and the importance of being correct:

ECCC-MOC
August 11, 2015

> At 9:11am, Scarborough looks to be spared the rain, as per Nash to Sport Delegate both embedded at the MOC.
>
> At 9:47am, the Sport Delegate communicates this to the Sport Manager on site at Tennis. The tennis courts are then dried and swept in preparation for the medal matches, which are set to begin at 10:30am.
>
> At 10:07am, within one half-hour of the most recent communication between the Sport Delegate at the MOC to the Sport Manager at the tennis venue, Nash then tells the Sport Delegate "showers will now hit Scarborough in the next half hour".
>
> The implications of this change from an all-clear at 9:11am to rain sometime around 10:45 is a delay in matches. After rainfall, the courts require additional time to dry (one hour for water to be removed) and they also require a second sweeping.
>
> The new start time for medal matches will be 1.5 hours later, or 12pm.
> At 10:50am- ECCC management and lead for PPA Games calls Nash at the MOC to see what happened.

In my conversation with Nash about the weather situation unfolding at the tennis venue, he tells me: "It's not raining there and that's not a good thing. I told them it would rain". He then added: "It's hard, you don't want to say the wrong thing." Nash is concerned that ECCC management will perceive this morning as a 'miss'. In this case,

Nash is balancing the desire to protect his image with his desire to be successful with the forecasting challenge brought on by highly convective weather patterns. Here, saying the wrong thing threatens the value Nash perceives himself to have, and impacts his credibility among end users as well as his peers and colleagues. Similar to Example 1, in Example 2 Nash's self-efficacy is threatened by his change in the forecast. Much like Elon and Elaine in Example 1, by giving information the group of meteorologists are explicitly claiming their identity as experts. Borrowing from Schwalbe (2013: 87), doing so makes these experts accountable and subject to the demand to explain or justify their expressive behaviour. When accountability demands cannot be met, self-image becomes fractured. This was evident in the first example in so much as the notification issued was considered organizationally unnecessary, which is theoretically akin to Elon and Elaine trying to claim a self, or a position of valued meteorological expert, in a situation to which they were not entitled. Conversely, Nash in Example 2 did not give news of the rain early enough. This decision was questioned by ECCC management, a probe that conveys Nash failed to claim the similar self he was expected to have. The examples illustrate the importance of correctness to meteorologists' social identity as valued expert and interconnectedness of identity with policy and operational success.

Example 3: "Yay, it got to -1°C in North Bay last night"

From May 21 to September 21 each year, ECCC meteorologists have the added task of issuing frost warning or advisories when widespread frost formation is expected over an extensive area and/or when surface temperatures are expected to fall near freezing in the overnight period[5]. On May 22, 2015, Elon engages with me about the frost warning he

[5] https://www.canada.ca/en/environment-climate-change/services/types-weather-forecasts-use/public/criteria-alerts.html#frost

issued the night before, which happened to be the first one for the 2015 season. As we sit together in the early morning hours, Elon is looking at conditions over Region 12 or the near North and exclaims, “Yay, it got to -1°C in North Bay last night!” When I ask if that’s a good thing, he responds to say: “Yeah, because I put out a frost warning at the last minute for people to cover their plants.”

Elon explains further that a frost warning was not originally put in the overnight forecast for North Bay because ECCC meteorologists on the day shift thought it would be cloudy that night, and more clouds means less chance of frost. But then a couple hours after Elon took over for the overnight shift, he looked at satellite imagery again and saw enough breaks in the cloud to warrant a frost warning. He issued the Frost Warning at 9:20pm. His exclamation the following morning as he is sitting next to me that the temperature in North Bay reached -1°C confirms that the frost warning was a “hit”. Looking back, however, Elon commented to say: “it should have gone out earlier, maybe in the afternoon so people can do something about it. If the frost warning gets out too late, it’s not like people will go out and cover their plants.”

This example highlights meteorologists’ desire for bringing about positive social impact during ‘severe’ and ‘non-severe’ weather. In combination with changes in the atmosphere, ECCC policy contributed to Elon’s management of the frost. It socially arranged the structure of work practices and governed the expressive actions Elon took during his encounter with the weather situation by both enabling and constraining his actions (Schwalbe 2013: 79), leading to success on the one hand and failure on the other, respectively. More pointedly, his last minute Frost Warning verified as a “hit”, however it also resulted in limited positive social impact. This opposition reveals the conflict

brought on by the pursuit of operational success, and the negotiation within the meteorologist wherein expert identity is reinforced by a "hit" but then also threatened when the meteorologist perceives their actions to have little value for the end-user. Overall, in Example 3 Elon demonstrates that more than adhering to policy, providing information that is meaningful to the public is critical for operational success. This means that issuing a notification, regardless of whether a "hit" or not, is sometimes less about policy's thresholds and criteria and more about getting it right, or delivering risk information that can and will benefit the public, which in this case meant issuing with enough time for the public to act and protect their property from damage.

The Role of the Meteorological Archetype

The mental image meteorologists perceive publics have of them influences their need to be correct as they pursue operational success. Unlike other scientific disciplines, meteorology has undeservedly earned itself a lower degree of social recognition (Turner 2009). Conscientious efforts in the mid-1950s to professionalize meteorology and secure the science it produces as a recognized public authority on weather have not always been successful (Turner 2009: 150). More contemporarily, meteorology and the work of meteorologists are sometimes questioned, joked about, and dismissed. In these ways, meteorologists have and continue to experience a degradation of their social identities, a reality documented in the Northeastern Brazilian context and discussed by Taddei (2012: 255) as threats of physical violence, verbal abuse, and ridicule. The social degradation also manifests itself in the North American context where ideas about meteorological work evolve to become an archetype of sorts where widely shared representations are created, maintained, and perpetuated socially through the likes of popular media film (the WeatherMan) as well as through comedic portrayals on primetime Canadian television

(Rick Mercer's 7 day forecast). That these comedic portrayals are generally recognized as representative of meteorological identity is indicative of the successful transfer or propagation of the archetype.

While public individuals experience popular portrayals in unique ways, the meteorological archetype broadly functions to generate commonly held beliefs about the credibility of meteorological work and the scientist's identity as meteorological expert (Stevens 2015: 44), for upon their issuing of a notification, he or she becomes accountable and is instantly available as the perfect victim for sacrificing in the public arena. They take on blame for risk that materializes, but also for risk that does not, and in this way often experience recurrent damage to their public image (Taddei 2012). This is related to Douglas's discussion on risk and blame (1992) in so much as risk, especially in the context of meteorological prediction, functions to hold someone accountable, a position for which the meteorologist often finds themselves in despite their efforts at precision and accuracy. In addition, the meteorological archetype relates to Schwalbe's (2013) discussion on accountability and his insight regarding the potential for the fracturing of one's self-image when accountability demands cannot be met. Schwalbe's contribution, in particular, reveals a type of double sacrifice in so much as when meteorologists experience failure they are at once suffering publicly and also internally with the damaged perception they have of themselves.

The everyday work of ECCC meteorologists' noted above illustrates the simultaneous power and preservation of the archetype through interaction. As Schwalbe (2013: 81) writes, the consistent signification of category membership is likely to elicit consistent attributions of character. In other words, through signifying acts, or the

repeated work of forecast and warning, and to the extent that meteorologists' work is perceived by publics as inaccurate, the more likely publics will continue to impute the group with a degraded expert identity. With awareness of the meteorological archetype, meteorologists come to behave based upon how they perceive others are reacting to their behaviour. These reflected appraisals (Schwalbe 2013: 82) are noted as a primary motivator of expressive behaviour. Thus, in the context of managing 'severe' and 'non-severe' weather, during the construction of risk information in their pursuit of operational success, meteorologists consider this archetype as a factor in their decision-making. This factor preserves, restores and sometimes challenges their self-image as meteorological expert as Examples 1-3 demonstrate.

The Role of the Public User of Weather Information Archetype

As much as the meteorological archetype influences the relational construction of risk on the forecast floor during 'severe' and 'non-severe' weather, ECCC meteorologists' pursuit of operational success is also influenced by an equally powerful but opposite mental image each has of the audiences they serve. The images are often developed through indirect interaction with these groups in different media environments, such as by meteorologists reading comments made on social media platforms or those public response behaviours reported on news broadcasts during weather events. These are considered signifying acts made by the public, which impute versions of the public onto the meteorologist, and when repeated over time perpetuate conceptions and misconceptions meteorologists have of public groups. This notion of the public user of weather information archetype as influential in the management of weather risk is reinforced by research in the field of science and technology studies where scholars: make a case for the power of the public image in shaping motives for, and preferred

mechanisms of engagement (Barnett et al. 2012: 46); discuss how public communication serves to co-construct and re-inscribe their imaginations of who the public is (Davies 2008: 427); and also show how the assembled imaginations experts have of their publics affects the framing of information (Maranta et al. 2003: 151) as well as the model that is chosen for communication (Gross 1994).

In the context of meteorology, the shared social space in the new and traditional media environment mediates meteorologists' experience with audiences. It assists in the creation of who meteorologists imagine their audiences to be, what they believe public groups know, and what they believe audiences need in terms of risk information. Similar to the influence of the meteorological archetype, the public archetype shapes meteorological work and the pursuit for operational success in the way that decisions made by meteorologists become swayed by these perceptions they have about others. This point was made in Example 3 above by Elon in his assumptions regarding the usefulness, or lack thereof, of the Frost Warning he issued late in the evening on May 21, 2015. It is also confirmed by the presumption made by ECCC meteorologist Samuel when he reported in his survey response: "People do not understand our definition of severe thunderstorms," a statement he followed up with by writing: "We need a way to teach the difference between a 'non-severe' thunderstorm and a 'severe' thunderstorm." The comment made by Samuel highlights the existence of an official definition grounded in policy, and it conveys the mental image he has of publics that do not understand that 'severe' thunderstorms include specific conditions that have met specific thresholds whereas 'non-severe' thunderstorms include the same conditions but fall just shy of thresholds.

To a certain extent, the mental image held by Samuel regarding what publics do and do not know is valid. It was shown to be true through an analysis of different conceptions of 'severe' and 'non-severe' thunderstorms. Generally, public participants in this study defined 'severe' thunderstorms as inclusive of one or all of the following: thunder, *lightning*, hail, rain and winds; and where those conditions are present with a certain intensity; and where they occur in close proximity to the participant, are long in duration, and result in negative social impacts. Conversely, public participants reported 'non-severe' thunderstorms as characteristic of: "having *fewer lightning flashes*" (Rebecca); "a thunderstorm that *does not pose any danger*" (Stephanie); *gentle rain* falling on you" (Cathy); and resulting in "*no real damage*" (Joseph).

These varied public understandings highlight the differing cultural models meteorologists and members of the general public employ to make sense of 'severe' and 'non-severe' weather. Drawing from anthropologist Claudia Strauss's (2005: 206) discussion on analyzing discourse for cultural complexity, the inclusion of lightning in both 'severe' and 'non-severe' public definitions is considered here a cultural keyword that has the power to inscribe understandings, ideas, thoughts and expressions. This is because of lightning's repeated use when talking with interviewees about what makes a thunderstorm a thunderstorm, what makes one 'severe' and how 'severe' differs from a 'non-severe' one. The consistent mention of lightning conveys that this feature in a storm is invested with strong values for public participants. Furthermore, that a 'non-severe' thunderstorm was defined as having little to no impact reveals the assumption held by public participants that 'non-severe' thunderstorms are inconsequential. Perhaps these opposing viewpoints should be unsurprising since, as van Dijk (2014) might

acknowledge, meteorologists represent a particular epistemic group with specialized knowledge while members of the general public do not. In other words, these participants' shared understanding represents the presence of a cultural model, however in their case it is not grounded upon expert knowledge, rather it is likely built upon reasoning and experience that was shown to be shared among the participants interviewed. Strauss (2005) comments on the realities of these models, reporting on the power of mental representations, and how deeply internalized they come to be, so much so that they often amount to taken-for-granted assumptions about the world. The assumptions become problematic for audiences, however, when 'non-severe' weather is approaching and they are not expecting conditions that fall just shy of threshold criteria.

Managing 'non-severe' weather risk: Alternatives for Achieving Operational Success

Elements that bring about feelings of operational success, such as the organizational "hit" and positive social impact, are meant to align. In some cases they do, such as when a 'severe' thunderstorm warning verifies as both a "hit" and is perceived as helping residents in their decision to keep their car under cover to save it from hail damage. At times, however, the factors generating operational success for ECCC meteorologists do not align. These circumstances can include weather that does not meet 'severe' thresholds, but is still considered risky and potentially impactful by meteorologists. The following discussion on the management of 'non-severe' weather shows this divergence and the relational nature of risk perception and management. In cases of 'non-severe' weather, meteorologists construct alternative risk notifications that are intended to both amplify public perceptions of risk to be more on par with their assessment of the 'non-severe' weather situation and inspire protective responses.

This construction of risk is a type of frame alignment (Benford 2013: 141), or a strategy for building a particular social reality for end-users. More than five decades ago, Goffman (1974: 21) pointed out how frames organize experience and guide action by enabling individuals to locate, perceive, identify and label occurrences and events. In other words, much like mental models, frames define conceptual boundaries of situations and events. Here, I am extending Benford's more recent discussion on the topic of framing to weather risk and policy contexts. I consider the construction and use of alternative notifications as a social encounter framed interactionally and suggest that by constructing alternative notifications ECCC meteorologists are strategically attempting to create an illocutionary force with their words, beginning with congruence between their expert assessment of risk and their audiences' perception.

In this next section, I analyze the production and use of two alternative ECCC notifications during 'non-severe' weather, the Special Weather Statement (SWS) and a lightning prototype application utilized during the TO2015 Pan American and Parapan American Games, to further my discussion on operational success. I argue that the SWS is a type of frame amplification strategy (Benford 2013: 141) since it is used to persuade end-users, whereas the lightning prototype application is more of a frame extension (Benford 2013: 143) because it expanded the boundaries of the ECCC notification framework to encompass the expressed needs and interests that were identified as more salient to the end-user, in this case the TO2015 Sport Managers. Mental models, institutions and the concept of frame resonance (Benford 2013: 145) are explained as related factors in the uptake of and response to these alternative notifications, which has

implications for the illocutionary force of these ECCC products and the meteorologists' ability to make a positive social impact.

Alternative 1. The Special Weather Statement (SWS)

ECCC Downsview Office
May 16, 2018
Hazel: Silence is what kills us.
If we have an SWS out {issued} at least we're saying something.

The Special Weather Statement (SWS; Appendix B) is an ECCC product written as a narrative that allows for the expression of meteorological uncertainty and for explaining in more detail the scope and extent of approaching weather. It is technically one of the least urgent notification in the suite of products available to ECCC meteorologists and is utilized during a range of weather conditions. On the one end, it provides a 'head's up' of weather that may or may not happen, and on the other, it is used to notify the publics of potentially harmful just-below-the-official-warning- criteria weather. They are especially sought out as an alternative during 'non-severe' weather scenarios when elements and features of thunderstorms aren't believed to reach critical 'severe' thresholds. Unlike the STW, the SWS is composed entirely by the severe weather meteorologist; they are not written according to a specific policy, nor are they created with any measure of consistency from one person to the next, nor do they require verification[6]. Thus, each becomes a unique characterization of the atmosphere dependent upon who is forecasting severe weather on any given day.

Once issued, the SWS is available to public users on a variety of traditional and new media platforms. There is no mandate for on-air broadcasters or meteorologists with

[6] As of the time of this writing (2019), ECCC are now beginning to verify SWS. Using Toronto as a testbed, this SWS pilot project attempts to capture if and when ECCC is over-estimating or under-estimating impacts when issuing an SWS.

traditional media such as television networks or radio stations to re-communicate the SWS, unlike the official Watches and Warnings produced by ECCC. If an on-air presenter chooses to discuss the SWS, each does so by re-creating the message manually, which means selecting the content and context each deems important for their audience. One of Canada's largest private weather company's "The Weather Network" has a smartphone application where an alert notifies the app-user that a 'Special Weather Statement' has been issued. The red lightning bolt on the application can then be clicked on to expand the entire statement verbatim for those seeking more information.

On the surface, the SWS is a useful tool for providing added detail during potentially harmful weather situations. Research confirms this benefit in the American meteorological context, showing that added context influences public comprehension when it comes to ensemble prediction, probability or frequency information, conveying uncertainty, as well as the impact of enhanced textual and graphical pieces in watch and warning products (see: Demeritt et al. 2010; Demuth et al. 2013; Joslyn and Savelli 2010). The Canadian SWS, however, with all of its flexibility for framing and narrative style, may prove to be an exception since my data show the product does not always translate to increased compatibility or commensurate understanding.

For example, despite its use to convey risk during 'non-severe' but still potentially impactful weather, many public participants reported their general understanding of the SWS as something different. Public participant, Noah, perceived the SWS to be a product providing a climatological outlook, while Lucas, Rebecca, Gabriel and Brooklyn thought it to be a synopsis or an update of the forecast. And still, resident Ginny, believed the SWS provides her with information about weather that was out of the

ordinary. Rebecca added that she did not know the difference between a SWS and a Severe Thunderstorm Warning (STW; example in Appendix E). Theo, Nasir, Stephanie and Ingrid all referred to the SWS as a mechanism for alerting the public for the potential for bad weather, while Umberto and Donald reported that the SWS is used to give a head's up for 'severe' weather.

Analyzing and comparing the common ECCC decision for issuing the SWS against what the SWS label signified to the public participant group reveals a significant conceptual divide regarding its purpose, namely that it is largely understood by the public who participated as a synopsis, an outlook, or explanation of weather that "may happen" as pointed out by Theo, which does not align with ECCC use of the product during 'non-severe' but still potentially highly impactful weather. These differing understandings highlight a lack of common ground or coherence between the two groups' models of thinking. As van Dijk (2014: 250) notes, coherence in discourse relies on structures of similar models between participants where there is a common relation between the fact referred to and those subjective representations participants are using to make sense of the fact. Benford (2013: 145) would likely agree that this incoherence represents a lack of resonance and that the SWS frame employed by ECCC to construct 'non-severe' weather risk is not striking a chord with their intended audience. With a fractured conceptual relation such as this, positive social impact is difficult to accomplish with an SWS in any meteorological weather situation, which makes operational success upon issuing one during 'non-severe' conditions equally difficult to achieve.

When ECCC meteorologists and public participants were asked about a particular SWS (Appendix B), conceptual divides continued to emerge with respect to the content

or terminology included in these alternative notification messages. For instance, one feature of the July 14, 2015 notification that escaped ECCC meteorologists but caught the attention of eight public participants was the mention of *low risk* in the SWS. This suggests that the mention of *low risk* in the July 14, 2015 SWS was interpreted by some public participants as an assessment of the weather risk situation, rather than what experts imagined would be the important takeaways: a description of conditions to pay attention to, such as the rain, how much, where, and when. In other words, though they included *low risk*, in this case ECCC did not intend for the SWS to be interpreted as an assessment of risk at all. When it came to *low pressure system*, nearly all public participants were unsure what the term meant. To that end, the primary responses given to my question "What does low pressure system mean to you?" were "I don't know" or "I have no clue". One resident of Toronto, Ingrid, commented to say: "I don't know. I'm not a PhD in meteorology", which suggests that this term is too specialized for individuals who are not trained in atmospheric science. By including terminology like *low pressure system*, ECCC meteorologists are presupposing that their audience understands. Much like the varied multiple perspectives regarding the purpose of the SWS, the data show that people have an even greater incoherence when it comes to understanding the term *low pressure system*.

Public participants also varied from ECCC meteorologists in their definitions for certain features of rain (Figures 2, 3 and 4 below). Combining the *scattered thunderstorms* mentioned in the SWS with *isolated cells* and *line of storms*, I asked and compared participants' responses for the three with ECCC meteorologists':

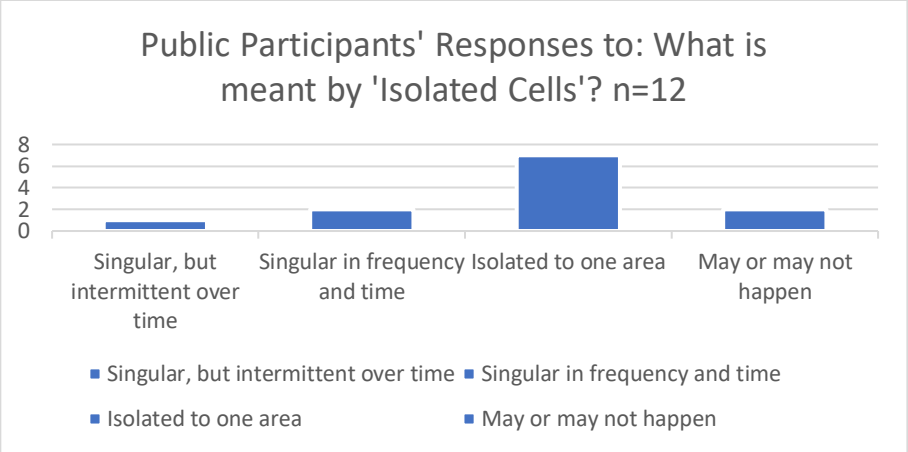


Figure 2. Public Participants' Responses to 'Isolated' cells

Figure 2 is compared with ECCC meteorologists' definition for 'Isolated Cells', which is "very sparse distribution across space, more so than scattered. Typically a single shower."

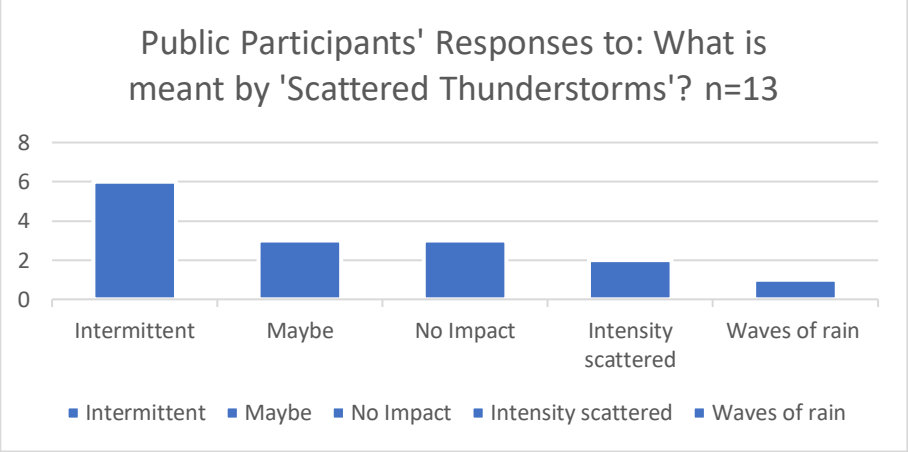


Figure 3. Public Participants' Responses to "Scattered'

Figure 3 is compared with ECCC meteorologists' definition for 'Scattered Thunderstorms', which is "sporadic distribution across space. When showers are on and off throughout the day."

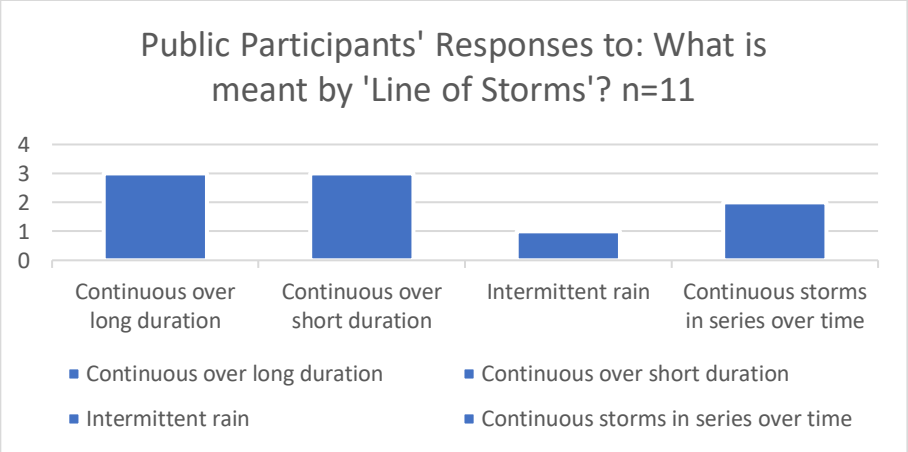


Figure 4. Public Participants' Responses to 'Line of Storms'

Figure 4 is compared with ECCC meteorologists' definition for 'Line of Storms', which is "solid distribution of showers across time and space."

The perspectives represented in the charts above show considerable differences with respect to how features of rain are understood between ECCC meteorologists and public participants in this study. ECCC grounds their definition in elements of intensity, space and time. Public participants, on the other hand, include measures of probability and impact, and they also conceive of 'lines' in multiple ways: as both one continuous line across geographic space as in a large swath and as continuity in a series where there are multiple lines, one after the other, moving across a more contained geographic space.

These varied conceptions suggest different mental constructions are used to define these features between the two groups. While ECCC meteorologists' representation of each term is singular and guided by their specialized knowledge as meteorological experts, the public participants rely on different models of reasoning, such as their experience with the term and whether or not they had heard it before, to make sense of what is meant by *isolated cells, scattered thunderstorms*, and *line of storms*. For the latter group, there is no shared assumption among them for how each term is defined. The

casualness in participants' demeanour, their laughs while providing these responses, and their ability to move on in the interview with ease suggests that the model each is using to define the terminology works for them, even though it may be officially inaccurate. Sandstrom, Martin and Fine's (2010) sociological perspective confirms that producing weather information to effectively inspire coherence and timely response is more than just about the attitude of "at least we're saying something'. In their chapter on language and the creation of social reality, these scholars show how naming gives an object its classification and meaning and assists in the organization of perceptions around the object and subsequently stimulates behaviour towards it. Their stance suggests that in the context of constructing risk information it is the name given a product that transforms what the message stands for from something abstract into something more concrete. In this study, the SWS is a label that was conceived of by ECCC to create meaning for their audiences. In other words, the SWS category was generated by ECCC to assist in their efforts to construct a relationship between their audiences and their environment, one based on a shared collective meaning of the SWS and one that inspires a common mode of response when the product is issued (Sandstrom, Martin, and Fine 2010: 55). The variable and often contradictory understandings for what the SWS represented along with the incoherence of terminology found within the body of the risk message demonstrates that the label has not lead to collective understanding, nor a common mode of response, however. In Austin's terms, public participants in this study have not understood the intentions of ECCC and because of this the illocutionary force, and thus the pragmatic effect of the SWS, was diminished. The multiple conceptions surrounding the purpose of the SWS and the content found within this risk message has implications for its

effectiveness in amplifying risk in 'non-severe' weather situations, which in turn impacts the ability for meteorologists to achieve operational success. The analysis highlights the interconnections between framing of risk information, mental and cultural models used to make sense, and the impact of these on the pragmatic effect of the SWS as an alternative warning strategy. In the next example, a second alternative is used by ECCC meteorologists, one with more clear framing and greater coherence, yet similarly deployed with limited pragmatic effect, despite an illocutionary force that should have been successful given the conditions in place between participants in interaction.

Alternative 2: Lightning Prototype- when the next strike could be within striking distance

Prior to the inception of TO2015 PA and PPA Games competition, ECCC and TO2015 staff collaborated about what TO2015 Games staff weather information needs would be during the summer event. The understandings negotiated across the two groups during their discussions illustrate the stability of meaning created through interaction. Put another way, through these consultations an agreement was made for ECCC to frame risk by extending ECCC policy to better meet the needs of its users. In this way, a framing strategy was constructed, one that resembles a type of bridging rather than amplification since there was ideological congruence between ECCC, TO2015 Games' staff and Sport Managers on the ground at each venue. The discussion highlighted the importance of lightning as a risky weather feature for this group of public users belonging to TO2015 Games staff. As Sport Manager of Beach Volleyball, Brooklyn, commented during our interview:

University of Toronto
October 27, 2015

Brooklyn: We would play through everything except lightning.
If there was ever any sort of threat of lightning --

> that's when we needed to make some decisions.
> Lightning is the only reason we'd stop. It's the baseline.
> Lightning was the real factor.

The Sport Managers for TO2015 followed the commonly supported 30/30 rule when it came to lightning as they managed their respective outdoor sporting events. This rule stipulates, more or less, that when lightning is observed, play stops and the time between the lightning and thunder is counted. When 30 seconds or fewer have been counted between lightning and thunder, the field of play is to be left and shelter is to be sought immediately. People are to remain sheltered for 30 minutes after the last peal (or sound) of thunder.

While critical for TO2015 Games, lightning is not a criterion included in official ECCC 'severe' weather products; its presence falls under the 'non-severe' yet still potentially harmful weather category. Understanding that an alternative notification was warranted to best meet the needs of users, however, ECCC meteorologists utilized the lightning prototype (LP) as a tool to warn outdoor Sport Managers about the presence of lightning[7]. This alternative notification was issued to add value and offer positive social impact in the form of inspiring protection of athletes, volunteers, staff, and spectators during TO2015 outdoor events. The prototype was available for download during TO2015 Games as a smartphone application and alerted subscribers visually, audibly, and vibrationally when lightning was detected within 30 kilometres and also within 10 kilometres. Nasir, former track and field Olympian and Sport Manager for canoe slalom at TO2015 described the alert as: "very loud, like you could hear BOOM! when the

[7] ECCC owns the lightning sensors purchased from Vaisala (which make up the Canadian Lightning Detection Network or CLDN), the raw data are sent from individual sensors to Vaisala to be processed and then sent to ECCC- personal communication with H. Yang of ECCC on May 30, 2018.

lightning hit on your app. It was a BOOM! BOOM BOOM BOOM BOOM BOOM! And it was just, and you could see and this lightning app we had it actually counted the number of hits." This sentiment was echoed by Lucas, the Sport Manager for soccer, who when talking about alerts on the LP mentioned hearing "the crash of thunder and then your phone vibrates." In fact, of the nine outdoor sport managers interviewed for this study all reported the LP as an extremely useful tool for notifying them about risk that was officially 'non-severe'.

Despite its perceived usefulness, the alternative notification strategy often failed operationally in the sense that even when notified of lightning as close as 10 kilometres away, TO2015 matches and venue operations continued. Consider the example below, an excerpt from my interview with Brooklyn where she recounts details during a lightning scare at the 'purpose built stadium' for the beach volleyball games:

University of Toronto
October 27, 2015

Brooklyn: {Referencing the day of the scare} we could see it
out over the lake.
We couldn't see lightning but we could see clouds.
I was checking my lightning app constantly.
And now that I'm looking at this app --
it's showing within 10km -- and that's when I thought maybe
we should seriously consider not starting the next match.
We saw some pretty ominous clouds.
I don't think we saw any lightning ever.
I can't remember exactly.

In the above comment, Brooklyn is pointing out the risk she perceived from a combination of environmental cues and the alert provided from the LP. If the risk conveyed on the LP is considered a measure of ECCC meteorological risk during this officially 'non-severe' weather scenario, one can reason that the LP frame extension was

at least partially successful in bridging expert assessment of risk with this user. Risk was further amplified for Brooklyn in this situation because she knew that with lightning so close-by and with only a purpose-built stadium to protect everyone, there was nowhere within close walking distance to move the upwards of 5000 spectators should it be deemed necessary for them to seek immediate protection from the elements.

As the interview with Brooklyn progressed, however, she commented that even with the LP alerting of lightning within 10 kilometres, and despite official policy which dictated action upon the observance of lightning, the Technical Delegate decided against delaying or cancelling:

University of Toronto
October 27, 2015

Brooklyn: {Referencing the name of the Technical Delegate} --
the Technical Delegate has the most experience.
He was comfortable to continue with the match.
Those are the people that are the experts in the field --
and know and have lived through some of this stuff before.
He {the Technical Delegate} said -- you know --
if we can't see any lightning -- it may be out there -
but if we can't see it --
chances are probably pretty good that we're going to be ok.

This decision to carry on with the beach volleyball game without delay points to a glaring safety issue brought about by this choice. Meteorological experts understand that not seeing lightning on the ground does not mean risk is eliminated. For this group, when lightning is detected within 10 kilometres, as was the case during this beach volleyball event, meteorological training has taught these specialists that the phenomenon is within striking distance to cause harm. In fact, according to personal communication with ECCC research and development scientist on May 30, 2018, there is a type of lightning commonly known as "bolt from the blue" that can travel a great deal horizontally away

from the parent thunderstorm cloud. Many American sources claim this distance to be as great as 16 to 24 kilometres[8,9]. In addition, this example underscores the danger of waiting. Since the closest permanent building to the temporary structure was approximately a 10 minute walk away, waiting for visual confirmation placed spectators of this match at considerably higher risk.

As much as Sport Managers perceived risk in a similar way to ECCC meteorologists, the example shows that their decisions were bound by the Technical Delegate, a person who is responsible for making the final call regarding game play. My data show this Technical Delegate did not perceive risk during this volleyball event in the same way. In fact, given the reference made by Brooklyn to words spoken by the Technical Delegate about the lightning: "if we can't see it chances are probably pretty good that we're going to be ok", it follows that the 'lightning observed' clause in the 30/30 rule is unofficially interpreted by this individual as visual on-the-ground confirmation, and not observation in the form of a lightning bolt on a smartphone application. Because lightning was not visible on the ground, risk was perceived as low.

The Technical Delegate's decision is explained here by his or her extensive history and experience with the sport, which contributed to an alternative mental model or way of thinking about lightning and risk. Contrary to the model employed by ECCC meteorologists, the Technical Delegate's is not one centred on meteorological training but rather on his or her involvement in outdoor sport and the absence of harm caused by lightning over the years. In other words, the Technical Delegate's model on risk is

[8] https://www.weather.gov/safety/lightning-myths
[9] https://lightninginjury.lab.uic.edu/LtnInjuries.pdf

aligned with what Whorf (1956) would argue are the Delegate's habitual ways of thinking and acting, those that follow the patterns established by his experience of the word risk and what it has come to stand for over the years. The Technical Delegate's understanding of the term risk, and his way of thinking about risk that has transpired as a result, have become deeply internalized over time and, in turn, has contributed to the development of informal rules and conventions. The Technical Delegate relies upon these informal rules when making risk-related decisions during these types of sporting events. Practically speaking, these informal policies and conventions materialized for the Technical Delegate as the visual absence of lightning as non-risky and the 'eyeball test' for assessing lightning risk, which is contrary to ECCC's method for defining and assessing lightning threat.

Recent empirical studies (Morss et al. 2015; Lazrus et al. 2016) explored mental models used by public groups in Boulder, Colorado and identified similar mismatches between expert and lay-groups' understandings when it came to perceptions of threat and decision making. Within their research context of flash-flooding, these scholars suggest the misconceptions or imprecise beliefs held by lay-groups increase the difficulty of evaluating risk and taking action. Consequently, Morss, Lazrus and colleagues contend identifying gaps is a useful step for developing more effective risk information and enhancing shared conceptions for what constitutes threat. While this is true, the LP is an example of communication created specifically to address gaps in knowledge and in many respects it still did not generate appropriate protective actions. Put another way, its style, the mechanism and platform for transmitting the information, and the content that was shared was formulated based on the expressed needs of users and with the intention

of creating a shared conception of 'non-severe' weather risk, and still even with the understanding of intentionality behind the LP, the alternative's illocutionary force was weak, and consequently, failed to inspire action because risk meant something different to the Technical Delegates.

In keeping with risk perception scholars Kasperson and colleagues (1988) and Benford (2013), lightning risk was indeed amplified for Sport Managers with the LP, however, the explanation given for its limited use reveals that the Sport Manager's shared conception and heightened assessment of risk was no match for the alternative model and the long-standing unconventional norms relied upon by the Technical Delegate to manage the risk situation. In other words, the LP did not resonate with the Technical Delegate. Benford (2013: 146) explains diminished resonance of framing strategies as a function of three factors, including: frame consistency, empirical credibility and the credibility of the framing agent or claimsmaker. The empirical results here suggest Benford's explanation is true when it comes to Technical Delegates, however the contribution of scholars such as Whorf (1956), who challenged our views on the relationship among language, thought and behaviour, would encourage us to consider the lack of resonance as equally connected with the pragmatic force of ECCC's alternative. Since the Technical Delegate's habitual thought and the mental model he used diminished the effect of ECCC's LP notification, it stands to reason that both framing strategies and routinized ways of thinking about lightning and risk contributed. Furthermore, that the Sport Manager did not challenge the Technical Delegate's 'eyeball test' shows how at times, long-standing unofficial conventional norms that are used to guide risk management decisions propagate in social environments where power differentials exist, such as the

one between the Sport Manager and Technical Delegate, even if those unofficial conventional norms are scientifically incorrect. Thus, the case reveals that along with the impact of habitual thought on sense-making, mental models and behaviour, the mechanisms under which institutional norms manifest also perpetuate and limit the illocutionary force (Austin 1962) of the LP as an alternative notification during the management of 'non-severe' weather risk.

Relatedly, the lightning example also reveals the implications for the presentation and acceptance of ECCC as expert agency in this situation. For example, the decision against halting activity reflects the Technical Delegate's poor appraisal of ECCC's expert analysis of the situation. The Technical Delegate did not agree with the expertise of ECCC and made a decision enabled through the particular social arrangement in place, specifically that the informal policies had been permitted to supersede that of meteorological expertise. Similar to Example 1 from earlier, where Elon and Elaine issued a Watch that didn't verify, in this weather situation it could be argued that the Technical Delegate deemed ECCC as attempting to claim a self he or she perceived the Agency was not entitled to. Correspondingly, the decision against halting activity alludes to the diminished social value of ECCC as an agency for this Technical Delegate and also suggests a perception of diminished social value for ECCC by Brooklyn, especially since she reported that "those are the people that are the experts in the field and know and have lived through some of this stuff before." Overall, the opposing risk assessment along with the decision to disregard the lightning notification has far-reaching implications. One example includes the degradation of meteorologists as expert and the preservation of the

meteorological archetype, even though ECCC met their accountability demands and provided an alternative to meet the apparent needs of their users.

Conclusion

The interaction among ECCC meteorologists as they are reading and responding to 'severe' and 'non-severe' weather is similar to Schwalbe's (2013: 78) description of an activity system. Their interaction on the forecast floor is socially accomplished through a coordination of scripted and non-scripted or improvised behaviours as they negotiate policy and manage weather risk in 'severe' and 'non-severe' weather situations. To that end, during their everyday work practices each meteorologist attempts to construct a social reality for the public that is in alignment with organizational thresholds, the informal institutional conventions they use to guide their understanding, and also with the image they are presenting of themselves as meteorological expert. The study demonstrated how making the "right decision" is always a fine line, as Elaine suggests in the chapter's opening vignette. Ultimately, official policy holds the power in controlling official risk knowledge and definitions that are interpreted by experts during the construction of risk information for their audiences. In weather situations officially considered 'non-severe' but still perceived as risky by meteorologists, these experts' interaction is heightened as they navigate the situation in a way intended to inspire audiences' beliefs in the risk and bring about some degree of positive social impact.

This investigation revealed a unique architecture of risk construction and response between ECCC meteorologists and public participants as ECCC meteorologists pursued operational success. Relatedly, the investigation highlighted the mediating role of language in shaping social realities, both on the forecast floor and in public. The case demonstrated how ECCC meteorologists frame 'non-severe' weather risk by issuing

alternative notifications, which sometimes include the SWS and during TO2015 included a lightning prototype (LP) application. Analysis of public participants' understandings of the SWS product revealed considerable conceptual variation in terms of the notification's general purpose as well as the terminology used within the message. Moreover, the alternative notification often created to manage the murky, middle situations when the atmosphere is bringing about officially 'non-severe' just shy of threshold criteria weather, was shown to have questionable pragmatic effect on account of this variation. Meanwhile, Sport Managers' experience with the LP highlighted the nuanced ways risk comes to be constructed, accepted and negated in spite of collaboration. For this alternative risk management strategy, the LP was shown to have questionable effectiveness not for lack of shared conceptual understanding but more so because of a lack of shared understanding between the right people. In other words, the illocutionary force of the LP was successful in creating a threatening social reality for Sport Managers, but not threatening enough for the individuals responsible for making game play decisions. Considered here as frame disputes (Benford 2013: 147), public interpretations and responses toward ECCC's alternative management solutions illustrate the negotiated nature of meaning creation.

This study went beyond the call made by Boholm (2015) for greater efforts to be put toward contextualizing risk and understanding how it is managed through policy. Specifically, I examined the conditions under which risk is operationalized by meteorologists according to policy during 'severe' weather and also how it is managed when weather falls short of officially 'severe' thresholds, in which case no policy or official rule to warn exists. I accomplished this by paying attention to the local, micro-

scale nuanced actions and decisions that were carried out by ECCC meteorologists as well as audiences who use their information. The rich and detailed accounts generated as result of this effort revealed policy and risk as processual and highlighted the myriad interactions involved as policy and risk information travel across space to different sites. The analysis also revealed the work carried out by ECCC meteorologists as tied to their expert identity. For example, the policy and risk management solutions employed by this group of experts are influenced by their desire to present the best, most competent version of themselves. Achieving success reinforces a positive presentation of self and perpetuates their belief as valuable to operations. On the other hand, failure damages their presentation of self and propagates their desire to add more value in subsequent weather risk situations. Altogether, the approach and resultant findings underscore the relational nature of risk construction and the ways it comes to be assessed, communicated and managed interactionally during the policy implementation process. Furthermore, the findings confirm the usefulness of my anthropological endeavour for focusing a different lens on risk and policy and offering a window onto the processes by which risk and policy attempt, sometimes unsuccessfully, to organize people and their understandings.

Finally, the results of this study shed light on the limitations of a threshold-based warning system, and conversely, confirm the potential usefulness of an impacts-based warning philosophy where outcomes and implications of weather become the categorical boundaries for warning creation. Also, based on the findings of this study it stands to reason that ECCC meteorologists will harness greater shared meaning of risk and appropriate response during ‘non-severe’ weather situations by generating notifications with labels that both triggers public interest and clearly distinguishes between different

weather risk scenarios. To that end, if using the SWS, it means labelling the notification (1) in a way that captures the attention of the public it aims to serve, (2) labels them differently from other less threatening 'head's up' weather scenarios, and (3) includes terminology that is understood more broadly.

References

Austin, J.
1962 *How to do things with words*. Cambridge, Mass: Harvard University Press.

Alhakami, A. S. and P. Slovic
1994 A psychological study of the inverse relationship between perceived risk and perceived benefit. *Risk Analysis*. Vol. 14(6): 1085-1096.

Bakhtin, M.M.
1981 *The dialogic imagination: Four essays*. University of Texas Press.

Barnett J, K. Burningham, G. Walker and N. Cass
2012 Imagined publics and engagement around renewable energy technologies in the UK. *Public Understanding of Science.* Vol. 21(1): 36–50.

Beck, U.
2009 *World at Risk*. Cambridge, UK; Malden, MA: Polity Press.

1992 *Risk society: Towards a new modernity.* Sage Publications: London, California, New Delhi.

Benford, R.D.
2013 Social movements and the dramatic framing of social reality. In *The Drama of social life: A dramaturgical handbook.* C. Edgley (ed). Ashgate Publishing Company. Pp. 139-155.

Bernard, R.H.
2002 *Research methods in anthropology: qualitative and quantitative approaches (3rd ed.)*. Walnut Creek, California: Altamira Press.

Boholm, Å.
2015 *Anthropology and Risk*. Routledge: London and New York.

2003 The cultural nature of risk: Can there be an anthropology of uncertainty? *Ethnos.* Vol. 68(2): 159-178.

Bohom, Å. And H. Corvellec
2011 A relational theory of risk. *Journal of Risk Research*. Vol. 14(2): 175-190.

Casteel, M. A. and J. R. Downing
2013 How individuals process NWS weather warning messages on their cell phones. *Weather, Climate, and Society*. Vol. 5: 254- 265.

Chilton, P.
2004 *Analysing political discourse: Theory and practice*. Routledge: London and New York.

Chiu, C., S. Vagi, A. Wolkin, J. Martin, and R. Noe
2014 Evaluation of the National Weather Service Extreme Cold Warning Experiment in North Dakota. *Wea. Climate Soc.* Vol. 6: 22-31.

Clore G.L and J.R. Huntsinger
2007 How emotions inform judgment and regulate thought. *Trends in cognitive sciences*. Vol. 11(9):393-399.

Daipha, P.
2015 *Masters of Uncertainty: Weather Forecasters and the Quest for Ground Truth*. Chicago: University of Chicago Press.

Davies, S.R.
2008 Constructing communication: Talking to scientists about talking to the public. *Science Communication.* Vol. 29(4): 413-434.

Demeritt, D., S. Nobert, H. Cloke, and F. Pappenberger
2010 Challenges in communicating and using ensembles in operational flood forecasting. *Meteorol. Appl.* 17: 209-222.

Demuth, J.L, R.E. Morss, J.K. Lazo and D.C. Hildebrand
2013 Improving effectiveness of weather risk communication on the NWS Point-and-Click webpage. *Weather and Forecasting*. Vol. 28(3): 711-726.

Demuth, J. L., R. E. Morss, B. H. Morrow, and J. K. Lazo
2012 Creation and communication of hurricane risk information. *Bull. Amer. Meteor. Soc.* Vol. 93(8): 1133-1145.

van Dijk, T.A.
2014 *Discourse and knowledge: A sociocognitive approach.* Cambridge University Press.

Douglas, M.
1992 *Risk and Blame*. London and New York: Routledge.

1986 *How institutions think*. Syracuse University Press.

Epley, N. and T. Gilovich
2006 The anchoring-and-adjustment heuristic: Why the adjustments are insufficient. *Psychological science.* Vol. 17(4): 311-318.

Fine, G.A.
2007 *Authors of the Storm: Meteorologists and the Culture of Prediction*. University of Chicago: Chicago and London.

Finucane, M. L., A. Alhakami, P. Slovic and S.M. Johnson
2000 The affect heuristic in judgements of risks and benefits. *Journal of Behavioral Decision Making.* Vol. 13(1): 1–17.

Fischhoff, B., P. Slovic, S. Lichtenstein, S. Read and B. Combs
1978 How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sciences.* Vol. 9(2): 127-152.

Frisvold, G. B. and A. Murugesan
2013 Use of Weather Information for Agricultural Decision Making. *Wea. Climate Soc.* Vol. 5(1): 55–69.

Goffman, E.
1974 *Frame analysis: An essay on the organization of experience.* New York: Harper and Row.

1967 *Interaction ritual: Essays in face-to-face behaviour*. Indianapolis, New York: The Bobbs-Merrill Company Inc.

1959 The presentation of self in everyday life. Garden City, N.Y.: Doubleday.

Gordon, I., J. Lewis and K. Young
1997 Perspectives on policy analysis. In. *The policy process: A reader, 2nd ed.* Prentice Hall. M. Hill (ed). Pp. 5-38.

Gumperz, J.
1977 The Sociolinguistic Significance of Conversational Code-Switching. *RELC JOURNAL*, Vol. 8(2): 1-34.

Gross, A.G.
1994 The roles of rhetoric in the public understanding of science. *Public Understanding of Science.* Vol. 3 (1): 3-23.

Hayden, M., O.V. Wilhelmi, D. Banerjee, T. Greasby, J.L. Cavanaugh, V. Nepal, J. Boehnert, S. Sain, C. Burghardt, and S. Gower
2017 Adaptive capacity to extreme heat: Results from a household survey in Houston, Texas. *Weather Climate and Society*. Vol. 9(4): 787-799.

Houser, M.
2018 Who framed climate change. *Sociologia Ruralis*. Vol. 58(1): 40-62.

Jasanoff, S.
2010 A new climate for society. *Theory, Culture & Society*. Vol. 27(2-3): 233-253.

Jagtenberg, T.
1983 The social construction of science. In *The Social Construction of Science: A Comparative Study of Goal Direction, Research Evolution and Legitimation*. Holland: D. Reidel Publishing Company. Pp. 1-11.

Joffe, H.
2003 Risk: From perception to social representation. *British Journal of Social Psychology*. Vol. 42(1): 55-73.

Johnson-Laird, P.N.
2005 Mental models in thought. In Holyoak, K. & Sternberg, R.J. (Eds.) *The Cambridge Handbook of Thinking and Reasoning*. Cambridge: Cambridge University Press. Pp. 179-212.

Joslyn, S. and S. Savelli
2010 Communicating forecast uncertainty: Public perception of weather forecast uncertainty. *Meteorological Applications*. Vol. 17(2): 180-195.

Kasperson, RE, R. Ortwin, P. Slovic, HS Brown, J. Emel, R. Goble, JX Kasperson, and S. Ratick
1988 The Social Amplification of Risk: A Conceptual Framework*." Risk Analysis*. Vol. 8(2): 177-187.

Kristeva, J.
1984 *Revolution in Poetic Language*. New York: Columbia University Press.

Latour, B. and S. Woolgar
1986[1979] "The construction of a fact." In *The Laboratory Life: The social construction of scientific facts*. Princeton, NJ: Princeton University Press. Pp. 105-150.

Lazo, J.K., R.E. Morss, and J.L. Demuth
2009 300 billion served: sources, perceptions, uses, and values of weather forecasts. *Bulletin of the American Meteorological Society*. Vol. 90(6): 785-798.

Lazrus, H.
2009 *Weathering the waves: Climate change, politics and vulnerability in Tuvalu.* Unpublished dissertation manuscript. University of Washington.

Lazrus, H., R.E. Morss, J.L Demuth, J.K. Lazo and A. Bostrom
2016 "Know What to Do If You Encounter a Flash Flood": Mental Models Analysis for Improving Flash Flood Risk Communication and Public Decision Making. *Risk Analysis*. Vol. 36(2): 411-427.

Lazrus, H., B. Morrow, R.E. Morss, and J.K. Lazo
2012 Vulnerability beyond stereotypes: Context and agency in hurricane risk communication. *Weather, Climate, and Society.* Vol. 4(2): 103-109.

League CE, W. Diaz, B. Philips, E.J. Bass, K. Kloesel, E. Gruntfest and A. Gessner
2010 Emergency manager decision-making and tornado warning communication. *Meteorol. Applications* Vol. 17(2): 163-172.

Leiserowitz, A.
2006 Climate change risk perception and policy preferences: The role of affect imagery and values. *Climatic Change.* Vol. 77(1-2): 45-72.

Lerner, J. S. and D. Keltner
2001 Fear, anger, and risk. *Journal of Personality and Social Psychology*. Vol. 81(1): 146-159.

Manning, P.K.
2014 Organizational analysis: Goffman and dramaturgy. In *The Oxford Handbook of Sociology, Social Theory and Organization Studies: Contemporary Currents*. P. Adler, P. du Gay, G. Morgan and M. Reed (eds). Oxford Handbooks Online. Pp. 266-298.

Maranta, A., M. Guggenheim, P. Gisler, and C. Pohl
2003 The Reality of Experts and the Imagined Lay Person." *Acta Sociologica.* Vol. 46(2): 150–65.

Martin, E.
1997 Managing Americans: Policy and changes in the meanings of work and the self. In *Anthropology of Policy: Perspectives on governance and power*. C. Shore and S. Wright (eds). Routledge: London and New York. Pp. 183-197.

McNeely, S.M. and H. Lazrus
2014 The cultural theory of risk for climate change adaptation. *Weather, Climate and Society.* Vol. 6(4): 506-519.

Morss, R.E, J.L. Demuth, A. Bostrom, J.K Lazo and H. Lazrus
2015 Flash Flood Risks and Warning Decisions: A Mental Models Study of Forecasters, Public Officials, and Media Broadcasters in Boulder, Colorado. *Risk Analysis.* Vol 35(11): 2009-2028.

Morss, R.E. and M. Hayden
2010 Storm surge and "certain death": Interviews with Texas coastal residents following Hurricane Ike. *Weather, Climate, and Society.* Vol. 2(3): 174-189.

Norman, D.A.
1983 Some observations on mental models. In D. Gentner and A.L. Stevens (eds). *Mental Models*. Lawrence Erlbaum Associates, Inc.: New Jersey. Pp. 7-14.

Pennesi K.
2013 Predictions as lies in Ceará, Brazil: The intersection of two cultural models. *Anthropological Quarterly*. Vol. 86(3): 759-790.

2011 Making forecasts meaningful: explanations of problematic predictions in northeast Brazil. *Weather Climate and Society.* Vol. 3(2): 90-105.

Quinn, N.
2005 Introduction. In *Finding culture in talk: A collection of methods.* N. Quinn (ed.). Palgrave MacMillan. Pp. 1-34.

Ramos, M-H, T. Mathevet, J. Thielen, and F. Pappenberger
2010 Communicating uncertainty in hydro-meteorological forecasts: Mission impossible? *Meteorol. Appl.* Vol.17(2): 223-235.

Roncoli, C., B. Orlove, M. Kabugo and M. Waiswa
2011 Cultural styles of participation in farmers' discussions of seasonal climate forecasts in Uganda. *Agriculture and Human Values*. Vol. 28(1): 123-138.

Ruin, I., C. Lutoff, B. Boudevillain, J. Creutin, S. Anquetin, M. Bertran-Rojo, L. Boissier, L. Bonnifait, M. Borga, L. Colbeau-Justin, L. Creton-Cazanave, G. Delrieu, J. Douvinet, E. Gaume, E. Gruntfest, J. Naulin, O. Payrastre, and O. Vannier
2014 Social and hydrological responses to extreme precipitations: An interdisciplinary strategy for post-flood investigation. *Weather, Climate and Society*. doi:10.1175/WCAS-D-13-00009.1

Sandstrom, K.L., D.D. Martin, and G.A. Fine
2010 *Symbols, Selves, and Social Reality, 3rd edition.* New York, Oxford: Oxford University Press.

Savelli, S. and S. Joslyn
2012 Boater safety: Communicating weather forecast information to high-stakes end users. *Wea. Climate Soc.* 4: 7–19.

Schwalbe, M.
2013 "Situation and structure in the making of selves". In *The Drama of social life: A dramaturgical handbook.* C. Edgley (ed). Ashgate Publishing Company. Pp. 75-92.

Searle, J.R.
1969 *Speech acts: An essay in the philosophy of language*. Cambridge: Cambridge University Press.

Sherman-Morris, K.
2010 Tornado warning dissemination and response at a university campus. *Natural Hazards.* Vol. 52(3): 623-638.

Shore, C. and S. Wright
2011 Conceptualizing policy: Technologies of governance and the politics of visibility. In *Policy worlds: Anthropology and the analysis of contemporary power.* Eds Shore, Cris, Susan Wright and Davide Però. Bergahn Books: New York, Oxford. Pp. 1-25.

Siegrist, M. and G. Cvetkovich
2000 Perception of hazards: The role of social trust and knowledge. *Risk Analysis.* Vol. 20(5): 713-719.

Silver, A. and C. Conrad
2010 Public perception of and response to severe weather warnings in Nova Scotia, Canada. *Meteorological Applications.* Vol. 17(2): 173-179.

Slovic, P., M. L. Finucane, E. Peters and D. G. MacGregor
2007 The affect heuristic. *European Journal of Operational Research*. Vol. 177(3): 1333-1352.

Slovic, P.
1999 Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk analysis.* Vol. 19(4): 689-701.

Smith, D.E.
2005 *Institutional ethnography: A sociology for people*. Rowman Altamira Press.

Spinney J. and K. Pennesi
2013 When the river started underneath the land: Social constructions of a 'severe' weather event in Pangnirtung, Nunavut, Canada. *Polar Record*. Vol. 49(4): 362-372.

Starr, C.
1969 Social benefit versus technological risk. *Science.* Vol. 165: 1232-1238.

Stevens, A.
2015 *Archetype revisited: An updated natural history of the self.* London, New York: Routledge.

Stevens, A.L. and D. Gentner
1983 Introduction. In D. Gentner and A.L. Stevens (eds). *Mental Models*. Lawrence Erlbaum Associates, Inc.: New Jersey. Pp. 1-6.

Stone, D.A.
1988 *Policy paradox and political reason*. Harper Collins.

Strauss, C.
2005 Analyzing discourse for cultural complexity. In *Finding culture in talk: A collection of methods.* N. Quinn (ed.). Palgrave MacMillan. Pp. 203-242.

Strauss, C. and N. Quinn
1997 Introduction. In *A cognitive theory of cultural meaning*. Cambridge University Press, Cambridge. Pp. 3-11.

Taddei, R.
2012 The Politics of Uncertainty and the Fate of Forecasters. *Ethics, Policy & Environment*. Vol. 15(2): 252-267.

Trouillot, M.
2001 The anthropology of the state in the age of globalization: Closer Encounters of the deceptive kind. *Current Anthropology*. Vol. 42(1): 125-138.

Turner, R.
2009 Keeping meteorologists masculine: The American Meteorological Society's response to television 'weather girls' in the 1950s. In *Weather, local knowledge and everyday life: Issues in integrated climate studies.* V. Janković and C.H. Barboza (eds.). Rio de Janeiro, Brazil: MAST. Pp. 147-158.

Tversky, A. and D. Kahneman
1974 Judgment under uncertainty: Heuristics and biases. *Science.* Vol. 185(4157): 1124-1131.

Whorf, B.
1956 The relation of habitual thought and behaviour to language. In *Language, thought, and reality.* J.B. Carroll (ed). Cambridge, MA: MIT Press. Pp. 134-159.

Wong, T.F. and Y.Y. Yan
2002 Perceptions of severe weather warnings in Hong Kong. *Meteorological Applications.* Vol. 9: 377-382.

Chapter Three
"I'm not 100% sure":
The confluence of policy, interaction and risk in managing ambiguous urban river flooding in Toronto, Ontario

Introduction

TRCA Office[10]
October 28, 2015

16 Ed: That's the thing - I'm not 100% sure the DVP is going to flood.
17 Right now we're at 76.3 metres.
18 We're .4 metres away and it's tapering off.
19 Nancy: We don't have any rules around it.

On October 28, 2015, a typical fall rainstorm suspended itself over Toronto, Ontario. By 7:30 that morning, flood forecasters at the Toronto and Region Conservation Authority (TRCA) determined urban river flooding was imminent, or that based on their calculations flooding was going to occur in parts of their jurisdiction. In these circumstances, TRCA policy dictates that a Flood Warning is issued. The TRCA Flood Warning is a notification alerting the public that: "*Flooding is imminent or already occurring in specific watercourses or municipalities. Municipalities and individuals should take action to deal with flood conditions. This may include road closures and evacuations."* Despite TRCA's assessed flood risk meeting the official policy threshold, the Chief Flood Duty Officer (FDO) in charge that day, Ed, did not immediately issue a Warning. He was considerably uncertain as to the extent of flooding, what impact it might have and at what location, and he didn't want to create unnecessary chaos since the Don River and DVP flood regularly in heavy rain.

[10] Line numbers in Chapter 3 are specific to Chapter 3. See Appendix C for a verbatim transcription of face-to-face interaction captured via audio-recording (B) and in field-notes (A, C, D). The Transcription Key located at the top of Appendix C is applicable for the entirety of the dissertation.

Implementing TRCA policy and issuing the Warning for Ed was much like Goffman's (1967) version of the gamble in so much as there were four decision possibilities, two with negative outcomes: either Ed could issue a Warning with no impacts experienced, like a false alarm, or he could not issue the Warning when impacts are experienced. The problem lies in the fact that official TRCA flood warning policy does not address these conceptual gambles and contextual factors; there are no rules around these less than 100% certain cases as Nancy points out above, which makes the black and whiteness of flood warning policy murky for some flood forecasters. Because of this, Ed was left to navigate these uncertainties and weigh the odds. After a considerable amount of time, deliberation and much delay, Ed went ahead and issued a Flood Warning at 3:20pm, which ended up being only minimally useful for those who received it.

Motivated by this event and the extent that uncertainties played a role for Ed in implementing official TRCA flood warning policy, in this chapter I examine interaction as a site for the confluence of uncertainty, risk and policy in the context of urban river flooding. In particular, I look at TRCA flood forecaster engagement and negotiation of flood warning policy as an examination of face in interaction and I also develop the notion that the relationship TRCA has with their key recipients is a type of interaction ritual chain. With respect to the latter, I suggest TRCA's delayed Warning represents a weakening of the interaction ritual chain between themselves and their key recipients, and I explain this by sharing the perspectives of key recipients' actions on October 28, 2015, which exposed this weakness and revealed unintended consequences when the rules of conduct are not followed. Specifically, I 'study through' (Reinhold 1994: 477-479) the

localized, small-scale decisions made and actions taken by TRCA's key recipients in response to the 3:20pm TRCA Flood Warning to illustrate how members from this group took matters into their own hands that day rejecting the cultural capital, or flood risk expertise, provided to them by TRCA. Instead, I show how they relied upon a combination of institutions, the negotiated order internal to their organization, and individual agency to manage the flood risk situation.

In this chapter, I argue that interaction plays a critical role in shaping policy-related decision making within and across spaces by reinforcing and challenging people's ideas, by expediting as well as delaying their actions, and by creating effects for others beyond those individuals involved in the immediate social encounter. Working my way out from the October 28, 2015 event and tracing actors' interactions and actions, in the following pages, I challenge traditionally held notions of policy process as a neat, tidy, logical, orderly, rational set of flows and procedures that move systematically (Stone 1988). Instead, I show the implementation of policy or policy work as multi-dimensional and contested, especially in ambiguous circumstances where little guidance exists. More specifically, by focusing on the subtleties of policy processes in uncertain risk events my objective is to expose policy implementation as relational in the way that the process shapes, and is shaped by, inter and intra-agency interaction; as social in the way that risk management in policy situations challenges and reinforces the social order or hierarchies and perceptions of expertise as evidenced through decision-making; and as contextual, and thus differently conceived of and treated depending on the flood situation and depending upon who is in charge.

Following a theoretical description of interaction, uncertainty and risk in policy work and a brief review of the methods employed in this study, I go on to discuss the history of urban river Flood Warning policy in Toronto. This sets up the analysis of the October 28, 2015 flood event and my investigation for how risk was assessed, how uncertainty was managed through face in interaction, and how key recipients responded to TRCA's Flood Warning. Examining interaction's role during the urban river flood event is a good way to understand the interconnected nature of policy and risk. On the one hand, the case shows policy's influence on perceptions, assessments and management of risk during ambiguous flood situations. Reciprocally, the case highlights how perceptions of risk influence how policy is implemented. Relatedly, focusing on interaction reveals the unintended consequences that come about from situations perceived with uncertain risk, such as hesitations in decision making and limited utility of TRCA Warning products. The interactional approach I take here is productive in the way it exposes the nuances of social relationships between and across organizational groups as well as interaction's instrumental role in influencing the ordering of people and expertise in policy and risk situations.

The role of Interaction, Uncertainty and Risk in Policy work

Policy has been identified as a course of action pursued by government and adopted for the sake of expediency, and where the process of its creation and its effects are deemed pragmatic, functional and techno-scientific (Martin 1997: 183; Però 2011: 225). On the surface of this rational approach to governance, policy and its related processes appear straightforward, simple, efficient and exercised without delay, much like what Deborah Stone purports in her book *The Policy Paradox* (1988). This is a point echoed by anthropology of policy scholars Wedel, Shore, Feldman and Lathrop (2005: 34) who

further contend that for many policy users external to government processes, on first sight policy resembles a tool uniting means, or a mechanical and one-dimensional instrument deployed to bridge gaps between goals and their execution (Wedel et al. 2005: 37).

Scholars have also argued that processes of policy creation and implementation stabilize patterns of relations between groups, shape ideas of what government representatives ought to do and naturalize to a certain extent government presence in social landscapes. This gives heed to the origins of policy wherein the term carries with it historical meanings that continue to be deeply embedded in our everyday lives, including in our expectations to be policied and in our dependence upon policy as a guide for sense-making and action. Evolving from these early conceptual beginnings of policy, the way it manifests over time in various facets of our daily life and through its repeated deployment, government presence becomes 'encompassed' in the social relations experienced between actors, or where government and its processes sit above, yet also within, its localities, regions and communities (Ferguson and Gupta 2002: 983; Painter 2006: 755). In this way, policy is conceived of as a powerful tool that enables encompassment.

Lefebvre's (2009: 59) reference to the structuring that emerges from this dialectical interplay between policy ideas, people and the economic, social and political forces individuals are living with, explains the effects of encompassment. Together these notions of policy show how through policy government processes strengthen social relations between government and recipients of policy-based information. Such effects of policy work on social relationships have also been illustrated by Shore and Wright (1997) who, in their examination of policy, governance and society, contend that policy has the

power to craftily manufacture consent, consolidate legitimacy and authority, and engineer understanding so that agreement comes 'naturally' (Shore and Wright 1997: 18), Although their focus is on the audiences who take up government policy and the way it operates as a tool to steer public behaviors, my focus in this chapter is primarily on policy work in the organizational setting and how the official rules become unquestioned by government flood forecasters depending on the context of flooding, which is useful here to consider as I investigate the nature of the delay in the October 28, 2015 TRCA Flood Warning.

Perceptions of risk and the worries that come about in risk situations influence policy-related decision making (Bradbury 1989: 391; Boholm and Corvellec 2011: 180). Mayer and colleagues (2017) make the reciprocal link between risk perception and policy attitudes, contending that perceptions shape motivations for policy making, while the establishment of policy helps to create ideas about what is and is not risky. This is useful because it speaks to the government perceptions, and thus ideals, that inform policy-making activities, and it also identifies the way policy is used as a tool to bind perception of risk or contain within the permanent dimensions of official policy what kind of risks are paid attention to or count. As a form of risk governance, for example, if rain falls over the City of Toronto, official rules dictate that flood forecasters focus their attention on the potential for flooding near watercourses within their jurisdiction not away from them. This geographic boundedness of policy directs flood forecasters that flood risk away from the river is not part of their mandate or doesn't count toward their risk assessments, whereas risk brought on by river flooding and adjacent to the rivers does. Moreover, as official policy directs interpretations and assessment of risk situations, in a mutually

reinforcing way, the assessed risk directs how and which parts of the official policy will be used to manage the risk situation. In other words, depending on if the flooding is assessed as possible or imminent, different policy notifications are optional. Thus, through government actors' engagement with policy and risk, policy and its products begin to function as a cultural agent (Shore and Wright 2011: 20; Smith 2005: 120) with the ability to classify the spaces and subjects it seeks to govern, shifts action, guide perceptions and experiences (Shore and Wright 2011: 3), all the while operating to limit the range of 'reasonable' choices one can make (Wedel et al. 2005: 37-38).

In addition to official policy as directing the interpretation and management of risk situations, policy and its related processes are also influenced by socially and culturally structured conceptions and evaluations of the world (Boholm 1998, 2003; Boholm and Corvellec 2011). These conceptions are grounded in symbols, histories, ideologies, and representative of unique ways of thinking, according to Douglas (1992: 46) and Weinstein (1989), include various elements such as memory, education and value judgments (Douglas 1985: 29-40), and encapsulate one's worldview (Flynn et al. 1994; Slovic and Peters 1998) and one's political, aesthetic and moral values (Douglas 1992: 31). Balanced with these individual factors is the influence of social context on risk perception, or more specifically institutions. Institutions are the informal rules and conventions ensuring social coordination during interaction (Douglas 1986: 46). Douglas (1992: 102) points specifically to the power of socially created institutions during individual risk analyses. She views these informal codes of conduct as the mobilizing force in risk interpretation and response behaviour (Douglas 1992: 78), which emerge through interactions and consultation between the risk-perceiver and others in their

community. According to Douglas (1992: 31), institutions are synonymous to a collectively constructed censor where each risk-perceiver sifts information, considers the bearing of risk on themselves, their community, and evaluates the extent the risk will affect the individual or the collective good (Ibid 1992: 46-47). From this description, individual factors, social context and organizational factors such as institutions, along with ideas for how the risk may affect others, all contribute to perceptions of risk during policy's implementation process, over and above official policy or rules. This helps to explain the heterogeneity of perspectives included in the discussion that follows, or the reasons for how and why flood forecasters and public groups' implemented policy and used the Flood Warning, respectively, in unique and unexpected ways.

Uncertainty is a concept linked closely with risk and risk governance, or strategies that often manifest as a result of policy. It is a term frequently compared to risk and presented as an object that expresses qualities of risk (Samimian-Dariash and Rabinow 2015: 3-4). Historically, uncertainty has been studied in terms of uncertainty management or how society attempts to create greater certainty. This is true of even anthropological scholars, such as Douglas and Wildavsky (1982) and Douglas (1992) who, in their studies of risk, culture, blame and danger, focused their examinations of uncertainty on its identification and how people attempt to eliminate it. More recently, anthropology scholars have centred their attention on understanding more deeply the experience of uncertainty, how it emerges, and how different forms of uncertainty are met by a range of responses (Samimian-Darash and Rabinow 2015). Adriana Petryna's (2015) chapter in Samimian-Darash and Rabinow's edited collection, for example, centres her discussion of uncertainty in the context of gaps among knowledge, practice and inscrutable

circumstances related to environmental politics. In her work, Petryna describes the challenges of managing the interface between physical incoherence and human interference, and utilizes the concept of *horizon* to illuminate a space in which people engage in "continuous self-correction vis-à-vis changing baselines and knowable risk" and where incremental actions take place amid multidimensional uncertainties (Petryna 2015: 155-156). The metaphor of the horizon is helpful because it conveys well the complexities involved in processes of policy implementation at TRCA, such as Flood Warning generation. More precisely, the metaphor illustrates the intermingling layers of the atmosphere, the hydrological environment, along with the oscillation of waning and expanding dangers that are perceived in times of heavy rain; layers that become especially critical in situations when decisions need to be made in a timely and efficient manner. Altogether, the inclusion of uncertainty in this theoretical framework is useful because research on the topic proposes ways for explaining the effects of ambiguity experienced by flood forecasters as they operationalized flood risk policy on October 28, 2015.

Nuances of policy and its implementation processes, the relational nature of risk perception and assessment, and the management of uncertainties brought on by ambiguity are constituted in, and also constitutive of, interaction. In other words, interaction is an overarching feature of meaning creation where meaning is both invoked during interaction as well as organized by it. In the context of implementing and appropriating TRCA urban river Flood Warning policy and the audiences receiving its related products, such as a Flood Warning, interaction enables the emergence of these nuances as well as frames the shape that these elements can take during engagement. Several scholars from a

variety of social science disciplines have contributed to the discussion on meaning creation through interaction (Bakhtin 1981; Gumperz 1977; Kristeva 1984; and Smith 2005). Bakhtin's insight regarding meaning creation as a socially-situated blending of one's present with their past is useful in the way that his work helps to explain the influence of past utterances and texts and the layering effect of these interactional factors in TRCA flood forecasters' sense-making and their subsequent creation of risk notifications.

Likewise, sociologist Dorothy Smith's approach to institutional ethnography is helpful for understanding text's influence on flood forecasters' interpretation and appropriation of urban river flood policy. In particular, Smith challenges us, similar to Sandstrom's group (2010), to conceive of interaction with texts as generating standardization of comprehension and practice. Empirically, anthropologists studying weather and climate in North America and abroad have shown how meaning is created jointly across space and time and between participants in the interaction, based upon the relationship that is held between them (Roncoli et al. 2011; Pennesi 2011, 2013; Taddei 2012). These scholarly contributions confirm the constitutive nature of interaction and the ability for interaction to influence meanings that emerge within and across organizational settings, such as that which occurs between flood forecasters and their audiences.

Given my emphasis on meaning as jointly created through interaction, I ground this study in a Goffmanian approach, particularly in his perspectives on interaction ritual (IR) and order, face and rules of conduct during social encounters (Goffman 1967, 1981). I am motivated to do so because the face-to-face interaction captured among flood forecasters during the October 28, 2015 urban river flood event revealed a special

relationship between these experts in their organizational context as they negotiated and appropriated policy. More pointedly, their interaction had what Goffman refers to as 'shape and coherence'; it illustrated continual attempts to repair, reconstitute or maintain the social order within the hierarchy of the group, and it showed how the needs of the self or individual forecaster/participant in interaction were expressed and changed situationally. Building from this, the chapter draws on theoretical contributions made more recently by Randall Collins (1987; 2004) and the concept he developed to explain meaning creation during interaction, or the interaction ritual chain. According to Collins (1987: 198; 2004: 23), IRs are procedures between two or more people under conditions of co-presence that both generate and consume symbols representing group membership; comprise negotiations that represent moments of shared social reality; require cooperation and a mutual focus of attention; are dependent upon shared motivations and resources; and where the motivations and resources come from previous encounters, hence the IR as a chain. Collins (1987: 199) continues in his description of the IR chain to report resources that circulate during interaction and affect its outcomes, such as cultural capital, emotional energy and social reputation.

Based on this definition, interaction among flood forecasters at TRCA as well as between flood forecasters at TRCA and their key recipients represent two types of IR chains. First, deliberations among flood forecasters as they negotiate policy and their subsequent construction of flood notifications during flood events constitute a specific type of interaction ritual. Engagement between these flood experts is an interplay of practices, conventions and procedural rules that functioned as a means of guiding and organizing their flow of talk (Goffman 1967: 34). This engagement combined with the

organizational setting in which flood forecaster interaction takes place, and also combined with the number of times policy has been negotiated among this group during past flood risk events, all coalesce to establish social membership and enact the ritual chain within their flood forecasting environment.

Second, TRCA and each of its key recipients are members in a special relationship bound by its own rules of conduct, which has generated a patterning of behaviour between the groups. In Goffman's (1967: 49) terms, the relationship between TRCA and these groups is a type of interaction ritual in so much as TRCA has an obligation to issue notifications to key recipients in accordance with policy, and users have an expectation that TRCA will fulfill its obligation and issue them flood notifications as dictated by its official flood warning policy. These notifications represent TRCA flood expertise and are considered here the cultural capital the agency holds and brings to the group. In other words, this knowledge is an asset that TRCA utilizes during encounters between members of this IR chain to follow through on their obligation. By virtue of their membership in the IR chain, this TRCA expertise is perceived by flood forecasters to be held in high regard by key recipients. Put another way, key recipients' expressed desire for these notifications not only activates their membership in the IR chain but it also suggests they place a high value upon the information that TRCA sends to them.

Flood events, both their possibility as well as their occurrence, are times when TRCA is prompted to meet its obligation and also when key recipients expectations for fulfillment are aroused. These encounters reinforce and stabilize the interaction ritual chain, including membership in the network as well the rules of conduct to be followed

by its members. In their research on social interaction and organizations, Fine and Hallett (2014) assert that the stability is not generated within the immediate encounter alone, but depends on social memory of past events as embedded in ongoing social relations, and from incorporating agreements developed from experience. In these sociologists' opinion, successful past interaction through the established group order serves as a model for interactions in the present and thus the ability for groups to create and maintain orderliness (Fine and Hallett 2014: 1775). Though the interaction is rarely face-to-face between TRCA and its key recipients, and thus does not meet Collins's (2004) condition of physical co-presence, the mutual interests among TRCA and its key recipient groups in flood and flood risk have contributed to their shared motivation to mitigate impacts against it. In this chapter I am less strict in my attention to the specific ritual pattern Goffman conceived of, and also less attached to his focus on interaction as solely executed to maintain or restore interactive equilibrium. Also, I have extended Goffman's and Collins's concepts beyond face-to-face interaction, and I admittedly do not attend to Collins's central resource of emotional energy in the IR chain. Still, their concepts of interaction as ritual and a ritual chain are useful here in the way that they account for who is involved in forecast interaction, how participants in these deliberations conduct themselves as they work together to pursue specific organizational goals, and the rules and expectations of conduct that have developed over time between flood forecasters and recipients of TRCA flood warning information.

Interactions that take place between flood forecasters during flood warning generation are replete with *facework*, or the verbal and non-verbal acts people use to express their view of the situation, and evaluate the scenario and its participants,

including the self (Goffman 1967: 5). Face is a notion derived from Goffman (1967: 5) concerning the image of a speaker in interaction and defined as the positive social value a person effectively claims for himself by the line others assume he has taken during a particular contact. As an example, a person has face, is said to be in face, or maintains face when the line he takes presents an image of him that is internally consistent/supported by judgments of other participants (Goffman 1967: 7). In Goffman's view, face is a display of the self, of one's character and their identity that is ratified during interaction by the hearer and/or listener. Thus according to Goffman, people present themselves as the kind of person others expect them to be and their engagement with others is about presenting self in a way that avoids threatening these expectations. Brown and Levinson (1987) expanded on Goffman's work and are recognized as major contributors to this field of research for their development of a cognitive model of politeness, concepts of positive and negative face, and the use of face threatening acts as strategies in interaction to protect the positive or negative face wants of others. Their approach differs from Goffman's in that, although exhibiting presentations of self through face, the motivations of face work in their view rest primarily on fulfilling the presumed face wants, or desires, of others. Despite their theoretical advancement on the topic, Brown and Levinson's approach has been criticized for their position that face is an *apriori* attribute that stands to be threatened in interaction and their notion that expressions of speakers' intentions are always motivated by their desire to mitigate face threats carried by certain face threatening acts towards hearers (Bargiela-Chiappini 2003; Haugh 2009; Spencer-Oatey 2009).

My analysis in this chapter blends these foundational concepts to explain aspects of face-to-face interaction at TRCA. Having said this, I place greater emphasis on the presentation of self and individual goals during interaction and situational factors that influence face in interaction than Brown and Levinson. To that end, I incorporate a self-perspective on face much like Spencer-Oatey (2009) does in her examination of rapport management in Chinese-British business interaction and similar to how Sükriye Ruhi (2009) does in her exploration of the inter-relationship between face and self-presentation in naturally occurring discourse in a Turkish setting. In these scholarly works, Spencer-Oatey and Ruhi both emphasize the emergence of a speaker's own face concerns in interaction, and I do the same here. My objective in doing so is to show the strategic and relational nature of face, how different faces are expressed by the same individual during singular encounters, and how when speaking in organizational settings, flood forecasters are dynamic in their use of *facework* in so much as their efforts promote their own face as well as the face of the group. In my examination, I also pay close attention to the local or situational factors as well as the broader elements influencing face in interaction, and thus meaning creation. Therefore, similar to what Francesca Bargiela-Chiappini (2003) asserted more than a decade ago, I consider the systems of rules, conventions and expectations at TRCA. This approach responds to the call made by scholars in the field of pragmatics, Michael Haugh (2009) and Helen Spencer-Oatey (2009), who suggest more attention be paid to broader contextual elements in investigations of face and politeness.

Following a brief description of methods, I trace the flood warning policy process as it moves across temporal and social scales and sites in non-linear ways, outlining what river flooding and risk means to flood forecasters, and showing how perceptions and

decision making during ambiguous river flood situations are interactional. Along the way, I make connections among uncertainty, risk and policy, and illustrate how the triangulation of these three factors influences the negotiations and struggles flood forecasters have in adhering to or resisting the official rules during policy implementation, and likewise, the struggle for successful uptake of urban river flood warning by its intended users.

Methods

A closer look at urban river flood warning policy in Toronto necessitated an alternative ethnographic approach, one more multi-sited across an entire 'fieldspace' (Shore and Wright 1997: 11). As Schwegler and Powell note (2008: 3), policy is never a discrete geographical phenomenon; it takes shape in a number of locations. Likewise, anthropology of policy scholars report the importance of recognizing policy as articulated through interaction and systems of governance across the social and political environments. As such, the endeavour to explore connections and relations in Toronto made possible by urban river flood warning policy among seemingly disparate groups required time spent with, and investigation of, multiple groups located in various offices across the city. To that end, I took Hugh Gusterson's (1997) suggestion and 'tilted the field' so as to study flood warning policy in great detail as it moved across space, collecting the perspectives of a constellation of different actors representing multiple levels of government, private enterprise and public, all of whom had varying degrees of knowledge ranging from expert to laygroup. I collected data over a 17-month period between May 2015 and October 2016 and relied upon 'studying through' (Shore and Wright 1997: 14; Wedel et al. 2005: 40), a methodological approach that may focus on a singular topic but follows discussion on that topic as these topics range back and forth

and back again between individuals, and up and down and up again between a range of institutions (Wright and Reinhold 2011: 101). Participant observation, survey administration, and face-to-face interviews aided my efforts to trace these policy connections, as well as helped to illuminate how flood warning policy played out in different contexts, and how different organizational and everyday worlds are intertwined across time and space. The triangulated approach was useful for cross-validation as well, since it ensured greater reliability and accuracy of research results (Jick 1979), and allowed for a richer, more nuanced account of how groups make sense of flood warning policy and its connection with risk perceptions in the context of river flooding (Bernard 2002).

Participant observation, also referred to as one method of naturalistic inquiry (Sandstrom, Martin and Fine 2010: 21), focuses on people's behaviour in natural social settings, where understandings are derived from, and grounded in, the spoken words and interactions of participants. In this case, I acted as a participant observer over 18 visits, one hour or more in length, at Toronto and Region Conservation Authority (TRCA) to attend meetings, participate in flood warning and response simulation exercises, or observe forecasters as they assessed the day's flood risk between May 2015 and June 2016. I also administered two surveys during this time (Appendices J and K for samples), one to TRCA flood forecasters (n=12) and a second during face-to-face one-on-one interviews with key recipients of TRCA flood information (n=15) as well as media, or weather and flood information communicators who are employed by major television networks (n=10). The surveys measured understandings of river flooding in urban areas as well as interpretations and responses toward an October 28, 2015 river flood warning

notification. Overall, interviews lasted anywhere between one-half to two hours and resulted in approximately 774 minutes of recorded talk, which was then transcribed, coded and analyzed using Atlas.ti, a qualitative software analysis program. I selected participants purposively since each represents groups directly involved in either producing, communicating or using river flood warning notifications and managing flood risk, and because TRCA identified many as key users of their flood notifications (see Appendix A for project participant list). The following comparison between TRCA and key recipients, including media, presents a diverse range of viewpoints regarding policy implementation and response on October 28, 2015. As such, it helps to show how risk-related policy-inspired products work differently in situations of uncertainty and ambiguity.

History of Urban River Flood Risk Management in Toronto, Ontario

Urban river flood warning policy in Toronto is embedded within a decades long historical context of urban flood risk management practices that were formalized following the deadly impacts of October 15, 1954 Hurricane Hazel. In this tragic event, 81 people were killed in the City, thousands were left homeless and significant financial damages were incurred[11]. As a result of the loss of life and lack of preparation, local municipalities and the province developed a comprehensive plan for flood control and water conservation, which included the public acquisition of vulnerable land and restrictions on development in the City's floodplains[12]. Current TRCA flood risk management practices are reflective of the many adjustments that have taken place since Hurricane Hazel, including those that occurred following the next major legacy flood event in Toronto during the summer of

[11] http://www.hurricanehazel.ca
[12] http://citiesintime.ca/toronto/story/hurricane-ha/

July 2013. During the 2013 event, several city roads and underpasses were under water, motorists were forced to abandon their vehicles and transit authorities halted and delayed services, closed major transportation corridors, and cancelled flights. A major commuter train stalled on the tracks, which left thousands stranded and in need of rescue[13].

The 2013 flood disaster amounted to insured property damage close to the one billion dollar mark (Henstra and Thistelwaite 2017: 12), making it one of the most expensive in Ontario history. The significant social and economic impacts during this event put a spotlight on TRCA and management's attention quickly turned toward making organizational improvements to the City's flood risk management operations. One improvement focused on enhancing and streamlining TRCA's generation and communication of early warning notifications; Major Event Operations were reviewed, communication and action flow charts were created and revised, labels and definitions for different flood phenomena were identified and agreed upon, flood forecaster roles were formalized, and modifications to training and operational procedures were made and practiced routinely, to name several. The enhancements show how urban river Flood Warning policy following the 2013 major flood event found a new expression; new social and semantic spaces opened up and sets of relations and webs of meaning were redefined (Shore and Wright 2011: 1). Specifically, they had the effect of socially re-organizing TRCA flood forecasters, re-constructing a sense of internal order among them, and were intended to impose a prescribed set of actions and particular kinds of conduct by and for recipients of flood warning information, both in terms of expectation as well as interpretation of the message. While the changes did much to generate clear instruction

[13] (https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=5BA5EAFC-1&offset=2&toc=hide

for TRCA flood forecasters regarding when a Flood Warning should be issued and provided clear direction for whom and how the message should be communicated, the October 28, 2015 event analyzed here highlights the intricacies and unintended consequences that come about during the implementation and uptake of policy, despite years of well-meaning enhancements.

At the time of this writing, multiple groups at multiple levels of government are involved in urban river flood warning prediction and notification in Toronto, but officially it is the Ministry of Natural Resources and Forestry (MNRF) and the Toronto and Region Conservation Authority (TRCA) who are primarily responsible as per a provincial mandate document dated back to June 1984. MNRF is provincially-based and operates a Surface Water Monitoring Centre (SWMC) in Peterborough, Ontario that observes water levels on lakes, rivers and streams in the province to predict where and when flood risk may occur at the provincial level. Flood experts at SWMC will issue either a provincial flood watch, which provides information about the potential for flooding, or a provincial watershed conditions statement, which provides notices on general watershed conditions and outlooks for flooding as a result of spring melt or runoff[14]. These products are shared with any one of the 36 municipal Conservation Authorities in the province such as TRCA, and to other organizations, such as Environment and Climate Change Canada's (ECCC) Downsview office in Toronto. While the province remains the lead, TRCA is a critical partner for the province and is responsible for the operation of a local monitoring network, interpretation of local

[14] https://www.ontario.ca/law-and-safety/flood-forecasting-and-warning-program

watershed conditions, and the creation of flood information for their jurisdiction as it relates to the overflowing of rivers, creeks and streams in, or onto, urban areas.[15]

A group of water resource engineers comprise the flood forecast and warning team at TRCA where each, on a weekly rotational basis, provide their expertise and serve as either the on-call Flood Duty Officer (FDO) or the on-call Chief FDO. Borrowing from Summerson-Carr (2010: 18) expertise is defined as:

> both inherently interactional, involving the participation of objects, producers, and consumers of knowledge, and inescapably ideological, implicated in the evolving hierarchies of value that legitimate particular ways of knowing as "expert."

During 'on' weeks, the FDO expert is responsible for assessing daily flood risk, a task that accounts for approximately 10% of their daily workflow. They do this by accessing and reviewing any number of sources of information at the beginning of their day, whether weekday or weekend. These sources include SWMC's assessment of provincial conditions, and ECCC's current weather and forecasts, official Watches and Warnings that are in effect. Flood forecasters pay particular attention to POPs (Probability of Precipitation)[16], or chance of rain, and the use of enhanced language such as 'thunderstorm' in this information. These experts also engage with predictive models to enhance their situational awareness of flood risk, such the North American Mesoscale (NAM) numerical weather prediction Model, the Global Environmental Multiscale (GEM) Model, and Quantitative Precipitation Forecasts (QPF) to gain a sense of data-generated rainfall prediction. Finally, this group pays special attention to levels of water

[15] January 19, 2016 FDO Meeting notes

[16] The probability of precipitation is a subjective estimate of the likelihood that a measurable amount of precipitation will fall sometime during the day at any given spot in the forecast area (https://ec.gc.ca/meteoaloeil-skywatchers/default.asp?lang=En&n=7884CDEA-1&def=show1E9CAF366#E9CAF366)

in the jurisdiction's watercourses and dams. Values from these sources are tabulated and inserted into algorithmic equations, which then produce the daily flood risk within TRCA's nine watersheds. If there is no risk within TRCA jurisdiction, the FDO issues the daily flood email and puts weather aside and continues with their regular work duties, which account for 90% of their daily workflow. If there is potential for flooding, however, the FDO works in tandem with the Chief FDO and other flood forecasters to decide upon the degree of risk and the notification most appropriate for issue. Since the responsibility is carried out on a rotational basis, different sources of data are reviewed by different FDOs and thus decision and risk trajectories unfold differently during any given flood event.

TRCA Official Urban River Flood Policy

TRCA official urban river flood policy[17] is to issue a Flood Watch when "flooding is possible in specific watercourses or municipalities", and a Flood Warning when "flooding is imminent or already occurring" (See Figure 5).

[17] https://trca.ca/conservation/flood-risk-management/understand/

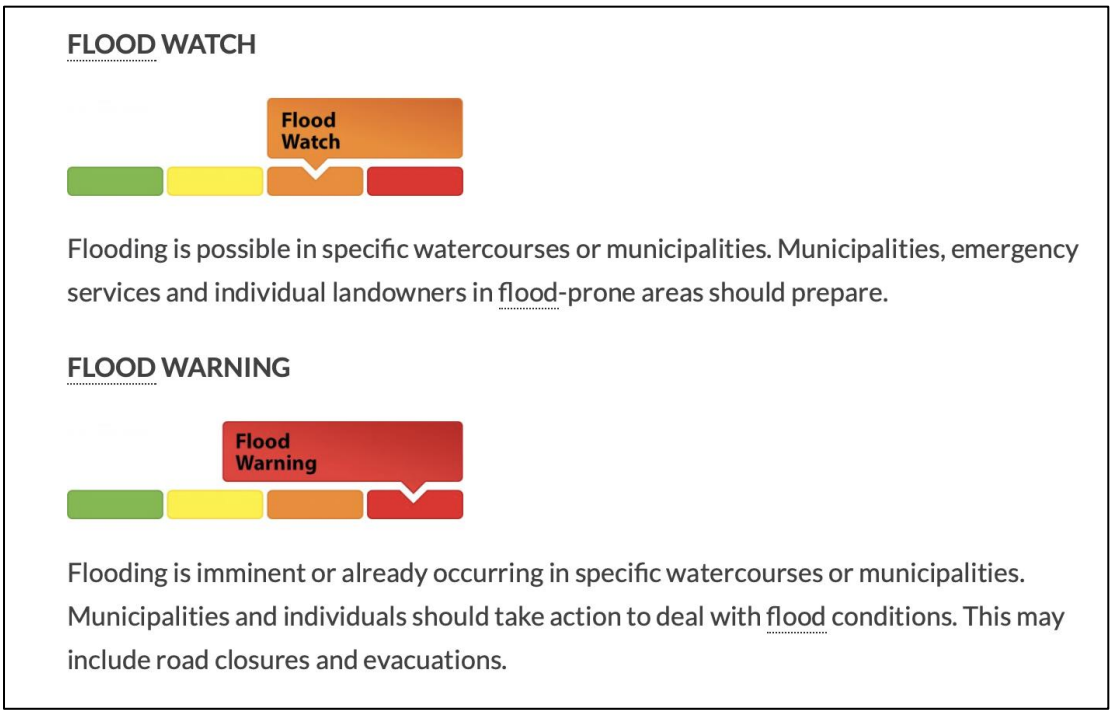


Figure 5. TRCA Flood Watch (depicted in orange on the severity scale) and Flood Warning (depicted here in red on the severity scale). https://trca.ca/conservation/flood-risk-management/understand/

Policy dictates that flood messages will be posted in the Flood Forecasting & Warnings section of TRCA's website and communicated (see Appendix D for October 28, 2015 Flood Warning) via electronic transmission to designated key recipients (Figure 6; key recipients who utilize flood information to prepare in advance against flood impacts are highlighted in bold) within municipalities, local agencies, the school board, and the media, such as major television news networks, or via Twitter, a popular social media platform. New-age and traditional media platforms, along with the representatives employed by media networks in Toronto, such as CTV, CBC and CP24, serve as an important communication conduit for disseminating information about weather and river flood risk to the general public. However, their efforts are based on private network rules rather than public or governmental ones. This means that, unlike the Canadian Radio-

television and Telecommunications Commission (CRTC) mandate imposed upon broadcasters for communicating ECCC weather watches and warnings, media are not required to follow the same directive when communicating notifications produced and issued by TRCA. As a result, media selectively choose when and what flood warning information to communicate to their viewers. This is similar to other key recipients of email notifications who, with varying degrees of flood knowledge and expertise, individually assess the severity and risk of the situation, and from this the value and relevance of re-communicating TRCA notifications to individuals and departments within their organizations or activating municipal emergency response procedures, which may or may not include taking actions to warn local residents[18].

[18] https://trca.ca/conservation/flood-risk-management/understand/

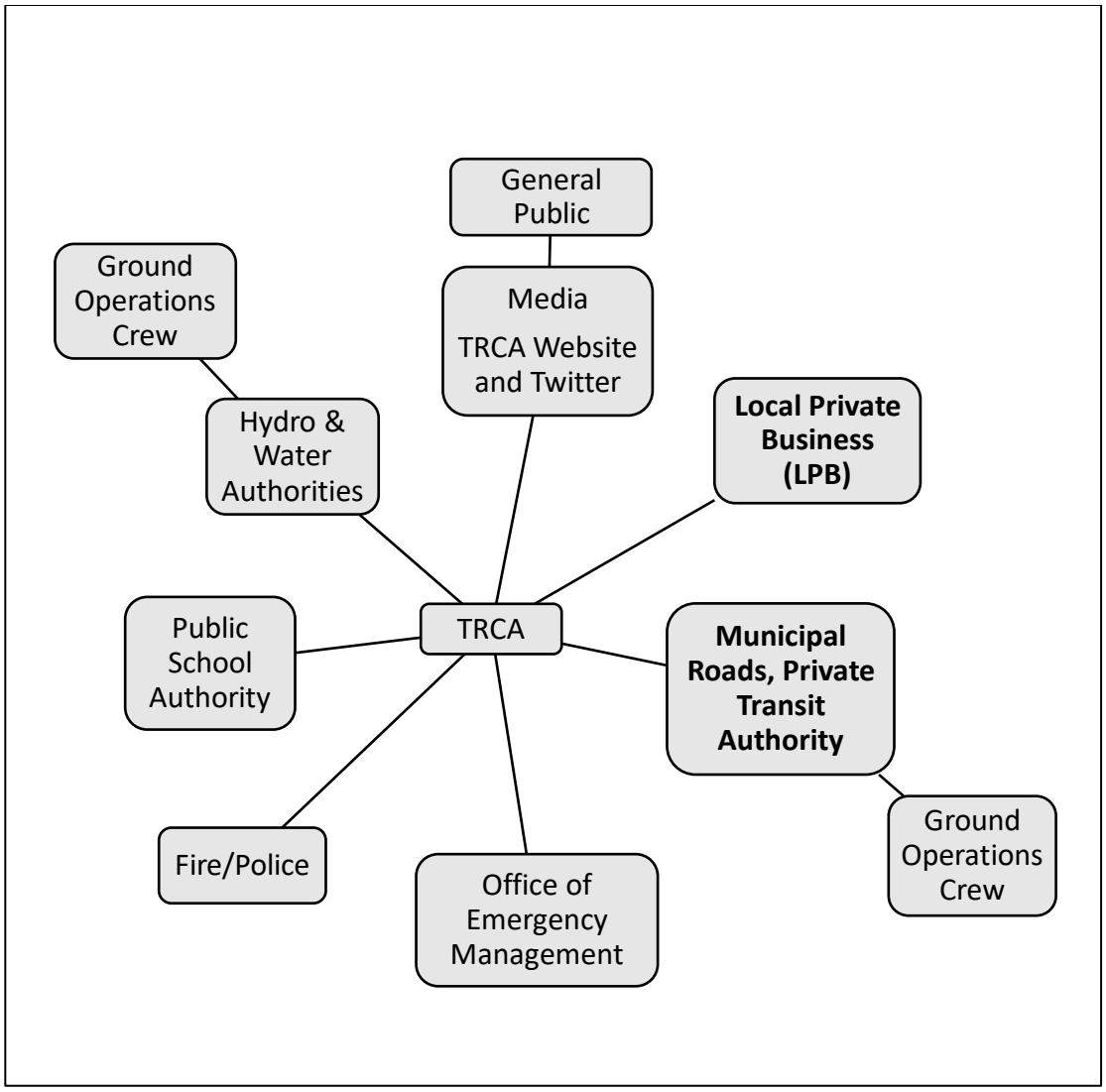


Figure 6.Communication of TRCA Urban River Flood Notifications to 'key recipients'

This historical overview and description of river flood risk management in Toronto, Ontario illustrates the process as involving interactions at federal, provincial and local levels across public and private divides, and among individuals with varying degrees of flood expertise and knowledge. On the surface, these relations appear straightforward and communication binary: either yes, recommunicate, or no, do not recommunicate the flood notification. In contrast, the following analysis and discussion of the October 28, 2015 flood event reveals policy work as more nuanced, especially during cases of higher

uncertainty. Studying through interaction and perspectives surrounding the event illustrates the socialness of the urban river flood risk policy process, particularly uncovering the various ways official policy is relationally interpreted and experienced at the local level, according to differing perceptions of risk held by individuals, who are heterogeneously positioned within their own institutional environments.

The October 28, 2015 Urban River Flood Event [19]

On October 28, 2015, Olivia and Ed found themselves two days into their weekly rotation as the 'on-call' Flood Duty Officer (FDO) and Chief FDO at TRCA, respectively. That morning, Olivia arrived to work earlier than is typical, at roughly 7am, and began her assessment of flood risk within TRCA's watersheds. Olivia is new to TRCA and its flood forecast and warning program. In fact, October 28 is one of the first times her attention to flooding has extended beyond the daily morning assessment. Observed as typically quiet, I notice Olivia spent her time that morning asking questions of the Chief FDO and following protocol, for instance: checking and re-checking the predictive weather models as well as two specific rain gauges stationed along the Don River, one at Todmorden and another at Dundas St (Appendix F: Map of Study Area- Don Valley Flood Vulnerable Areas)[20] for water level accumulations. Rainfall amounts equal to or greater than 25mm trigger a heightened awareness for FDOs since that value is nearing the threshold of impact to vulnerable locations with the Don River watershed. Water levels beyond a certain depth at the Don River at Todmorden signify flood likelihood to the Bayview extension, and have implications for the Local Private Business (LPB) and the Local

[19] This descriptive overview of the event is to be considered alongside Figure 7
[20] Preliminary, raw data reported from the Todmorden and Dundas gauges recorded water levels on to the TRCA real-time network

Private Transit Authority's business operations. Likewise, water levels beyond a certain depth in the Don River at the Dundas St. gauge signify flood likelihood to the City's Don Valley Parkway (DVP) and have implications for road operations staff with the Municipal Road Authority, East division (Appendix F). The LPB is a demonstration hub focused on environmental sustainability located on the Bayview Extension adjacent to the Don River. At this site, citizens, business people, and representatives from academia and government come together for collaboration. The LPB holds weekly farmer's, artisan's and garden markets, hosts day camps and a nature school, houses art exhibits, and operates as a meeting space for community events, such as weddings. The Local Private Transit Authority is a private rail company whose railway tracks are sandwiched between the Bayview Extension and the Don River.

TRCA Risk Assessed

Using the upper end of ECCC's predicted rainfall range, by 7:30am Olivia calculated approximately 30mm of potential runoff, which would create flooding in parts of TRCA's jurisdiction, particularly in areas adjacent to the Don River including Toronto's Bayview Extension. Olivia communicated this runoff value to Ed, the week's Chief FDO. At this point, Ed began focusing entirely on updates in predicted rainfall amounts and water level recordings, only looking away from the computer to respond to questions asked by Olivia, or those posed by others flood forecasters in the room, or by management. From my observations during TRCA meetings, Ed typically exhibits a studious character and a conscientious approach to flood management. I often observed him as a leader of the Flood Forecast and Warning group in the way that he heads discussions on the roles and responsibilities of the program, outlines the major event operations under different scenarios as well as creates protocol documents and

flowcharts. On this day, as the on-call Chief FDO, Ed was *the official decision maker* as it pertains to implementing urban river flood warning policy vis-à-vis a flood warning notification. Contrary to Olivia, Ed has several years of involvement as an FDO working floods of differing scales and severities, most notably the July 8, 2013 flood, which has prepared him to take on the role of Chief FDO. Yet, despite this, Ed has little experience being in this specific position as the one who makes the last and final call.

Together, with knowledge of potential runoff and flooding of the Bayview Extension, Olivia and Ed's perceptions of flood risk increased. These perceptions quickly amplified when the two realized the TRCA Director was to be spending the day in meetings at the flood vulnerable LPB, the TRCA-affiliated organization located on that exact section of the Extension adjacent to the Don River. Unsurprisingly, the situation quickly evolved to require an 'all hands on deck' approach by the TRCA flood management team. Thus, in addition to Olivia and Ed's constant monitoring of weather radar and the real-time gauging network, other flood forecasters became involved, offering their assistance to Ed as he managed the urban river flood risk that day. This was particularly true of Stuart and Nancy. Stuart is newer to TRCA than Olivia but far more experienced in flood management. He was recently hired at the Toronto-based CA in a management/FDO role, no doubt for the inter-provincial knowledge he brings to the table, and for his ability to communicate and articulate clearly, both with staff during events as well as with media as the TRCA liaison. Aside from carrying out interviews with different media personnel on October 28, Stuart stuck close to Ed so he could keep current with the Chief FDO's thinking. Nancy, on the other hand, is an extremely seasoned TRCA flood forecaster. She generally encourages a holistic and predictive

approach to flood risk management, emphasizing the importance of early rather than after-the-fact warning measures.

Once Olivia determined flooding was expected within TRCA's jurisdiction, I began focusing my *in situ* observations on capturing risk-related decisions made, as a first step in understanding this event from multiple perspectives. To that end, during my nine hours with TRCA forecasters, I recorded their voiced perspectives and made note of their interactions and actions, who they communicated with and at what time. I combined these data with perspectives offered by key recipients of the Flood Warning during interviews after the event. The purpose of this effort was to generate a multi-sited, temporal illustration combining TRCA's policy negotiation process, specifically their process for Flood Warning generation, along with key recipients' decisions, and overlaid with rainfall amounts, water level measurements at two key rain gauges located on the Don River, and with the time ECCC Rainfall Warnings were issued. The type of analysis presented in Figure 7[21] is the result of these efforts and provides a macroscopic overview of the flood event; it shows the time risk was assessed by different groups, the communication that took place between and across the groups, the key decisions that were made (as illustrated by decision points attached to text boxes), and even hints at features of the TRCA-key recipient interaction ritual chain. The following description of flood forecaster and TRCA action and interaction corresponds with details included in Figure 7.

[21] Credit to D. Webster, Director of the Digital Animation Center for the Department of Visual Arts in the College of Arts and Media at the University of Colorado at Denver, for transforming my fieldwork illustration to its current graphical format

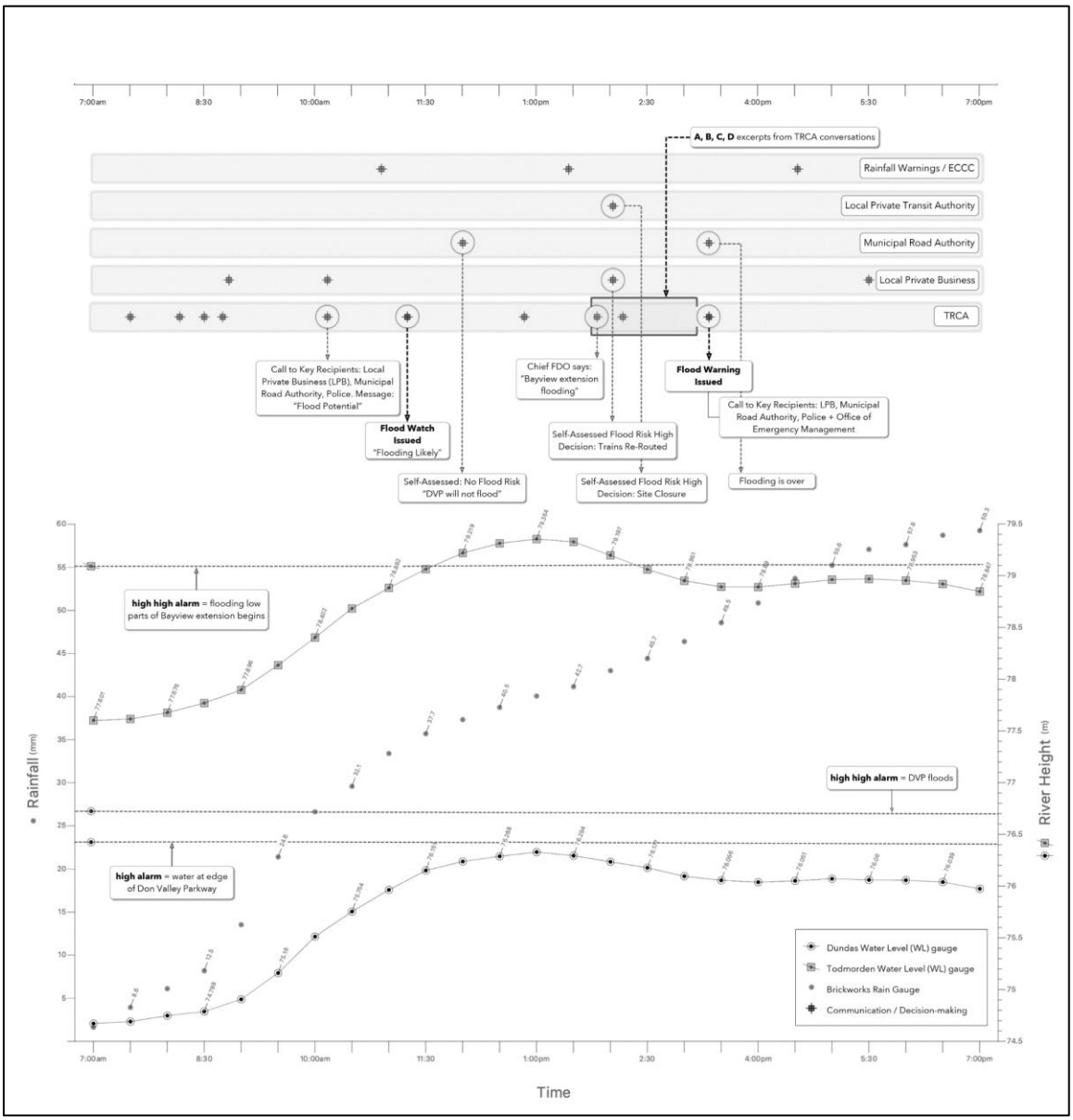


Figure 7. Ensemble of inter-organizational interaction during Toronto river flood prediction on October 28, 2015

At 8:10am, Olivia placed a call to ECCC meteorologists for a morning update. Approximately 20 minutes later, she heeded Ed's instruction and drafted a TRCA Flood Watch, and at roughly 8:45am she called key recipients, including Ron over at the Local Private Business (LPB) as well as members of local law enforcement, informing each organization of the flood potential. Five minutes later, at 8:50am, Ron issued his own Flood Watch alert for the LPB location, which indicated an internally recognized flood threat and 'elevated' flood risk at the LPB. By 9:50am Olivia noted 27mm of rainfall recorded at the Brickworks rain gauge and a .25 metre rise in water levels between 9:30am and 10am at the Todmorden gauge, both adjacent to the LPB. At approximately 10:15am, Olivia placed another call to Ron at the LPB notifying his group that the Don River was now expected to flood at their location. Approximately one hour later, at 11:15am, TRCA issued their Flood Watch to recipients via email, and then also to the general public via Twitter, which officially indicated flooding was possible in parts of the jurisdiction, but was issued, according to Ed (Line 10 of the Transcript in Appendix C-TRCA Flood Forecaster Recorded Interaction), to cover the imminent flooding of the Bayview Extension. The decision made by the LPB to issue a Flood Watch at 8:50am is worth noting because it signifies action taken in advance of TRCA's 3:20pm Flood Warning. As the analysis continues, the decision made by Ron will become one of many made by key recipients prior to TRCA issuing the official Flood Warning notification.

At the same time, Ron's decision to issue his Flood Watch after telephone communication with Olivia reveals that policy is not just a matter of TRCA flood forecasters reading written rules, issuing written notifications and users responding or acting upon written words. Instead, the actions carried out by Olivia and Ron show that

policy negotiation and appropriation is as much about the behind the scenes interaction that takes place between TRCA and their recipients. To that end, it includes the talking on the phone, the verbal communication of TRCA assessments of risk and the informing user groups of their plans. The sequence of actions in the above description, particularly Olivia communicating imminent flooding with Ron at the LPB (10:15am) and then issuing the TRCA Flood Watch about an hour later (11:15am), demonstrates two important aspects of TRCA policy work, which challenge traditional notions of the policy process as automated, linear and uncontested. First, since TRCA policy dictates that imminent flooding calls for a Flood Warning to be issued, TRCA issuing a Flood Watch at 11:15am subsequent to recognizing flooding was forthcoming seems out of order. It shows how the implementation of policy sometimes unfolds in ways that run counter to the official rules. Second, that TRCA communicated a Flood Warning over the phone to Ron at the LPB, yet issued a Flood Watch for others, suggests that recipients of TRCA Flood Warning policy are not all considered equal. In fact, it implies that TRCA's recipients of Flood Warnings are placed along a gradient of risk whereby those perceived as being at higher risk are placed higher on the gradient and will, therefore, receive different information from others who are perceived as being at lower risk. Contrary to official policy, which is structured in a such a way that all recipients fall under the same risk assessment and thus receive the same notification type, the example illustrates policy negotiation as an artful navigation that unfolds in nuanced ways, especially during the management of risk that falls outside of official TRCA guidelines.

TRCA Risk Expands Southward: Bayview Extension and the Don Valley Parkway

While attention throughout the first part of the morning concentrated mostly on the heightened flood risk for the Bayview Extension and potential impacts to Ron's group at

the LPB next to the river, by 11:00am the water depth recorded at Dundas St. gauge, located slightly south of Todmorden, was found to be steadily increasing from its normal level. An hour and a half later, at 12:30pm, with water levels at the Dundas St. gauge continuing to rise, TRCA perception of flood risk to the Don Valley Parkway rose as well (Appendix F: Map of Study Area- Don Valley Flood Vulnerable Areas). As a result, at 12:50pm Olivia drafted a Flood Warning. At 1pm, 37.7mm of rain registered at the Brickworks rain gauge near to the LPB and both the Todmorden and Dundas St. water levels in the Don River peaked at 79.35m and 76.34m, respectively. Continuing to monitor conditions, at 1:49pm reports of flooding of the Bayview extension were noted by Ed and other TRCA flood forecasters. Soon thereafter, at 2:02pm, the LPB closed their site due to river water approaching their grounds and the Private Transit group decided to cancel and/or re-route their commuter trains along the Richmond Hill Line. An hour and eighteen minutes afterward, at 3:20pm, TRCA issued their Flood Warning (Appendix D) and Ed subsequently placed phone calls to several key recipients to notify each of the alert for potential flooding to the Don Valley Parkway, although water levels at the Dundas St. gauge had been receding for nearly two and a half hours by that time. At 4:32pm, ECCC ended their Rainfall Warning for the City of Toronto, and by 5:30pm email correspondence by Ron to his staff at the LPB noted the event as a near hit: “the river level is high; only a close call. No flooding”.

The above description of time spent by TRCA and a few of their key recipients shows how policy implementation, or the processes of issuing and responding to flood information, takes shape at different locations, and sometimes counter to official rules. It highlights how identifying flooding as risky involves a symbolic process of

representation, one that emerges through communicative and social interaction (Boholm 2015: 162). Moreover, it illustrates the myriad social connections that policy requires, for example between TRCA and ECCC, who TRCA are calling upon to receive weather expertise as well as those groups to whom TRCA is providing their flood expertise. By charting these connections, we see an intertwining of actors across both horizontal and vertical social scales: federally-based meteorologists, provincially mandated but locally embedded flood forecasters, municipally located public and private groups, all of whom are working toward managing the risks associated with the rain and flooding. In the next section, I take a closer look at the role of language and interaction in explaining TRCA's delay in policy-related decision-making, which I attribute to Ed's feelings of uncertainty and wavering perceptions of risk.

TRCA: Urban River Flood Risk and Policy-Related Decision Making

By the afternoon on October 28, and specifically within the four-hour window of time the Flood Watch and Flood Warning were issued, inter-agency interaction waned and was replaced with extensive intra-agency deliberations among Ed, Olivia, Stuart and Nancy surrounding the evolving flood threat to the DVP. During these deliberations, the foursome act out a particular line, or pattern of verbal and non-verbal acts by which they express their views of the situation (Goffman 1967: 5) as they pursue their organizational goal of making a timely and efficient decision. In the next section, I examine a small number of these deliberations (see A-D in Figure 7; Appendix C for a transcript of TRCA flood forecaster interaction), or those face-to-face interactions within the entire social encounter that resemble Goffman's interaction ritual, to illustrate how: (1) certain features of language used by Ed are evidence of his uncertainty; (2) certain features of language reveal the causes of Ed's uncertainty and its role in influencing his perceptions

of risk, which at times differed from his colleagues; and finally, (3) linguistic strategies deployed by the foursome intended to inch the policy-related decision making forward. Though the interaction was meant to manage uncertainty and assist with making a timely and efficient decision, forecaster engagement during the afternoon of October 28, 2015 revealed multiple interactional goals within the exchange and therefore exemplifies well how meaning is negotiated during the process of interaction.

Expressions of Uncertainty

Just before 2pm, the Bayview extension begins to flood and the water is approximately 10cm from the edge of the Don Valley Parkway. Sitting next to the group and observing their conversation, Ed's uncertainty is unmistakable. In addition to the non-verbal worried look he gives, Ed verbally demonstrates his uneasiness during the exchange by being in the wrong face. According to Goffman (1967: 8), a speaker is in the wrong face if the information he is presenting cannot be integrated into the line that is being sustained for him. For instance, in Line 4, Ed says, "I'm thinking we're going wait," and in Line 11 he comments, "I'm thinking with the Warning." Combining this with "I'm not 100% sure," (Line 16) and "My hesitation about the Warning" (Line 65) altogether suggests Ed is not wishing to take full responsibility for the line of his group as Chief and lead decision maker. He attempts to offset the potential backlash he fears will come his way should he address this policy decision incorrectly by using vague language. In other words, the consistent use of "*I'm thinking*" and his explicit statements of being unsure indicates Ed is reluctant to take a stance. Put another way, Ed is not firm in the line he should be taking and his comments convey insecurity. In this situation, Stuart, Nancy and Olivia are holding onto the impression of Ed as chief and leader, and Ed's evasion of commitment is a risky move. By being out of face, Ed is not behaving in the line that is

desirable or expected of him. In other words, by waffling and expressing uncertainty, Ed is not exhibiting the appropriate demeanour (Goffman 1967: 77; Hallett 2007: 149) of a leader. This has operational implications in so much as it impacts the expediency of making a timely and efficient decision.

Attempting to save face, Ed engages in corrective processes during the encounter. Goffman (1967: 19) defines corrective processes as the measures taken to correct the effects of failing to maintain the face of oneself or others. According to Goffman, these strategies are employed to restore equilibrium in the interaction. Ed was noticed to engage in corrective work when in Line 13 he said, "You know what I mean**?**" in reference to a Warning as unnecessary since the water level is receding, and in Lines 66-67, "this is the biggest u::m the most u::m -- I guess -- highest level Warning that we have right**?**" The raised intonation at the end of these sentences along with Ed's inclusion of the word RIGHT, are considered here as offerings made by Ed to explain his face or why he is not in line with his colleagues, and in so doing, are attempts made by him to remedy the impression of the situation. These examples of face in interaction supported by comments made by Ed, Stewart and Nancy underscore the relational nature of meaning creation in the way that it highlights the influence of spoken words on others' understandings and subsequent responses.

Causes for Uncertainty

As the day continues, the struggle Ed has with implementing river Flood Warning policy by way of issuing a Flood Warning is noticeable: "Issuing is a big deal -- it's not just getting wet. I am not liberal at issuing these kinds of messages," he admits in Lines 208-209. Through analysis of recorded interaction, Ed's causes for uncertainty and thus his perceptions of risk are revealed, namely factors associated with the extent and impact of

flood threat, along with his perception of blame and the presumptions he makes regarding the power of TRCA notifications. Also revealed during interaction is Ed's second goal, or his desire to make a decision that will be perceived as correct.

Extent and Impact of Flood Threat

One element contributing to Ed's perceptions of risk is the uncertainty he feels surrounding the extent and potential impact of the flood threat**.** According to TRCA policy, a flood[22] is defined as *"an overflow or inundation that comes from a river or other body of water and causes or threatens damage"*, yet this definition does not specify the extent of water, which leaves the flood forecasters in a position to individually evaluate how much water qualifies as threatening. Is it overflow or inundation? Does 'overflow' mean covering the edge of the roadway, one lane of traffic, or more? How do 'overflow' and 'inundation' differ and is one scenario more threatening than the other? Likewise, what is meant by 'causes or threatens damage' in the official definition? The ambiguity related to damage similarly creates confusion for flood forecasters. Official policy says nothing of what kind of damage, where or to whom; it simply offers a vague description of impact upon which each flood forecaster must, again, individually assess as either worthy of a Flood Warning or not. Stuart makes his own interpretation when he says in Line 18, "We're at .4m away and it's tapering off", which is indicative of his definition of flooding, or that reaching the edge of the roadway is equivalent to flood status.

Contrary to Stuart, Ed says later in the conversation (in Line 81): "It's like u::h I *see the Warning being more -- August or -- July 8th* right?" This expression is Ed's

[22] https://trca.ca/conservation/flood-risk-management/

attempt to defend his position that the uncertain extent and impact of the current flood event warrants additional consideration for issuing the Flood Warning. The reference Ed makes to July 8 links him to his involvement as a flood forecaster during that event in 2013. In this sense, much like linguistic anthropologist Jan Blommaert (2005) describes of *facework* in interaction as occurring in real-time but simultaneously encapsulated in several layers of history, Ed's uncertainty is revealed here to be embedded within a specific historical context. On July 8, flooding resulted in waist-high water on the City's major transportation corridors. This type of indexicality, or a pointing to one's past, is implicit in any consideration of face, according to Haugh (2009). Ed's reaction exposes the impact of historical events on uncertainty and decision-making during flood-risk events. It also signals that for Ed complete inundation qualifies as a flood to him, not simply water reaching the edge of the road. Thus, while reaching the edge of the roadway is sufficient to issue a Flood Warning for Stuart, the conditions on October 28, 2015 are not physically threatening enough for Ed.

Ed is also unconvinced the amount of water is threatening enough, or will generate substantial damage, which similarly plays into his policy-related decision making. He points out in Line 16, "I'm not 100% sure the DVP is going to flood." This speaks to the importance for Ed of actualized damage when issuing a Flood Warning, but also conveys that the location of the damage is critical for Ed in this process. This is confirmed in Lines 66-67 when Ed accounts for his delay by explaining his belief that the Flood Warning is associated with flooding on the DVP: "My hesitation about the Warning is -- I'm <u>so</u> associated with the DVP that this is the biggest u:mm he most u:mm -- I guess -- highest highest level of Warning we have…". That Ed regards the Warning

as more appropriate for events with large extent of flooding in a particular location, and since it is not certain that either are the circumstance TRCA is dealing with that day, these moments of hedging are evidence of an alternative line Ed is taking during this interaction. In other words, in addition to the group goal of making a timely and efficient decision, Ed has a second goal of making the right decision. Though these comments threaten the face wants of the group, when considering this alternative line, Ed's comments are an effort to maintain his own face.

In an effort to cooperate and promote the line Ed is taking, Nancy acknowledges the importance of location for TRCA when she points out in Line 20: "The challenge has always been the flood location". The interaction between Ed and Nancy hint toward the tendency of TRCA to further narrow the geographic boundary imposed by their jurisdictional boundary from the entire Don River watershed to one specific watercourse, the Don River, at one specific location: the Don Valley Parkway (DVP). This is a notion confirmed later in the conversation when Ed says to Stuart (Line 169-171): "You know what -- let's issue the message. And I'll talk to XX {Nancy} and confirm things because of the -- Previous -- the the you know the frame of mind that we were always in." This impression was further confirmed when, in Lines 188-191, Nancy circles back to say: "{to Stuart} you need to have conversation with XX and XX {upper management} about flood warning. Not issued very often and usually only when our key areas - our key vulnerabilities are at risk."

Alternative to Ed and his belief that a Flood Warning is more appropriate for large scale events in critical locations, for Stuart there is no narrowing; flooding in any location within TRCA jurisdiction would suffice a Warning to be issued. This is a position he

makes clear early on in the encounter (Lines 25-27) when he comments: “Are their tracks flooded? Use Bayview extension flooding -- tracks flooded -- and potential for DVP as rationale.” Here, Stuart is attempting to save the face of the group, or trying to have the foursome return to the line of making a timely and efficient decision. As a newer member to the TRCA team, his inexperience with both organizational dynamics that have evolved in the years since the big 2013 flood and the prominence of relying upon an informal convention during the policy implementation process (even though the official rule dictates otherwise) make it easier for him to do so.

Perceptions of Blame and Presumptions of Power

Perceptions of blame and presumptions about others were also found to contribute to Ed’s uncertainty and policy-related decision making. Between 2-3pm (see B and C in Appendix C; see B and C in Figure 7), Ed makes comments that suggest he is concerned about issuing a Warning unnecessarily. For example, in Lines 197-198 he says, “My feeling is that we are going to be creating chaos for the DVP or at the DVP if we issue.” He follows this a short time later to say, “Don at Dundas is at 76.2 and it’s receding. Send it {the Flood Warning} out and nothing and create chaos” (Lines 204-205). These contemplations are expressions once again of the alternative line Ed has taken from the group. As much as he wants to make a timely and efficient decision in keeping with the group’s line, Ed is more focused on promoting his own face. It also reveals that Ed’s alternative line is not simply about making the decision he perceives as correct, but also about making the decision that will be perceived as correct by others. In other words, Ed is concerned for his own face wants, the presumed face wants of others beyond the immediate situation, as well as the face wants of the group. These are the types of interactions, according to Spencer-Oatey (2009: 148), that capture the dynamic face

concerns that people have in different contexts. Moreover, the sensitivities expressed above by Ed through face highlight the emotional nature of policy work and simultaneously illustrate how multiple faces are managed during the same face-to-face encounter.

As Ed is conceptually organizing the flood danger, assessing the risk and the need for issuing a Warning that afternoon, Nancy responds to Ed's contemplation moments later to say (Lines 210-213):

TRCA Office
October 28, 2015

210 Nancy: This is predicated based on the assumption that as soon as you issue
211 the Warning they are going to close the road?
212 I seriously don't think they are going to do anything
213 directly based on your message.

Nancy's face threatening act highlights Ed's presumption that recipients will make decisions as a direct result of receiving the Flood Warning. The presumption is reflective of Ed's belief that the Flood Warning steers key recipients' behaviour. Nancy's addition of, "I seriously don't think they are going to do anything directly based on your message," is her way of questioning the pragmatic effect of the Warning. It signifies her belief that the Warning is a state of knowledge whereas it oppositely demonstrates Ed's belief that the Warning will inspire immediate and automatic action of the groups receiving it. This represents a misalignment in the IR chain between Ed at TRCA and key recipients since the rules of conduct are that key recipients expect the Flood Warning, not that they will accept or use it. In this way, the IR chain is analogous to the rituals that exist in principal-teacher relations Hallett (2007) describes in his study on interaction ritual and power in education institutions. More pointedly, TRCA has the power to make

the decision whether or not to warn, however, they do not have control over the meanings key recipients attach to the Warning, neither of the overall situation, nor how key recipients will respond.

Strategies Deployed to Manage Uncertainty and Risk

Although the decision to warn or not is Ed's, efforts are made by the foursome during the afternoon to reassure Ed that he was not alone. This was accomplished through their expressions of considerateness (Goffman 1967: 10). For example, in Line 4 Ed says, "I'm thinking *we* are going to wait", Nancy further comments in Line 8, "*we* could speak to what is flooding", and also in Line 1 Olivia asks, "So *we're* not issuing the Warning right now?" Here, use of the inclusive *we* is stressing common membership in their group. It is an attempt to reinforce institutional solidarity amongst the flood forecasters, to underscore the group's mutual wants and goals, and to provide verbal support to Ed along the lines of: 'we're all in this warning quagmire together'. In other words, the group is doing what they can to maintain group face. Still, no matter the amount of solidarity and support, Ed knows it is his name that will appear at the bottom of the Flood Warning, if and when he issues the notification.

At the same time, while Nancy and Olivia's comments in Line 8 and Line 1, respectively, maintain group face, they threaten Ed's face. Stuart, in line with Nancy and Olivia, comments in Line 9 to say: "*you could also say Flood Warning based on,*" which confirms that, unlike Ed, these three individuals don't necessarily see the need for Warning delay. Nancy further threatens Ed's face when she negatively evaluates Ed's indecision, "Kind of wishy-washy. *We either issue or don't issue*" (Lines 14-15). Suspecting that Ed has taken an alternative line centred on making the right decision, for time's sake, Nancy shifts face in interaction. She does this in Line 21 when she says,

"since July 8th -- issuing covers off any questions that may occur," and then again in Lines 182-183 when she comments, "When you're in the flood warning situation -- you're already in it -- you're not wrong." Contrary to the accusation of being wishy-washy in Lines 14-15, Nancy's comments in Line 21 and 182-183 are attempts at positive politeness, or strategies used by Nancy to appeal to Ed's desire for correctness and to assure him that were he to issue a Flood Warning it would be correct.

As time goes on and the opportunity for making a timely and efficient decision dwindles, Nancy and Stuart make additional attempts to maintain group face, but do so in a way that also maintains Ed's. For example, in Line 70 Stuart says to Ed, "I defer to you", and then again in Line 72-73 he points out: "Again -- you're the decision maker today so -- and not that one is more right than the other". Nancy's attempt, on the other hand, comes closer to the close of the interaction when she says, "The arguments for doing it are just as valid as arguments against" (Line 207). These explicit and implicit acts of deference attend to the wants of the group by encouraging a decision one way or the other, as well as to the asymmetrical social order in place among members of the group. In other words, since Ed is the Chief, the two are raising Ed's face wants as superior and conveying that he is socially superior in the decision-making hierarchy and simultaneously encouraging him to exhibit a more appropriate demeanour.

Analysis of the interaction that took place among Ed and his three colleagues during the afternoon of October 28, as illustrated through an analysis of face and face work, explain expressions of uncertainty for implementing urban river Flood Warning policy, the causes to which these uncertainties are attributed, and also how Ed and his colleagues managed this uncertainty. Interaction demonstrated several features of

Goffman's approach to face in interaction, such as signaling the group's social relationship and the subtle boundaries that existed between Ed as the decision-maker and his colleagues. Furthermore, their face-to-face engagement demonstrated the influence of deference and demeanour in the context of risk-related decision-making and the balance between individual face wants and the face wants of the group. Relatedly, the analysis of the described features of the overall forecaster encounter represented the attitudes of speakers and the elements of the event that were important to the group. Moreover, the interaction highlighted how face concerns emerge dynamically, yet also how participants in an exchange are always committed to some kind of interpretation for what is going on.

On the other hand, the presence of an unofficial risk gradient for Warning, the identified institutional norms for narrowing the geographic scope for issuing a Warning, along with the individual variables contributing to uncertainty and thus risk assessment, as well as the presence of multiple opposing goals as evidenced by face, illustrate TRCA's IR chain as very different from the kind theorized by Goffman and Collins. Interaction on the forecast floor that afternoon revealed differences in social values, non-conformity toward the group's objectives at times, and differences in motivations. This shows how social reality is a product of interactional processes and suggests that in cases of risk-related policy work, the interaction ritual chain is much more malleable than originally conceived. In the end, the wants of the group were not met since the decision was neither timely nor effective. Ed's face wants were met, however, since the Warning was perceived to be the correct decision based on the approval given by management.

Key Recipients including Media: Response and Use of TRCA Warning

TRCA and key recipients of their Flood Warnings have established a social relationship wherein TRCA is accountable for issuing notifications to them when Flood Warning

policy conditions are met. In other words, these groups are members in specialized interaction ritual chains based upon key recipients' expressed desire to receive the flood notifications TRCA issues. In this next section I reason that TRCA's late Warning on October 28, 2015 was TRCA not fulfilling their obligation to Warn. I further suggest the delayed Warning resembles a weakening in the interaction chain, and one that was made noticeable by the perspectives of key recipients and their varied uptake of the notification. The description of key recipient actions and explanations for how the day unfolded in their respective organizational settings shows these groups rejected the capital upon which the IR chain had been established and instead used a different form to take matters into their own hands and manage the evolving flood risk situation. The perspectives show variable uptake by these public groups, which supports the notion that much of the conflict Ed experienced surrounding if and when to warn was potentially unnecessary.

At 3:20pm, the approximately 250-word Flood Warning was issued (Appendix D) to recipients and media, concealing in its email transmission TRCA's internal contradictions and the lengthy interaction between the four flood forecasters. Put another way, the presentation of the Warning made invisible to recipients' eyes TRCA's subjective assessments of risk and their negotiations for how risky the situation was and if the risk warranted a Flood Warning. Despite the written message being the same for all readers, it was taken up into different institutional contexts where recipients' interpretations and responses were shown to be influenced by differing time needs and individual assessments of risk.

How Time Influenced Flood Warning Utility

Timing of the Warning was shown to be critical for key recipients of TRCA flood notifications. On October 28, 2015, most participants from these key groups remained formally unaware of the 1:49pm reports of flooding along the Bayview extension nor were they privy to TRCA's thinking regarding the evolution of flood threat as the afternoon wore on. In other words, for many, the 3:20pm Flood Warning was the next notice given after the 11:15am Flood Watch. While each key recipient's time needs varied, most reported 3:20pm as too late to receive the Warning that day. For example, the representatives from the Water and Hydro Authority commented that, had the Warning been received earlier, the two might have adjusted staffing of their operational ground crew, but couldn't because it was too late. Moreover, the representative from the Water Authority commented that TRCA Flood Warnings are a key piece of information to help solidify their operational decisions, however, receiving one during the "3-6pm timeframe is the worst" since day shift ground crews would already be enroute home and the evening shift crews would have not yet arrived.

Additionally, several recipients noted that each had already activated their respective flood management operations by the time the Warning was issued. Ron, for example, at the LPB explained that by 3:20pm their group was already in Stage 3 of their organization's flood escalation and communication framework, which included flood-proofing their site by raising flood-gates and removing items from low-lying areas to name a couple. Likewise, given the amount of rainfall that day, representatives with the Municipal Road Authority mentioned placing crews on the ground at lunch-time to check low-lying areas for obstructed catch basins and drains on roadways. For these individuals, along with an Emergency Manager who was either wrapping up at work or already on

their way home, the 3:20pm Warning came too late, and was therefore not used to a great extent. From the perspective of a Private Transit Authority representative, given that it takes 5-7 minutes for a train to travel from the central station to the portion of the track running adjacent to the Bayview extension (Appendix F: Map of Study Area- Don Valley Flood Vulnerable Areas), and given that flooding at the Bayview extension was reported at 1:49pm, and given that almost immediately thereafter the Private Transit Authority decided to reroute trains, one can safely surmise the 3:20pm Flood Warning played a negligible role in their decision-making that day.

Similarly, media who are looking to the TRCA Flood Warning to highlight the location of reported flooding, and/or locations expected to flood, in order to communicate preparation and safety strategies with their audiences, were limited in this way. As a media representative employed with a local television network pointed out, by 3:20pm most of their evening show is compiled, vetted and ready for broadcast, which complicates the inclusion of TRCA's 3:20pm Flood Warning. Connor, an on-air broadcaster with one of the major television networks in Toronto, who routinely recommunicates details included in TRCA flood information during his broadcasts conveyed the implications brought on by a late Warning such as the one issued on October 28, 2015. He speculated that his reiteration of the Warning would be something like: "looks like the Bayview extension will be a problem for travel and {referencing the Private Transit Authority} through the Don Valley stretch: you may be facing delays", which he commented would be old and irrelevant news, especially since the Private Transit Authority's trains along that corridor had been re-routed approximately 80 minutes earlier (Figure 7).

Juxtaposing the time needs expressed by key recipients with TRCA perceptions suggests the two are misaligned. Consider the following exchange between Stuart and Ed between Lines 110-117 of the excerpt:

TRCA Office
October 28, 2015

110 Stuart: My concern is that it's 2 o'clock right?
111 Ed: Exactly -- we're in rush [hour].
112 Stuart: [we're in]
113 Like at four -- it's going to be so much harder for them to go in at 4:30 --
114 Ed: Yeah.
115 Stuart: And close it {the DVP} than it is to tell people at [3:45]
116 Ed: [Stay off the roads]
117 Stuart: don't take the DVP home right,

At 2pm, though Stuart and Ed acknowledge the already dubious position they are in, the conversation suggests their understanding of recipients' operational decision making to occur later in the day. For example, Stuart's comment, "*Like at four*, it's going to be so much harder for them to go in and close it", implies the Municipal Road Authority, while not ideal, could wait until that time to receive the official Flood Warning. Moreover, Stuart's comparison with 3:45pm, or that it is "much harder for them to go in at 4:30" "*than it is to tell people at 3:45 -- don't take the DVP home*" indicates the presumption that 3:45pm would somehow better meet the Municipal Road Authority's time needs. Perspectives shared by this key recipient group, however, confirmed that decisions are made much earlier in the day. Put another way, not only did the Municipal Road Authority send ground crews out at lunch time, their self-assessment of risk was made at approximately 12pm, or over three hours prior to the Flood Warning, as was shown in Figure 7.

Alternatively, if by saying *tell people* Stuart was expressing concern for the general public driving on the potentially flooded DVP, the presumption remains that notice by 3:45pm would have been sufficient notice for the public to take an alternative route. Knowing the general public receives TRCA flood information (see Figure 6) from the TRCA general website, Twitter or media outlets, and knowing that traditional media was reported by members of the general public as the most popular way to access flood information, and knowing that media's broadcasts are already vetted by 3:20pm, Stuart's presumption that a 3:45pm Warning would lend itself to more effective decision making than a 4pm or 4:30pm Warning is likewise erroneous. The 3:20pm Warning issued by TRCA was more attentive to the presumed time needs of key recipients than a Warning later in the day, yet the results confirm it was still issued too late for it to be useful. The perspectives of the three key recipients groups regarding their use of the Flood Warning in this case, and its limited utility for groups in general based upon the time it was received, calls into question where the best pragmatic force for TRCA expertise resides. In other words, responses beg further consideration regarding which notification would generate greater utility: the Flood Warning, or the Flood Watch. While the latter is a risk message to convey possibility, it is often issued with much more time for recipients to interpret and respond.

Recipients Assessing Risk: The Desire and Ability to Watch on Their Own

In addition to time needs as a factor influencing the utility of TRCA's Flood Warning, uses of the notification were also shown to vary because key recipients, particularly those who require flood information to prepare in advance of potential threat, reported watching on their own and paying attention to information other than TRCA notifications when assessing their organization's risk for flooding. In the words of a representative

from the local Private Transit Authority regarding TRCA: “They’re {referring to TRCA} not really providing us with too much. We do get the emails. They {referencing the emails} are very generic, so it’s not really of any value.” Instead, this recipient confirms gaining situational awareness through traffic cameras and TRCA rain gauge data that day, along with water level graphs. This signifies that while the Flood Warning itself was not specifically valuable for this individual and their organization, other TRCA information was relied upon so that their group could make their own risk assessment.

Josh over at the Municipal Road Authority- East Division was one of a few key recipients who engaged in his own assessment of flood risk on October 28th on behalf of his team. Over the noon-hour, two representatives at his location carried out a statistical regression analysis with TRCA rain gauge data which predicted a 1pm peak of 76.81m in the Don River at Dundas St. followed by a decline in the water level until finally plateauing at 3pm. In other words, these values suggested to members of the Municipal Road Authority- East Division that little to no flood risk to the Don Valley Parkway was expected (Figure 7). While their operations remained elevated throughout the afternoon and into the evening commute as a precaution, their decision to do so was based on their own internal flood risk assessment. Similar to the Private Transit Authority group, Josh and his group did not wait on TRCA flood expertise or their issuance of a flood notification that day. Instead, these Municipal Road Authority-East Division and the Local Private Transit Authority relied on the statistical data TRCA produces and manages for public groups to make their respective decisions. This example hints that on October 28, 2015, in the absence of flood expertise, this key recipient found data to be a greater asset than the flood risk interpretation made by TRCA flood forecasters.

In another example, the Local Private Business (LPB) with their own flood operations policy, inclusive of institutional definitions for weather watch, flood watch and flood warning, critical thresholds for each along with different scenarios, as well as who is responsible for what in each of those scenarios, typically make their own flood judgment calls. On October 28th, Ron's assessment of flood risk to the LPB was made early in the day (8:50am) and the site was closed within minutes of seeing firsthand the flooding of the Bayview extension (1:49pm). Ron's desire to assess the risk was confirmed when he said, "quite often we'll make our own judgement calls before we read too much into the TRCA messages". His comment, "the TRCA Warning validates what we do," not only confirms Nancy's comment from before that questioned the pragmatic effect of the Warning (Lines 210-213), but also highlights that Ron is making risk assessments and decisions for the well-being of the LPB irrespective of TRCA. Ron's desire to watch on his own alludes to his enhanced perception of skill as flood risk expert. This was well illustrated by Ron at the LPB when he said, "when there's a lot of rain in the forecast we're looking at the weather and the river and we will make a decision *with TRCA* as to where things are at. We're working with the same data, so I mean yeah, we just help each other out". The use of *with* and the comment of *helping each other out* indicates the parity Ron perceives in relation to TRCA in terms of flood risk assessment expertise. At the same time that Ron boosts up his own flood risk assessment skills, however, his words are suggestive of the diminished value he places upon TRCA flood expertise, since he feels competent to carry out such a task himself. His views are similar to the sentiment shared by the Local Private Transit Authority recipient above, which

coupled with a reliance on TRCA data, suggest that data is a far more critical form of capital than flood expertise.

Discussion

On October 28, 2015, TRCA urban river Flood Warning policy shaped interaction, social relations and risk-based decision making among TRCA flood forecasters and also for key recipients of their information, although it did so differently across the groups.

As uncertainty ramped up for the Chief FDO, Ed, space opened for greater intra-agency interaction at TRCA. An analysis of face work during TRCA interaction revealed that flood risk and the pragmatic effect of TRCA notifications were perceived differently among flood forecasters as well as key recipients. The endeavor also showed how strategies of face influence the accomplishment of interactional goals and how complicated this process becomes when interactional goals are different among members of the encounter. Moreover, the flood risk assessments and decisions made by flood forecasters exemplify the relational social construction of risk-related policy through face. This adds nuance to Boholm's (2015: 106) understanding of risk as relational and situated. Specifically, the use of face in the relational production of risk assessment and management in this case illustrates how constructions are embedded within multiple social and cultural worlds, one for every member participating in the encounter. In other words, face work in interaction demonstrated the relational nature of the policy implementation and appropriation process.

Once issued, the late Warning was indicative of a weakened IR chain between TRCA and its key recipients on account of TRCA failing to meet their obligation in the established rules for group conduct. The time needs of key recipients suggest this failure had an impact since communicators noted they would have communicated and Water and

Hydro authorities mentioned they could have made different decisions had they been notified. The perspectives of the Local Private Transit Authority, the Municipal Roads Authority and the Local Private Business, and the perception of diminished value they place upon TRCA flood expertise, a resource upon which the IR chain was originally established, suggests the weakening of the IR chain goes beyond this case. The data show that for these groups in particular the social structure enabled by the IR chain is not functioning well. According to the data, a different form of TRCA cultural capital, data, is sought out as these key recipient groups employ individual agency to overcome the void. An empirical study carried out by Lewis (2013) that investigated interaction rituals in Christchurch, New Zealand after earthquakes in 2010 and 2011 demonstrated how established social structures shift in times of disaster and especially in situations characterized by uncertainty. If we consider the potential for urban river flooding as a pressure-filled situation along the same disaster continuum, admittedly not as severe as an earthquake, yet certainly one wrought with uncertainty, the response by these three key recipients to take matters into their own hands is understandable. Rather than be passive recipients of TRCA flood expertise vis-à-vis the Flood Warning, these members opted to be active participants in their assessment of flood risk.

The different perspectives of key recipients confirm Collins's (1987) assertion that the way in which micro-events and the behaviour of individuals in situations unfold is determined by where they are located in the larger network of encounters around them in time and space. Though he refers to individuals who share the same physical space, the idea helps to illustrate how members in TRCA-key recipient IR chains are themselves located in different settings across space and are part of multiple networks of encounters,

and are thus making sense of flood risk from their respective institutional viewpoints. This speaks to the influence of an organization's context in these pressure-filled, uncertain situations, or what social and behavioural scientist Anselm Strauss (1993: 249) refers to as the negotiated order during interaction. Negotiated order is the rules and policies, agreements, understandings, pacts and other work arrangements for which key recipients must also contend, over and above their IR chain membership. Here, there are multiple negotiated orders, people and policies interacting and being attended to. Notable for his contributions to the concept, Strauss's conceptual approach to negotiated order, interaction and social organization helps to explain how key recipients' actions on October 28, 2015 cannot be understood independently of the organizational context in which they exist (Strauss ([1959] 1969). To that end, key recipients' assessments of risk and subsequent actions that day, or their 'take matters into their own hands' approach, is more accurately characterized as them 'taking matters into their organization's hands' to make decisions that are in the best interests of their individual organizations. This underscores the relative nature of risk (Joffe 2003; Kasperson et al. 1988; Slovic 1999). Particularly, it shows that people give meaning and make sense of the TRCA Flood Warning, and by extension their perceived risk to flooding, from the institutional context and environment in which they are immersed.

Conclusion

Uncertainty is an inescapable component of flooding, emerging in the anticipations and interpretations of weather as well as in hydrological responses resulting from that weather; one cannot predict with complete accuracy how a watershed will respond to fallen rain. Uncertainty with respect to Flood Warning policy is no different it seems.

Grounded in Ed's comment, "I'm not 100% sure", the results of this analysis show how uncertainty contributed to risk assessments associated with policy-related decision-making. Tracing policy-related decisions in this risk context illustrated how the policy implementation process works. Specifically, the uncertainties that Ed contended with created a space for improvisation of policy. This occurred when Ed issued a Flood Watch or a notification alerting for "the possibility of flooding" in the jurisdiction, to cover the actual flooding of the Bayview Extension that afternoon. Choosing a Watch when the circumstances officially called for a Warning is an example of a creative policy solution spearheaded by Ed to manage the risk situation according to his interactional goal of making the decision that would be perceived as correct. Similarly, Ed's uncertainty afforded recipients an extra degree of reflexive latitude, arguably forcing them to tap more firmly into their local, negotiated order, for creating solutions irrespective of TRCA Flood Warning policy.

This ethnographic study highlights the human dimensions of the Flood Warning policy implementation process. TRCA perceptions of risk influenced by uncertainties and embedded within these organizational and individual belief systems informed the meanings flood forecasters associated with Flood Warning policy and influenced the group's accomplishment of interactional goals. The analysis reveals a Flood Warning policy that allows for different levels of warning, depending upon where people or groups are situated along the TRCA flood forecasters' risk gradient or continuum: those who represent key areas of vulnerability are placed high on the continuum versus those who represent areas within the jurisdiction but are not recognized by TRCA as vulnerable. That key recipients did not have similar senses of perceived flood risk that day, and

especially upon receiving the TRCA Flood Warning, signifies that the semantic association made between flood threat and risk by TRCA was not shared nor established effectively with their intended users.

Goffman's notion of the interaction ritual and Collins's notion of the IR chain helped to explain the special relationship TRCA has with its key recipients and how each group is expected to conduct themselves during flood encounters. The results revealed that Warning interaction failed for some key recipients to cement perceptions of TRCA flood expertise, and by extension the agreed upon cultural capital or resource circulating in the respective IR chains. As such, this case demonstrates that while TRCA may be the official handler of urban river flood warning policy in the area and the authoritative source of river flood warning notifications for key recipients, their expert knowledge has not been legitimized across the board, and this is especially so for groups who need and use flood information prior to the onset of potential or real impacts. Therefore, the findings here call for greater attention to be placed on what TRCA risk-based Flood Warning policy is, who it is for, how it works, and what it achieves, especially in uncertain urban river flood risk circumstances. TRCA flood forecasters were similarly curious about the intention of official Flood Warning, as noted by Stuart when he said in Lines 184-187:

TRCA Office
October 28, 2015

184 Stuart: Maybe what we're saying in the Flood Warning
185 is we want people to be aware that precipitation continues to fall
186 will still come
187 and that we're not out of the woods yet.

This curiosity also existed for recipients, but with respect to who the policy is intended for. As Ron from the LPB noted: “When TRCA is sending out advisories like this {pointing to the October 28, 2015 Flood Warning}, it is not targeted to a specific organization; it’s targeted to the community at large”.

The anthropological approach is valuable here for the light it brings to the human dimensions of policy implementation and use, its interconnections with uncertainty and risk. The methodology of being there and focusing on the interactional nature of policy and risk in ambiguous river flood situations magnified contextual nuances associated with policy to offer a more broadened understanding for how policy is understood and experienced at the local level, how it works and how it is worked into operational decision-making. These results expose useful evidence-based considerations should TRCA policy-makers look toward diminishing the uncertainties their flood forecasters face during flood events. One consideration is to establish rules surrounding the contextual features of policy, such as the extent and impact of water, to diminish the conceptual gambles flood forecasters take during flood situations that are less than 100% certain. Second, greater efforts could be made toward enhancing inter-agency coordination and understanding of recipient groups’ time needs and uses for information. Doing so builds more synergistic relationships with recipient groups and would enhance the utility of the services TRCA provides.

References

Bakhtin, M.M.
1981 *The dialogic imagination: Four essays*. University of Texas Press.

Bargiela- Chiappini, F.
2003 Face and politeness: (new) insights for (old) concepts. *Journal of Pragmatics*. Vol. 35(10-11): 1453-1469.

Bernard, R.H.
2002 *Research methods in anthropology: qualitative and quantitative approaches (3rd ed.)*. Walnut Creek, California: Altamira Press.

Blommaert, J.
2005 *Discourse: A critical introduction*. Cambridge: Cambridge University Press.

Boholm, Å
2015 *Anthropology and Risk*. Routledge: London and New York.

2003 The cultural nature of risk: Can there be an anthropology of uncertainty?. *Ethnos.* Vol. 68(2): 159-178.

1998 Comparative studies of risk perception: a review of twenty years of research. *Journal of Risk Research.* Vol. 1(2): 135-163.

Bohom, Å. and H. Corvellec
2011 A relational theory of risk. *Journal of Risk Research*. Vol. 14(2): 175-190.

Bradbury, J.
1989 The policy implications of differing concepts of risk. *Science, Technology and Human Values.* Vol. 14(4): 380-399.

Brown, P. and S. Levinson
1987 *Politeness: Some Universals in Language Usage*. Cambridge University Press.

Collins, R.
2004 *Interaction ritual chains.* Princeton University Press.

1987 Interaction ritual chains, power and property: The micro-macro connection as an empirically based theoretical problem. In *The micro-macro link*. J.C. Alexander, B. Giesen, R. Münch and N.J. Smelser (eds.). University of California Press. Pp. 193-206.

Douglas, M.
1992 *Risk and Blame*. London and New York: Routledge.

1986 *How institutions think*. Syracuse University Press.

1985 *Risk acceptability according to the social sciences*. New York: Russell Sage Foundation.

Douglas, M. and A. Wildavsky
1982 *Risk and culture: An essay on the selection of technological and environmental dangers*. University of California Press.

Ferguson, J. and A. Gupta
2002 Spatializing states: Toward an ethnography of neoliberal governmentality. *American Ethnologist.* Vol. 29(4): 981-1002.

Fine, G.A. and T. Hallett
2014 Group Cultures and the Everyday Life of Organizations: Interaction Orders and Meso-Analysis. *Organization Studies*. Vol. 35(12): 1173-1792.

Flynn, J., P. Slovic and C.K. Mertz
1994 Gender, race, and perception of environmental health risks. *Risk analysis.* Vol. 14(6): 1101-1108.

Goffman, E.
1981 *Forms of Talk*. University of Pennsylvania Press.

1967 *Interaction Ritual: Essays in Face-to-Face Behaviour*. Garden City, N.Y: Doubleday.

Gumperz, J.
1977 The Sociolinguistic Significance of Conversational Code-Switching. *RELC JOURNAL,* Vol. 8(2): 1-34.

Gusterson, H.
1997 Studying up revisited. *Political and Legal Anthropology Review*. Vol. 20(1): 114-119.

Hallett, T.
2007 Between deference and distinction: Interaction ritual through symbolic power in an educational institution. *Social Psychology Quarterly*. Vol. 70(2): 148-171.

Haugh, M.
2009 Face and interaction. In *Face, communication and social interaction*. F. Bargiela-Chiappini and M. Haugh (eds). Equinox. Pp. 1-30.

Henstra, D. and J. Thistlewaite
2017 Climate change, floods and municipal risk sharing in Canada. *IMFG Papers on Municipal Finance and Governance.* Pp. 1-44.

Jick, T.D.
1979 Mixing qualitative and quantitative Methods: Triangulation in action. *Administrative Science Quarterly*. Vol. 24(4): 602-611.

Joffe, H.
2003 Risk: From perception to social representation. *British Journal of Social Psychology*. Vol. 42(1): 55-73.

Kasperson, RE, R. Ortwin, P. Slovic, HS Brown, J. Emel, R. Goble, JX Kasperson, and S. Ratick
1988 The Social Amplification of Risk: A Conceptual Framework.*" Risk Analysis*. Vol. 8(2): 177-187.

Kristeva, J.
1984 *Revolution in Poetic Language*. New York: Columbia University Press.

Lefebvre, H.
2009 State. *Space, World: Selected Essays*. University of Minnesota Press.

Lewis, K.V.
2013 The power of interaction rituals: The student volunteer army and the Christchurch earthquakes. *International Small Business Journal*. Vol. 31(7): 811-831.

Martin, E.
1997 Managing Americans: Policy and changes in the meanings of work and the self. In *Anthropology of Policy: Perspectives on governance and power*. C. Shore and S. Wright (eds). Routledge: London and New York. Pp. 183-197.

Mayer, A. T. O'Connor-Shelley, T. Chiricos and M. Gertz
2017 Environmental risk exposure, risk perception, political ideology and support for climate policy. *Sociological Focus*. Vol. 50(4): 309-328.

Painter, J.
2006 Prosaic geographies of stateness. *Political geography*. Vol. 25(7): 752-774.

Però, D.
2011 Introduction. In *Policy worlds: Anthropology and the analysis of contemporary power*. Shore, Cris, Susan Wright and Davide Però (eds). Bergahn Books: New York, Oxford. Pp. 223-226.

Pennesi, K.
2013 Predictions as lies in Ceará, Brazil: The intersection of two cultural models. *Anthropological Quarterly*. Vol. 86(3): 759-790.

2011 Making forecasts meaningful: Explanations of problematic predictions in northeast Brazil. *Weather, Climate and Society*. Vol. 3(2): 90-105.

Petryna, A.
2015 What is a horizon? Navigating thresholds in climate change uncertainty. In *Modes of uncertainty: Anthropological cases*. L. Samimian-Darash and P. Rabinow (eds). University of Chicago Press. Pp. 147-164.

Reinhold, S.
1994 Local conflict and ideological struggle: Positive images and Section 28. *Unpublished D. Phil thesis in Social Anthropology*. University of Sussex. Pp. 477.

Roncoli, C., B. Orlove, M. Kabugo and M. Waiswa
2011 Cultural styles of participation in farmers' discussions of seasonal climate forecasts in Uganda. *Agriculture and Human Values*. Vol. 28(1): 123-138.

Ruhi, S.
2009 Evoking face in self and other presentation in Turkish. In *Face, communication and social interaction*. F. Bargiela-Chiappini and M. Haugh (eds). Equinox. Pp. 155-174.

Samimian-Dariash, L. and P. Rabinow
2015 Introduction. In *Modes of uncertainty: Anthropological cases*. L. Samimian-Darash and P. Rabinow (eds). University of Chicago Press. Pp. 1-9.

Sandstrom, K.L., D.D. Martin and G.A. Fine
2010 *Symbols, selves and social reality: a symbolic interactionist approach to social psychology and sociology* 3rd edition. New York and Oxford: Oxford University Press.

Schwegler, T. and M. G. Powell
2008 Unruly Experts: Methods and Forms of Collaboration in the Anthropology of Public Policy. *Anthropology in Action. Vol.* 15(2): 1– 9.

Shore, C. and S. Wright
2011 Conceptualizing policy: Technologies of governance and the politics of visibility. In *Policy worlds: Anthropology and the analysis of contemporary power.* Eds Shore, Cris, Susan Wright and Davide Però. Bergahn Books: New York, Oxford. Pp. 1-25.

1997 Policy: A new field of anthropology. In *Anthropology of policy: Critical perspectives on governance and power.* Eds. C. Shore and S. Wright. Routledge: London and New York. Pp. 3-42.

Slovic, P.
1999 Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk analysis.* Vol. 19(4): 689-701.

Slovic, P. and E. Peters
1998 The importance of worldviews in risk perception. *Risk Decision and Policy.* Vol. 3(2): 165-170.

Smith, D.E.
2005 *Institutional ethnography: A sociology for people*. Rowman Altamira Press.

Spencer-Oatey, H.
2009 Face, identity and interactional goals. In *Face, communication and social interaction*. F. Bargiela-Chiappini and M. Haugh (eds). Equinox. Pp. 137-154.

Stone, D.A.
1988 *Policy paradox and political reason*. Harper Collins.

Strauss, A.
1993 *Continual permutations of action.* Routledge

[1959] 1969 *Mirrors and Masks.* San Francisco: Sociology Press.

Summerson Carr, E.
2010 Enactments of expertise. Annu. Rev. Antrhopol. Vol. 39: 17-32.

Taddei, R.
2012 The Politics of Uncertainty and the Fate of Forecasters. *Ethics, Policy & Environment*. Vol. 15(2): 252-267.

Wedel, J.R., C. Shore, G. Feldman and S. Lathrop
2005 Toward an anthropology of public policy. *The ANNALS of the American Academy of Political and Social Science.* Vol. 600(1): 30-51.

Weinstein, N. D.
1989 Optimistic biases about personal risks. *Science.* Vol. 246(4935): 1232-1234.

Wright, S. and S. Reinhold
2011 Studying through: A strategy for studying political transformation. Or sex, lies and British politics. In *Policy worlds: Anthropology and the analysis of contemporary power.* Shore, Cris, Susan Wright and Davide Però (eds). Bergahn Books: New York, Oxford. Pp. 86-104.

Chapter Four
Policied versus *unpolicied* urban flood risk: The social construction of early warning (un)acceptability in Toronto, Ontario

Introduction: The Non-River Flood Disaster at 501 Alliance Ave.

August 8, 2018

> "The water was just approaching our necks," XX {referencing the name of one of the men rescued} said. To say that there was about a foot of height left until we reached the ceiling would be pretty accurate".[23]

The opening vignette hints at the harrowing experience of two men who narrowly escaped drowning at 501 Alliance Ave. in Toronto, Ontario during the evening of August 8, 2018 when a fast-moving storm dumped 72.3mm of rain between 9 and 11pm in the city. Largely unaware of the magnitude of the storm and the associated flood risk it generated, at 10:40pm these two industrial designers decided to take the elevator to the underground parking lot when suddenly it stalled, trapping the two; waters rose steadily, leaving them in dire need of emergency assistance. The police arrived to the scene with approximately one foot of airspace between the water and the ceiling[24], and because of their efforts, the rescued men live to tell the tale of the night their decision to stay late at work took an unexpected turn.

The flash flood disaster during the evening of August 8, 2018 was urban pluvial in nature, or the non-river flood type, which represents a newly emerging risk in Toronto. Non-river flood risk is not formally warned for in the City because early warning policy

[23] https://www.thestar.com/news/gta/2018/08/08/two-men-rescued-from-flooded-elevator-during-torontos-heavy-rain-tuesday.html
[24] (https://www.cbc.ca/amp/1.4777111)

does not exist for any single organization to issue advanced notifications to the public. Policy does exist, however, for the more well-established river flooding in Toronto, or the type resulting from overflowing watercourses. Inspired by the differing ways these flood risks are managed in Toronto, in the following pages I investigate how discourses of flood risk in Toronto have evolved to allow for different policy possibilities. Specifically, river flood risk discourse has enabled the construction and maintenance of early warning policy whereas the emergence of a non-river flood risk discourse has opened up possibilities for ad-hoc warning practices, short-term response strategies, and long-term mitigation solutions.

Using the August 8, 2018 non-river flood disaster as the backdrop for this investigation of *policied* and *unpolicied* urban flood risk, I argue that current non-river flood risk management in Toronto, coupled with the incoherence surrounding non-river flood risk, leaves the general public on their own to prepare and protect themselves against the sudden onset of flooding in Toronto, a threat for which they are neither experts in meteorology nor hydrology. I do this first by presenting river flooding as a *policied* risk, one representative of a dominant risk discourse. I then describe the emergence of non-river flooding in Toronto as a new(er) social threat, which has contributed to the emergence of a non-river flood risk discourse in the City. Physical challenges, such as difficulties in urban non-river flood forecasting, urbanization and a changing climate, are then discussed to illuminate their influence on the discursive construction of meteorological impossibility when it comes to non-river early flood warning generation. I show how the theme of impossibility creates space in the discourse for alternative risk management possibilities other than early warning while

simultaneously constructs social acceptability of this practice as existing beyond the sphere of public accountability. I situate this investigation of policy and risk in discourse theory to explain the reciprocating feature of discourse with mental models and knowledge in society. The endeavour is productive in so much as it opens up anthropology of risk and policy studies to new domains and shows how risk and policies related to their associated management and creation work at the level of discourse.

Discourses, Risk and Policy

Risk and its management through policy have become a common type of organizational governance (Power 2007: 9). Policy is defined here as a course of action pursued by government, enacted through social interaction, embedded within particular social and cultural worlds (Shore and Wright 2011: 1; Wedel et al. 2005: 40), and entrenched within varying institutional frameworks and observer viewpoints (Power 2007: 111). Power's contribution to the *Oxford Handbook of Sociology, Social Theory and Organization Studies* speaks to the growing desire to tame uncertainty in risk situations, which has led to the establishment of specific roles in society, such as risk manager, and a broader, embedded discourse on risk and the need to control or manage it. Thus, risk management has become a powerful organizing category (Power 2014: 370) and related policy has evolved as the traditional mechanism of choice, or the logical decision and approach to account for the increased range of perceived threats publics experience (Henstra 2011: 418). This rationally-based governance mechanism and structure stems from the advancement of the welfare state, also referred to as the regulatory state, in the latter half of the 20th century (Rothstein et al. 2006), where one of government's primary objectives was to protect and promote the well-being of its citizens.

This process and eventual structure of governance was aided by the evolution of the concept of *the social* in society as explained by social theorist Nikolas Rose. In his interrogation of the concept in the context of government and governance, Rose asserts that *the social* is a type of social simulation characterized by social relations with material effects. Upon its embrace, *the social* "set the terms for the way in which human intellectual, political and moral authorities in certain places and contexts, thought about and acted upon their collective experience" (Rose 1996: 329). His discussion reveals how the idea of the social become stabilized, so much so that demands come to be made and actions come to be taken in the name of the social, or grounded in the established social relations between people and their government. In a similar way, sociologist Stephen Crook (1999: 175) talks of the ordering of risk and how the ordering of risk identification, risk assessment and management practices feeds back into and amplifies the efficacy and legitimacy of these practices. Rose's contribution is helpful in so much as it assists in our understanding of how and why government rationalities, mechanisms for governance and risk management have evolved over time, while Crook's highlights how risk and its ordering also creates stability in the management of risk as well as in the relationship of people and the government.

Given such stabilization it is unsurprising that there has been an associated expansion of risk management discourses to include the public and their desire to hold their government accountable for protection. This desire has been noted by Power in the way that he discusses the presence of an augmented public expectation with respect to the government decidability and management of danger (Power 2007: 5). While recently there has been a move away from government regulation, disaster risk management is

one area where disaster scholars still advocate for government involvement (Henstra and McBean 2004). Especially in the realm of flood risk, proposals for management centre on shared responsibility, as political scientists Thistlewaite, Henstra and others describe government involvement in their analysis of relational aspects of flood experience, risk management, and public expectation (Henstra and Thistlewaite 2017a/b; Henstra et al. 2018; Thistlewaite et al. 2017). Thistlewaite and Henstra (2017), in particular, describe the interest in developing policies that distribute the responsibility for flood risk reduction and the burden of costs with other levels of government and non-governmental actors in Canada, primarily through advancing development of floodplain mapping. Greg Feldman's (2005) examination of the Estonian nation-state, security and the discursive construction of Russian speakers is useful here despite its different context. In this work, Feldman shows how ideas are constructed as problems and then how these problematic ideas become legitimized within dominant discourses. His discussion resembles the evolution of risk management structures discussed above, and in particular it approximates the development of urban river flood risk discourse in Toronto that is discussed below. The way Feldman situates policy in its enabling discourses is useful since I endeavour to do the same with respect to policy and risk on the topic of urban flooding.

In this chapter, I consider risk as a danger to someone or to something that bears value. Risk in flood contexts has been assessed by physical scientists as an ontological reality or as an object of discrete materiality. Risk analysis expert Henry Rothstein and colleagues (2006) provided a discursive take on the concept when they reported risk as an instrument to organize decision making. Despite its use as a key concept for regulating

behaviour in society, social science research has been helpful for reminding us that risk is a socially and relationally constructed concept wherein experience is woven together with notions of uncertainty, value, and context (Boholm 2015). In particular, social scientists have theorized risk as a learned phenomenon based in culturally structured evaluations of the world (Boholm 1998, 2003; Boholm and Corvellec 2011; Rappaport 1996); and grounded in values, symbols, histories, and ideologies, and representative of unique ways of thinking (Douglas 1992: 46; Weinstein 1989). Douglas's cultural theory on risk points toward social context as key in shaping individual cognitive and affective assessments of risk (Douglas and Wildavsky 1982). Thus, in accordance with the social scientists noted above, I similarly contend that evaluation of the physical environment is done through social systems or made sense of socially. In other words, when floods happen social elements give meaning to their occurrence, and from this arises highly individualized social experiences and constructions of personal threat from it. It follows from this description that predating the ability for risk to regulate and organize as Rothstein suggests, it must first be socially constructed as a problematic requiring management. These constructions shape broader discourses on risk and contribute to the development of political rationalities surrounding flood risk and its management.

Here, I investigate the discourses surrounding urban flood risk and policy in Toronto, Ontario. I draw primarily on aspects of van Dijk's (2014) conceptual approach to discourse, particularly his theoretical description of the triangulated relationship among discourse, mental models and knowledge in society by way of coherence. Discourse, according to van Dijk (2014: 12), is a form of social interaction in society; it is simultaneously an expression as well as a reproduction of social cognition, which

represents shared beliefs, norms and values. This points to the dialectical nature of discourse, or that local and global structures condition discourse but also that discourse makes it possible for the local and global structures to emerge in everyday life as social representations of broadly shared knowledge. Van Dijk further contends that mental models account for these local and global structures of discourse and are the building blocks for the reliable construction and representation of these overarching structures as well as our everyday experiences (van Dijk 2014: 25). Mental models accomplish this, van Dijk argues (2014: 52), by functioning as the starting point for all semantic understanding by, for instance, enabling causal and temporal relations between events. Van Dijk's perspective on mental models as a mechanism for meaning creation is in keeping with Stevens and Gentner (1983) who postulate mental models are cognitive frameworks that guide reasoning, organize thoughts and emotions, and Craik (1943) who viewed mental models as the overarching structure enabling people to construct versions of reality. Altogether, scholarly research has converged to reflect the power of mental models in shaping perceptions, showing that they have significant predictive power in helping people to understand and make qualitative inferences about their physical environment (Norman 1983).

The differing mental models held by groups has to do with how words and ideas are arranged in our minds. This process of arranging and its influence on the structuring of reality harkens back to the seminal writings of Benjamin Whorf (1956), as noted in chapter two (p. 43). Whorf's perspective on the philosophy of language confirmed the inter-connections between language, thought and behavior, and in this way demonstrates the influence of these elements on the construction of mental models. Furthermore, the

insight he offered in this early example is useful for my explanation on the conceptualized differences regarding risk and urban presented in this chapter, and the influence and impacts of these habitual understandings on behaviours related to urban non-river flood risk management.

Habitual thought and meaning has guided the development of mental models and discourse, and reciprocally, discourse and mental models produce meaning by providing a mutually constitutive framework for understanding, unpacking and creating understanding. Understanding and meaning are considered here as a type of knowledge and its acquisition is defined here in two ways: first as general knowledge, or the tacit, socially shared, justified and generally accepted social beliefs and their discursive reproduction in cultural communities and society at large (van Dijk 2014); and second, as specialized knowledge, or a type of knowing particular to epistemic groups whose members share in a specific activity, goal, attitude or ideology (van Dijk 2014). These different knowledge systems are intimately related to how people mentally construe and represent events as well as to broader discourses or patterns of thought surrounding ideas. Complementing van Dijk's explanation of epistemic groups, in the following pages I draw on Quinn's (2005) understanding of cultural models, described by her as the shared understanding of the world that has been learned and internalized by a group of people, to explain the shared connections between epistemic groups. Combining van Dijk and Quinn's insight, linkages are made between cultural models, the specialized knowledge guiding them, and the context of interpretation and action that enables mutual understanding, interaction and engagement for members of epistemic groups in different risk situations.

Critical to this triangulated relationship are the mechanisms enabling these conceptual links, or the knowledge devices used to shape comprehension. An example of a knowledge device is coherence, paraphrased here to mean the logic and reasoning developed through indirect relations between the facts referred to in the discourse and those represented subjectively in the mental model (van Dijk 2014). Coherence connects and shapes the inter-related concepts of discourse, models and knowledge by establishing sequences of understanding, such as helping to frame: what we know, how we know or came to know, how well we know, along with what needs to be done now based on our knowing (van Dijk 2014). Further facilitating our understanding of the *how* behind urban flood risk discourse and the differing strategies and solutions that have evolved over time, I tie van Dijk's concept of coherence to others who have studied anthropology or discourse in policy and other contexts. Macgilchrist's (2016) insight on breakdown and dissonance in discourse, for example, is helpful for understanding circumstances of incoherence, or the possibilities that come about from fissures or breakdowns of understanding. Linguist Paul Chilton (2004) for instance, in his efforts to show the function of language in how people constitute their everyday worlds, describes features of discourse that help generate coherence during communication such as interaction, spatial cognition, metaphorical reasoning and connections between the emotional centres of the brain. Chilton's efforts are worth acknowledging here to remind us that the models we use to make sense of and represent events, or more generally to develop coherence, are interactive. His point of view harks back to Norman (1983: 7) and to Strauss and Quinn (1997: 3) who all emphasize interaction as an essential mediating force in meaning creation as well.

The way that van Dijk and others weave together discourse, mental models and knowledge is useful because it provides suitable theoretical grounding as I follow the emergence of urban flood risk discourse in Toronto and trace its connections to the way people make sense of flooding and risk in their everyday life as well as the rationalities exercised toward differing governing strategies. This background is helpful in so much as it assists our understanding of policy ideals, policy behaviour, as well as perceptions of risk and responsibility in the urban flood context.

Methods

In this paper, I make policy the object of analysis (Wedel et al. 2005; Wright 2006) and use it as a window to understand how discourses shape, and are shaped by, mental models, and how these reciprocating features of discourse, belief and situated interests generate knowledge and different policy solutions when it comes to river and non-river flooding in Toronto. I take a *coherentist approach* (van Dijk 2014: 28) to discourse in the way that I look at discourse as the source of knowledge produced by reasoning and as a basis for inferences that are collectively produced and shared in a community. To that end, the premise for my paper is not experiments or analysis of talk, text or language used during interaction, but instead the coherence and incoherence that develops over time through knowledge acquisition through discursive practices, and those represented by interview and survey responses with public groups.

These insights were made possible from data I collected during fieldwork observations, as well as survey administration and face-to-face and telephone, one-on-one interviews (Bernard 2002). Specifically, I spent time with flood forecasters at the Toronto and Region Conservation Authority (TRCA) who comprise an epistemic group of bureaucratic actors and experts, or individuals with the qualifications and credentials to

validate their mastery of forecast and warning as it relates to watersheds (Schwegler and Powell 2008: 4). This included 18 visits, one hour or more in length, to attend meetings, participate in river flood warning and response simulation exercises, or observe forecasters as they assessed the day's river flood risk. In addition to the insight gleaned from TRCA flood forecasters (n=12), I collected viewpoints from (key recipients of TRCA flood warning information, referred to here as) institutional representatives (n=15), on-air communicators (n=10) and members of the general public (n=10) over a 17-month period between May 2015 and October 2016 where I measured their variable understandings of, perceptions of risk toward, and decision-making behaviours during flooding in urban areas.

Institutional representatives occupy formal positions within the City's flood response network and are considered key recipients of TRCA urban river early flood warning policy. These individuals were reported by TRCA as using TRCA flood information in their operational role as decision-makers and are employed in either private business or municipal departments in the City, such as emergency managers, and representatives from the water authority, hydro, roads, and the public school board. On-air broadcasters have education ranging from journalism to meteorology. Each has reached anywhere from undergraduate to graduate levels of completion and are employed by either private weather organizations or major television networks to present weather and flood information to the general public. Institutional representatives and on-air communicators represent multiple epistemic groups each with their own cultural model guiding their interpretations. The 10 members of the general public, or the intended recipients of communicated flood information, reside in various locations in Toronto and

hold a range of employment and/or life positions, including teacher, parent, manager with corporate company, foreman in construction, student, and retiree.

All participants in this study were selected purposively since they represent groups directly involved in either producing, communicating or using flood information, and they offer a diverse range of viewpoints on the topic given their varying geographic locations, employment positions, and perceptions of risk and behavior toward 'urban' flooding. In particular, the perspectives of TRCA flood forecasters, institutional representatives and on-air communicators demonstrate my efforts to *study up,* as Nader called for years ago (1974), and illustrate the multiple spaces risk-related flood policy discourses take shape. For institutional representatives, interviews were all held in participants' offices, whereas with on-air communicators and the general public, interviews were held in coffee shops and even at picnic tables in the park. For individuals who preferred, a survey was administered, completed and then returned via email or retrieved in person. Overall, interviews lasted anywhere between one-half to two hours and resulted in approximately 854 minutes of recorded talk, which was then coded and analyzed using Atlas.ti, a qualitative software analysis program.

TRCA Urban River Flood Policy

The development of Toronto and Region Conservation Authority's (TRCA) urban River Flood policy for the City of Toronto is an example of a rational approach to risk management motivated by social experience emerging from and couched within a broader urban river flood risk discourse. This preparedness strategy intended to mitigate the risk to life and property was formalized on the heels of October 15, 1954 Hurricane Hazel, an event where 81 people were killed, thousands were left homeless and

significant financial damages were incurred[25]. In response to the loss of life and lack of preparation, Toronto, other municipalities and the province of Ontario developed a comprehensive plan for flood control and water conservation, which included the public acquisition of vulnerable land and restrictions on development in the City's west-end floodplains near the Humber River, as well as the development of the organization's river Flood Forecast and Warning Service. The next major enhancements to TRCA urban river flood policy arose following the more recent and similarly historical July 8, 2013 flood in Toronto. At this time a relatively organized thunder storm suspended itself over Toronto, dropped over 90 mm of rain in two hours and caused extensive non-river flooding (Figure 8), social disruption, and power outages across the city. Developed for municipalities and residents within TRCA jurisdiction, this service for dealing with flood contingency planning in the City is a shared responsibility by municipalities, conservation authorities and the Ministry of Natural Resources, on behalf of the Province (TRCA 2013: 308).

The creation of TRCA urban river flood risk-related policy in 1954 was a classificatory act that made river flooding an officially identified risk in the region and a problem amenable to authoritative action (Rose 1996: 331). The establishment of policy was a discursive tactic that reduced intra-group variability for TRCA in so much as the strategy served as a suitable framing mechanism wherein dangers became organized in flood forecasters' minds (Douglas 1992). Echoing Douglas, and in agreement with Sandstrom, Martin and Fine's (2010: 55) perspective on organizational theory, the process of *policying* river flood risk assisted in the organization of flood forecasters' perceptions around the flood risk concept, transformed ideas about the concept from

[25] http://www.hurricanehazel.ca

something abstract into a social object, promoted a shared collective meaning and inspired a common mode of response. Experts in frame analysis would similarly contend that the classification initiated sense-making for flood forecasters and their interactions as bureaucratic experts (Entman 1953: 52; Goffman 1974).

By instituting early warning river flood policy, risk was not only defined for this expert epistemic group, but defined in specific ways. The configuration of ideas surrounding TRCA river flood policy introduced mandates for the type of flooding TRCA flood forecasters were responsible for managing and also the types for which they were not. As urban river flood policy stipulates, TRCA must address flooding that occurs along watercourses or river flooding, yet they have no responsibility for the variety that arises away from the rivers or non-river flooding, colloquially referred to as 'urban flooding'. Thus, this policy move provoked flood forecasting experts to locate and respond to risk based on where it exists geographically within the watershed. In this way policy shaped the cultural models of flood forecasters by giving institutional authority to urban river flood risk as critical to manage while simultaneously closing off urban non-river flooding as unworthy of official attention (Shore and Wright 1997: 14).

On the forecast floor, the classification prompted different conversations and different engagement among flood experts. It stimulated the organization of meetings wherein flood forecasters discussed river flood risk levels and appropriate action depending on the situation. It initiated a shift in work tasks to include daily assessment of river flood risk. Over time and through policy-based interactions, TRCA flood forecasters developed informal conventions, or institutional ways of thinking and acting, which further guided their understandings of the official classification and designation of urban

river flood risk (Douglas 1986: 46). In keeping with anthropologist Mary Douglas who saw thinking as dependent upon institutions, flood forecasters' informal rules and conduct acted alongside policy on the flood forecasting floor and helped to stabilize the risk as problematic, shape their organizational activity (Fine and Hallet 2014), and thus reinforce appropriate patterns of policy deployment. This was instrumental for TRCA as an epistemic group in the way that it guided forecasters' specialized knowledge and the cultural models they employed in their common endeavor of governing in accordance with the official flood policy (van Dijk 2014). In addition to shaping perception and the mental models employed to make sense of urban river flood risk, discourse surrounding policy produced and reproduced the everyday practices of flood forecasters, particularly by enacting new ways of acting and inculcating new ways of being, as linguist Norman Fairclough (2016: 89) suggests is an expected effect of policy-related discourse.

Urban river Flood Warning policy at TRCA is a classic ordering of risk in terms of Crook's (1999) definition of the phrase and operates as an agreement government has made with public groups to be accountable to citizens for flood risk as it relates to overflowing watercourses. Launching the policy not only set up the terms of important reference related to risk but also legitimized how the risk was to be managed for the protection of publics. In Toronto, urban river flood risk is managed through the deployment of policy, which involves issuing early notifications such as a Flood Watch when "flooding is possible in specific watercourses or municipalities" and a Flood Warning when "flooding is imminent or already occurring in specific watercourses or municipalities."[26] Deploying policy is akin to putting the discourse into practice and

[26] https://trca.ca/conservation/flood-risk-management/understand/

delivering the *policied* risk message to TRCA's targeted audiences. As per TRCA urban river Flood Warning policy, early warning risk messages are delivered via electronic transmission to key recipients within municipalities, local agencies, school boards, and the media (comprised of on-air communicators with major television news networks), or via Twitter, a popular social media platform. Recipients are then responsible for relaying the message to appropriate individuals and departments within their organizations and activating municipal emergency response procedures, which may or may not include taking actions to warn local residents[27]. The reception of the risk message constructs for individuals what qualifies as risk, establishes for recipients the objects and subjects at risk, and also gives those individuals reading the risk messages a sense for who to expect this information from. Thus it shows, borrowing from political discourse analyst Arthur Borriello (2017), how policy operates to rhetorically construct a common sense in publics surrounding urban flood risk. It does so by shaping their mental models and producing shared general knowledge. In this way, mental schemas generate, and are generated by, policy-informed interactional practices to create a shared sense of understanding. This is similar to the point made by sociologist Dorothy Smith (2005) in her conceptualization of texts as coordinators of activities. Considering her insight here as it relates to the creation of policy, its negotiation as well as its interpretation upon issue, in this chapter I show how policy ideals exist in the local settings of people's everyday worlds and also in those settings occupied by the ruling relations, such as government bureaucrats. It coordinates by inspiring that common ground in the public and also by regulating work of flood forecasters and their accountability to the public.

[27] https://trca.ca/conservation/flood-risk-management/understand/

Once the river flood notification has been issued by flood forecasters, or once TRCA policy has been implemented and the risk message is enroute to its targeted destination, it travels across space to environments where institutional representatives, on-air communicators and members of the general public choose to review, make their own interpretations, and their own decisions to re-communicate the message or use it as a guide in their protective responses to the risk situation. These public user groups are socially organized in terms of their own official rules, informal conventions and cultural or mental models, which challenges the automatic uptake of the singular understanding put forth by TRCA in their risk notification. Put another way, as the risk message travels across space it encounters institutional representatives and communicators, who belong to different epistemic groups belonging to different negotiated orders. Each of these groups have their own organizational purposes, goals and modes of communication, and as result a collision of ideals, understandings and action may occur. Thus, while episodic river flood experiences and TRCA's issuing of flood notifications attempts to bridge inferences and generate a degree of coherence among multiple social groups, the organizational demarcations between the agency and its user groups highlights the varying models of thought that exist. This explanation lends to our understanding of factors involved in the variable nature of social cognition, or those elements that have the ability to impede the penetration of dominant flood risk discourse.

TRCA urban river Flood Warning policy is an instrument for governance that assists in the propagation of discourse by conjuring across spaces: it focuses bureaucratic decision-making, triggers publics' sense-making and response behaviours, and operates to reinforce political rationalities. The notion that policy 'conjures' is an expression of its

ability *to do* things, a position on which most anthropology of policy scholars would agree. In fact, scholars in this field tend to imbue policy with many agentive qualities, such as the ability for it to shape social life, or to organize, classify, appropriate, stabilize and legitimize ideas (Shore and Wright 1997, 2011). In other words, sentiment exists toward policy as having the capacity to shift action as an actant (Akrich and Latour 1992: 259), and trigger belief, decision making, identity creation, or the perpetuation of the ideals upon which policy is based. At the same time, Shore and Wright (2011: 20) remind us of the relational nature of policy, reporting that it is only as policy enters into relations with actors, objects and institutions in different domains that its acting as an actant is made possible. To that end, policy may initiate a relation, but the interaction with the actor, object or institution is the catalyst needed to bring policy to life, or to make it possible for policy to achieve social effects.

Altogether, the deployment and uptake of TRCA urban river Flood Warning policy points to the interactive features of discourse, or how social relations operate in and through discourse. The interactions that have evolved over the years between TRCA flood forecasters and the official rules, those that have occurred amongst this group who negotiate the policy and implement it, as well as the interactions between this group and their key recipients, highlights the reciprocal, mutually reinforcing nature between policy and perception. Similar to what Fairclough (2016: 88) describes as the dialectical relationship of discourse between semiotic and social elements, policy helped to establish understanding, which influenced social practices, which then mediated the relationship between overarching knowledge structures and events. The repetition of this process strengthens intra and inter-organizational institutions surrounding river flood risk and

perpetuates the ideals and logics groups draw upon as they negotiate TRCA's risk-based policy in everyday practice. In this way, policy perpetuates and strengthens the urban river flood risk discourse more broadly across multiple social spaces. Reciprocally, this process worked, and continues to work, to legitimize the policy that has been established for urban river flood risk management and generate social acceptability surrounding these measures, although acceptability is not without its challenges as the discussion above (and Chapter 3) conveys. The socially motivated nature behind the creation of TRCA's urban river flood policy and its subsequent changes demonstrates how policy does not always originate with political actors conversing in bureaucratic settings. Instead, political rationalities for policy were shown to be inspired by experiences with the historic Hurricane Hazel flood event. This event contributed to the construction of an ideal that river flood risk was important, which assisted in the creation of a discourse on urban flood risk, which then informed the political ideal surrounding the risk, and following this, the establishment of its appropriate management through early warning notification.

Non-River Flood Risk in Toronto

Non-river flood events are occurring in Toronto with greater frequency and, as a result, are constructing broadly held notions that non-river flooding is threatening. This is challenging the prominence and attention that has been historically given to river flooding. The emergence of non-river flooding as a social threat coupled with the physical challenges in managing this type of risk has contributed to the construction of an alternative flood risk discourse, this time a non-river flood risk variety, except that it is emerging differently than urban river flood risk discourse in so much as it is eclipsing certain policy possibilities. In other words, while river flood risk has been socially

identified, organized through policy, and delivered to publics for many years vis-à-vis risk messages constructed by flood forecasters at TRCA, the emergent beliefs and models of thought surrounding non-river flood risk management have centred mostly on short-term response strategies and long-term mitigation solutions. The social acceptability of these risk management initiatives have contributed to the construction of a discourse whereby early warning exists beyond the realm of public accountability; it has contributed to keeping this risk *unpolicied* in the way that it has neither been formally classified nor delivered through a formal policy mechanism. This has been enabled by what Rothstein (2003: 87) would characterize as the 'institutional attenuation phenomenon' whereby processes in place serve to diminish perceptions or awareness of risk, and/or diminish perceptions of policy importance of associated regulations. The result is a type of 'organized irresponsibility' or regulatory neglect when it comes to non-river flood risk early warning, according to German sociologist Ulrich Beck (2015: 76), where government agencies and organizations are not made liable for providing advanced notice of non-river flood risk to those affected.

Urban Non-River Flooding: A New(er) Social Threat

The non-river flood near-disaster at 501 Alliance Ave. referred to in the opening vignette is an example of this newly emerging risk. However, urban non-river flooding is more than just about two men who nearly drowned in an elevator. Fieldwork observations and interview data identified that now more than ever before during short or long duration, heavy bouts of intense rain people are accustomed to seeing the overflowing of manholes on downtown roadways, or the inundation of city streets and underground subway stations. In these circumstances, people increasingly experience wading their vehicles through flooded low-lying roads, underpasses and even major transportation corridors.

Many experience the adjustments to transit scheduling and commute times. For some residents when heavy rain falls it is becoming more common to take the stairs in their downtown condominium because the building's electrical panel, and thus the elevator's function, has been compromised. Echoing Beck's discussion (2015: 83) on the effects of living in a world with a changing climate, non-river flood experiences are creating for Torontonians new ways of being, looking, hearing and acting in the world. In other words, the emergence of urban non-river flood hazard in Toronto is shifting the local experience of risk for publics, what they are witness to, and what their ideas for 'normal' impacts might be during rainy weather. When it comes to river flooding, residents in Toronto have long been familiar with the vulnerable lower Don River that 'always floods', however other urban non-river areas in the City are increasingly gaining their own reputation of vulnerability such as Lower Simcoe underpass, which floods with as little as 20mm of rainfall (Figure 8). The more frequent experience of urban non-river flooding in the City is helping to transform the everyday conversation about flooding along with the rationalities conceived of for managing it.

Urban Non-River Flood Forecasting

Along with the social changes brought on by urban non-river flooding in Toronto, physical challenges associated with forecasting for this type of risk have influenced the discourse surrounding its management. Urban non-river flooding is incredibly challenging to forecast effectively and with useful lead time (Doswell et al. 1996; Herman and Schumacher 2018). Characterized by their rapid occurrence, urban non-river floods in Toronto take similar shape to flash floods, which "come on like crazy" as Joseph, a longtime downtown Toronto resident said. Such a swiftness broadly highlights the complexities surrounding the possibility of providing early warning to public groups.

More specifically, however, urban non-river flood forecasting is considerably difficult because forecast and warning information depends to a large extent on accurate rainfall predictions (Collier 2007: 3; Doswell et al. 1996; Hapuarachchi et al. 2011: 2771; Herman and Schumacher 2018). In Ontario, ECCC meteorologists make rainfall predictions by interpreting variables like high resolution precipitation models and weather radar reflectivity that shows the intensity, speed and direction of a rain-producing storm. Despite advancements in science and computer-based models, the information produced is inherently predictive in nature, and as such, amounts remain extrapolated estimates.

The technological limitations associated with rainfall prediction for non-river flooding emerges in the everyday talk of ECCC meteorologists. For example, on the forecast floor, meteorologists are consistently trying to understand how to forecast more accurate precipitation amounts. If this could be done, the belief is that meteorologists could add value to their weather products that warn for heavy rain and the potential for non-river flooding, as noted by one manager at ECCC:

ECCC Downsview
May 8, 2015

Benny: If we can figure out a way on precipitation
then we can give better direction on where and how
we should be spending our time

Together, with the rapid onset of these style events, the technological limitation materializes in the discourse as a position of meteorological impossibility, or the inability to forewarn accurately and effectively, which lends to the *unpolicied* nature of this risk and the concomitant social acceptability of organized irresponsibility surrounding the lack of attention given to early warning as a management strategy.

Urbanization and Changing Climate

Adding further physical challenges to urban non-river forecasting are the uncertainties brought on by the impacts of rain in urbanized environments, or the interaction of meteorology, or what's happening in the atmosphere, with the hydrological situation, or what's happening on the ground. The natural topography and antecedent conditions such as the ground's ability to absorb more moisture play a role in this interaction, as do changes in land use patterns, particularly those associated with urbanization, which dramatically affect the impacts of rain. In Toronto, the process of urbanization accounts for the proliferation of new builds in the downtown core, where for example in a space roughly equivalent to one square kilometer, seven high rise condominiums and counting have been constructed in the last 15 years (Appendix H: Map of Study Area- Lower Simcoe St.). Following from Beck (1992: 21), who reports the predominant dangers or risks we experience today are largely techno-scientific developments resulting from modernization, and also in keeping with Giddens (1998: 25), who sees risk as a type of manufactured uncertainty characteristic of modernity, the current rate of urbanization in Toronto is exacerbating the non-river flood risk threats.

Offering a physical science perspective, Yang and colleagues (2013: 1793) report that urbanization is often associated with an increase in impervious surfaces, which can lead to the modification of regional climate, including increased rainfall amounts over these urbanized areas. If added volume of rain does fall there is no predicting how much, thus adding greater uncertainty to the already uncertain estimates. In addition, urbanization has been reported to intensify flooding by increasing the rate and volume of run-off (Collier 2007: 3). Together, this adds strain to storm water infrastructure and drainage systems, those which are sometimes aged and in need of repair in older Toronto

neighborhoods, or for those that may not have been constructed with the long-term growth in mind that the City has undergone in recent decades, such as the newly popular Lower Simcoe non-river flood area. The process of urbanizing imposes further limitations on the accuracy of run-off and discharge estimates that are used to assess the likelihood of flash flooding, and as such creates another layer of complexity in forecast and warning ability. Unsurprisingly, urbanization impacts the social experience of non-river flood risk and the limitation of accuracy these changes impose contributes to the perception of impossibility in non-river flood risk discourse surrounding early warning as a reliable management possibility.

Forecast and warning for flash-style urban flooding is also made more challenging by uncertain changes surrounding our changing climate (Collier 2007; Hapuarachchi et al. 2011). Storms are more frequent and projections indicate an increase in the intensity of rainfall in the future, which may lead to more flash flooding (United States Global Change Research Program 2018; Hapuarachchi et al. 2011: 2771; TRCA website[28]). While the case of August 8, 2018 is exceptional, the near-drowning elevator experience is an example of an increasingly common phenomena in an urban area such as Toronto where the coupling of unpredictable and extreme atmospheric conditions, along with exponential urban development, make the City a unique flood 'hazardscape' (Elliott and Frickel 2013). This 'hazardscape' increases the potential for urban non-river flooding and creates unequal exposure and disproportional risk for people working, living and

[28] "Climate change has increased the likelihood of more severe and frequent storms, which in turn raises the risk of flooding. TRCA Flood Risk Management plays a key role in providing municipalities with the information they need to respond to flooding."

recreating in the City (Hapuarachchi et al. 2011: 2780), as the urban non-river flooding in several locations in Toronto during the July 8, 2013 flood confirms (Figure 8).

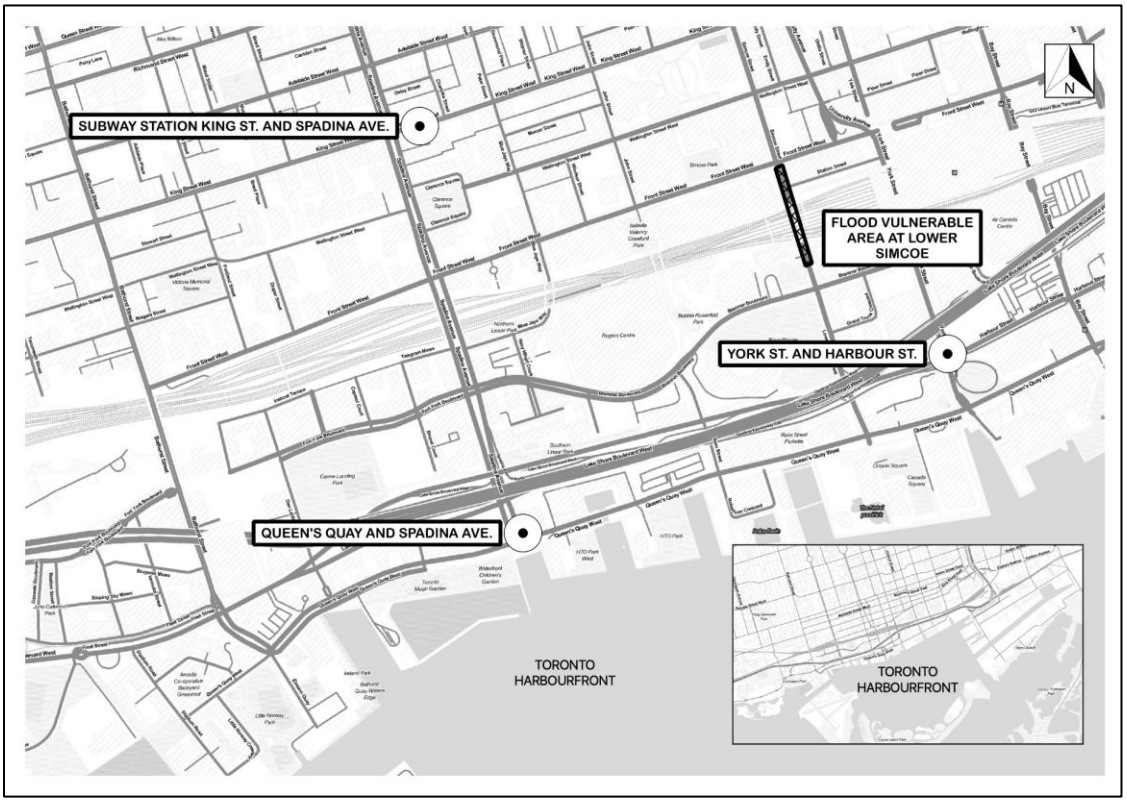


Figure 8. Locations of urban non-river flooding during the July 8, 2013 flood event

At the same time, my inclusion of a discussion on the changing climate illustrates my overlapping of one discourse with another. I am merging these discourses, just as scholars and industry partners like TRCA do, which underscores the embeddedness of discourses within discourses, the pervasiveness of such an overlap and the penetration of other discourses in their dialectical, relational construction. While Fairclough (2016: 89) theorizes that such merging is typically a strategic recontextualization where social agents purposely incorporate one discourse into another to achieve certain outcomes, I am doing

so as a way to show another factor that generated or contributed to how and why certain policy options were pursued while others were not. To that end, incorporating climate change discourse is helpful for showing how its interaction with non-river flood risk reinforces the presence and acceptance of the threat as risky. Furthermore, the notion of unpredictability in the climate change discourse, I would argue, helps to strengthen the perception of meteorological impossibility surrounding early non-river flood warning generation. Altogether, the physical challenges associated with non-river flooding have contributed to the mental models utilized by individuals when making sense of this risk. They have, as Borriello (2017) would say, reduced other ways of thinking about managing this risk to the point where rationalities converge in the discourse on the impossibility of providing publics with advanced notice of non-river flood threat in Toronto.

Non-River Flood Management in Toronto

Perceptions of meteorological impossibility and the *unpolicied* nature of early warnings for non-river flood risk in Toronto have contributed to its lack of an official risk ordering regime (Crook 1999). What has evolved instead is an ad-hoc fragmentary early warning practice, short term response strategies and long-term mitigation solutions, which I argue construct social acceptability in the discourse against formalizing early warning policy. The development and advancement of these practices, strategies and solutions illustrate how risk and its management have become a lens through which a certain kind of rational organizational design can be envisioned (Power 2007), and also shows how discourses are formed and legitimized within a complex chain of networks linked together (van Dijk 2014).

Urban Non-River Flood Warnings: An Ad-Hoc, Fragmentary Practice

There is an ad-hoc, informal system in place that attempts to provide advanced notice when urban non-river flooding is imminent. If an ECCC meteorologist deems there is non-river flood potential associated with a system of heavy rain moving through Toronto, he or she may choose to provide the public with advanced notice of risk in their Severe Thunderstorm Warning (STW) by including the phrase: *"Heavy downpours can cause flash floods and water pooling on roads"* (Appendix E), providing the weather conditions also meet severe thunderstorm threshold criteria.

The conscious efforts made by meteorologists to include non-river flood related language in the STW, despite official rules against it, demonstrates how these experts navigate policy struggles. It reveals their attempts to communicate information about the non-river flood risk even though it hasn't been officially classified as such, as well as their establish some semblance of ordering despite the lack of official structure. This move operates to facilitate coherence by publics and is an attempt to develop shared conceptions of non-river flooding as risky. It is setting out to equalize the knowledge differential between meteorological experts and public groups by activating or tapping into people's mental models and to help establish for them what they know about the situation and what they need to do now with that knowledge. In keeping with van Dijk (2014: 227), the STW is a knowledge device utilized by ECCC meteorologists to generate common ground. The inclusion of non-river flood risk information is also like a type of 'shape-shifting', to borrow from Shore (2011: 127), where meteorologists oscillate at their discretion between adhering to policy by not mentioning the word 'flood', and by including details related to non-river flooding brought on by heavy rain. Their manipulation of the formal rules in this way reveals the influence of something

other than official policy at play during decision making, perhaps personal ethics, principles and beliefs, or the prominence given to moral values over and above policy, as Shore and Wright suggest (1997: 16). Though ECCC meteorologists cannot escape the system within which they work, through the STW they utilize strategies in the space afforded to them to express alternative ideas and opinions. These actions show that policy can be a site of contestation, and expose official rules as not always universally and collectively agreed upon (Shore 2011: 128). Moreover, the actions demonstrate how social practices shape discourse by mediating the relationship between events on the ground with the overarching structure and rationalities governing their management.

Once ECCC issues their STW, on-air broadcasters will re-produce it as per Canadian Radio-Television and Telecommunications Commission (CRTC) mandate, which means that in their weather segments TV meteorologists will notify the public of the STW in effect. The nuanced details such as 'heavy rain', 'torrential downpours' and to 'avoid driving through water on roads' may or may not be included since this is a decision made by each on-air presenter and depends upon many factors including the timing or other weather stories that may be perceived as more important. The STW is reproduced verbatim on smartphone applications such as the one available from the Weather Network, which allows for individuals to have the STW *pushed* to their phone, nuanced details and all, providing the location services on the phone have been enabled.

Short-Term Response Strategies

The short-term strategies employed for non-river flood risk are reactionary in nature. TRCA website indicates for people to *"please contact your local municipality for more information"* in times of non-river flooding in Toronto. Bobby, a TRCA flood duty officer confirmed their organization as unconcerned with non-river flooding when she

said, “People keep calling us about street flooding and we are the wrong people to call.” This sentiment was seconded by Stuart when he responded with “that’s not us” after being notified of flooding along the 401 on October 28, 2015 in an area away from the nearest water source, Cook’s Creek. Interviews with two institutional representatives from the City highlighted their operational measures during flood risk as similarly response-driven. Oakley, the representative from the Water Authority, for example, commented that a common strategy during flooding is for residents to “put a claim against the City and then we {the City} have an insurance company that investigates the claim and then they {the insurance adjustors} work with operations {from the City}.” Any advanced preparation for Oakley was focused on preparing for consequences, such as those arising from “extreme weather which could be power outages and communication failures” and making sure that they have robustness in their critical infrastructure to handle the contingencies that arise. This was likewise the case for Sawyer at the Hydro Authority, who reported: “For us it’s, unfortunately, it’s a response element, so there’s not much we can do short term to prepare.”

TRCA’s position and those of the City representatives indexes their particular ways of thinking about non-river flood risk management. First, TRCA’s official stance actively constructs City departments as the groups responsible for handling non-river flooding in Toronto, while flood forecasters actively construct their group as not responsible. In the same way that Chilton (2004: 199) reports language indicates viewpoints, social position and group identity, TRCA is expressing distance from early warning and response when it comes to non-river flood risk as a way of identifying both their position as river flood risk managers and their lack of accountability for addressing

non-river flood risk. These are what Borriello (2017: 243) refers to as instituting moments for TRCA, or that through their expressed stance on non-river flood risk the group is establishing the social space and configuring boundaries of responsibility. The City representatives' perspectives, on the other hand, discursively add to the theme of impossibility in the non-river flood risk discourse. In other words, where meteorological impossibility regarding early warning for non-river flood risk was shown to have contributed to non-river flood management initiatives, operational impossibility for these City groups explains their attention to preparing against consequences, not preparing in advance to eliminate potential impacts. Moreover, the City is expressing distance from early warning, not to identify their position of unaccountability, but to identify that early warning strategy would not be useful given their position or operational role.

Long-Term Mitigation Solutions

In Ontario, rather than focusing on non-river early warning flood policy there is a growing emphasis on diminishing vulnerability by developing enhanced resistance, recovery, resilience to non-river flooding through long-term mitigation. Non-profit groups taking the lead on this are Partners for Action[29], an applied research network advancing flood resiliency in Canada in the face of a changing climate and extreme weather, and the Ontario Urban Flooding Collaborative, which involves interdisciplinary teams assembling to carry out collaborative flood action plans. Together, these groups are working towards the development of public knowledge creation and promotion of personal action in response to flooding and in-between flood events. This is similar to private insurance groups who encourage policy holders to protect themselves against

[29] https://uwaterloo.ca/partners-for-action/what-partners-action-p4a

financial losses resulting from basement flooding and sewer back-ups by purchasing additional non-river flood coverage as part of their home policy. Likewise, scholars in academia are part of the discourse surrounding long-term mitigation solutions, however they tend to focus their attention on insurance or policy instruments centred on resilience and property level flood protection (Morrison et al. 2018; Thistlewaite et al. 2017).

The efforts made by non-profits, the solutions encouraged by private insurance groups, and the attention given by academics to property level flood protection comprise critical elements in non-river flood mitigation and risk management. These approaches pay special credence to important facets of flood risk management, however they give unequal priority to long-term mitigation by concentrating on the protection of physical spaces such as underground infrastructure or homes. Somehow, within the cracks of non-river flood risk discourse, the needs of people moving dynamically across and within the urban landscape from one location to the next, or those occupying and traversing these physical spaces, or how they might be affected, as a non-river flood event unfolds, have gone unnoticed. Put another way, it seems as though the emergence of the social threat and its related physical challenges have permitted some transformation in the way individuals and groups construe non-river flooding as threatening, but have done so in an incomplete way because the changes in thinking are limited to mostly homeowners. Since van Dijk (2014: 25) reports people are developing their understandings of a discourse relative to the mental models they have about the situation or topic, one could reasonably argue that the long-term mitigation solutions are generating incomplete models and thus an incomplete discourse because the efforts have related the discourse only partially to what it is about and only partially to what it represents.

The carrying out of these non-profit initiatives and the managing of non-river flood risk in short-term and long-term ways enables the inattention given to early warning, and in so doing, assists in the construction of social acceptability of government irresponsibility when it comes to non-river flooding as an *unpolicied* risk. These examples show how social practices help in the configuration of discourse, the mental models that inform and are informed by discourse, as well as the knowledge that emerges from the combining of discourse with mental models. In particular, these triangulated elements, mediated by physical challenges, short-term response and long-term mitigation, worked together to depoliticize urban non-river early flood warnings and allow it, still currently, to reside beyond the domain of government.

Non-River Flood Risk Discourse: Evidence of Incoherence

Up to now the discussion has centred on river flood risk discourse and its associated policy and on non-river flood risk discourse and the factors contributing to early warning as *unpolicied*. While the social experience of non-river flooding has generated a broadly shared general knowledge of non-river flooding as threatening, differing social perceptions of participants demonstrate incoherence of the discourse. In other words, the perspectives offered by institutional representatives, on-air communicators and members of the general public illustrated incommensurability regarding what urban non-river flooding is, its causes and impacts, and also who these groups imagine is responsible for managing the risk. The incoherence is reflective of what discourse and policy expert Felicitas Macgilchrist (2016) calls a fissure and is explained by the varying underlying mental and cultural models of participants.

'Urban Flooding': All Definitions are Not Equal

TRCA defines 'urban flooding as "street flooding, basement flooding, and flooding of other low lying urban areas." In his discussion on the epistemic structures of text and talk, van Dijk (2014: 293) reports that this official definition presupposes public groups such as institutional representatives, on-air communicators and the general public know the category and understand the description. Yet, the results of this study indicate public groups do not always define 'urban' in the same way as TRCA. TRCA's cultural understanding of 'urban' flood is predicated upon flood origination and location whereas for institutional representatives, communicators and members of the general public 'urban' flood was based more upon impacts and their ideas for what constituted 'urban'. The mis-matched understandings highlight the different models relied upon, and thus a critical aspect of incoherence regarding the emerging non-river flood risk discourse.

With every face-to-face interview or survey administered I asked participants the same question: "When I say urban flooding, what comes to mind? What do you think of?" Despite public participants thinking my question strange and perhaps one with an obvious definition, each graciously responded. Answers varied across institutional representatives, communicators, and members of the general public, yet a pattern began to emerge whereby the definition for 'urban' flooding was shown to encompass all of the following: flooding or ponding of creeks, rivers, low-lying areas, basements, underground parking, backyards, roads, streets and buildings *all within a city or suburb*. For the majority of participants, 'urban' flooding translated to flooding anywhere within an urban setting, whether that be along the river or on a downtown street or in a basement. In fact, institutional representatives overwhelmingly reported their belief that 'urban' flooding occurs when a river overflows its banks. This is directly opposite to

TRCA's official definition and is interesting because as key recipients of TRCA flood information it demonstrates that institutional representatives are no closer to seeing it the TRCA way and no closer to a shared understanding of 'urban' flooding than the general public, despite institutional representatives' having an established relationship with TRCA.

Data also confirm that geographic distinctions were not made in the same way by participants as they are by TRCA, and as Kevin the CBC weather broadcaster reported, "it was tricky" to know what geographic distinction TRCA was referring to sometimes. As Kevin reported during our interview on July 12, 2016:

Telephone Interview
July 12, 2016

Kevin: They {referencing TRCA} are more concerned with river flooding.
They are looking at -- you know -- flow rate and -- you know --
how high the water is in relation to the banks --
and things like that in terms of the different tributaries that make up the watershed.
So if the watershed has a flooding event -- you know --
like that's along the river -- that's going to be more TRCA.
I would think when it comes to urban {referring to non-river} flooding --
that's not really the same -- it's not really (…)
That's really tricky because the watersheds do encompass the urban area.

Leonard, a young master's graduate who recently returned to his native Toronto, characterized urban flooding as storm drains becoming overwhelmed, exploding fire hydrants, and pools of water at the edge of the sidewalks and city streets. Noah, a resident living in Toronto's east neighbourhood of Leslieville, expanded on his definition of 'urban' flooding to say: "Ah, probably waterways being washed out. Um, and again, maybe it's that visual from a couple of years ago of the DVP flooding." The event he is referring to is the July 8, 2013 flood in Toronto, which was indeed 'urban' in nature but

the impacts Noah referred to were related to and caused by an overflowing Don River. Another member of the general public, Ingrid, talked about people who may be at risk of 'urban' flooding, commenting that "places like Tattle Creek, it goes under University of Toronto", which much like Noah, connected a watercourse with the definition of 'urban' flood. When Beatrice, a journalist with CBC hears 'urban' flood she's thinking about "the Don River and how close it is to the DVP and maybe a wash-out there". Likewise, Tim, a City Roads representative, said: "if the river can affect urban areas, then it would be 'urban' flooding". Similarly, a private transit authority representative defined 'urban' flooding as river flooding, pond flooding and basement flooding. These examples illustrate how participants associated 'urban' flooding with broader geographical boundaries inclusive of rivers and creeks in a city setting, which is in direct opposition to TRCA's definition.

The different experiences of participants in the public groups also contributed to varied understandings for what constituted 'urban' flood. For example, as the quote above from general public member Noah confirms, he grounds his definition of 'urban' flood in his experience of Toronto's July 2013 flood event, which was largely a river flood. Similarly, CBC journalist Beatrice's definition arose from having seen images of the overflowing Don River creating washouts on the Don Valley Parkway. As if to be sitting in a historical placeholder until called upon, these examples speak to how understanding is linked with specific cognitive and emotional appraisals of threat (Lerner and Keltner 2001: 155) and also how sense-making is connected with past experiences (Wertsch 2001: 225). Bakhtin (1981) reinforces the notion of meaning construction as a back and forth and as a fusion between past experiences with present circumstances,

which helps explain that instead of a selection, combination and transmission of isolated ideas, or a result of one's situated interests and organizational goals, definitions of 'urban' flooding or non-river flooding in urban areas for public groups is more heavily informed by the relation of their past experience with the current situation. Bakhtin, Lerner, Keltner and Wertsch's insight supports van Dijk's (2014: 50) notions for how models are both constructed and structured; meaning that events and actions are perceived, construed, represented and memorized in our mental thinking as long sequences of meaningful activities that are segmented in variable length and range in complexity.

These varying definitions for 'urban flooding' demonstrate that TRCA's official definition has not effectively inspired public allegiance nor singular understanding. This is because TRCA and public risk-perceivers are negotiating their respective understandings of the terminology based on their own unique mental or cultural models and their own habitual understandings for what constitutes 'urban'. In much the same way mental models generate shared general knowledge, cultural models employed by epistemic groups operate during this negotiation and work to generate specialized knowledge by framing interpretations of 'urban' flood, the models held and employed by participants didn't allow for the successful transfer of knowledge or for inferences to be made (Quinn and Holland 1987: 6). This is possibly due to the varied intentions between TRCA and public groups. For example, much like the distance expressed by TRCA in their short-term response strategy during non-river flood risk, the intent of their 'urban' definition is a way to rationalize their position of unaccountability. As the examples above show, however, public groups do not share the same intent as TRCA, nor do they

have a particular goal in mind when defining 'urban' other than to describe where it happens. In keeping with Whorf (1956), these alternative conceptions of 'urban' flood illustrate the power of habitual thought in shaping understandings of flood phenomena, and subsequently, descriptions of it and reactions toward it. In other words, the differing understandings with respect to 'urban' flood highlight how words constitute different things for different people using different mental schemas. Altogether, these different ways of conceiving the TRCA definition contributes to the incoherence in non-river flood risk discourse, which means there is a fracturing in the relations between official understandings and those subjectively held understandings of participants. While Macgilchrist (2016) points to these fractures as spaces that can be utilized to experiment with ways of developing coherence, I would argue the logics utilized for sustaining current management strategies and solutions, and thus the inattention to early warning non-river flood risk policy, have benefitted thus far from this incoherence in the discourse.

Perceived Causes for Non-River Flooding

TRCA has a singular stance regarding the causes of 'urban' or non-river flooding in urban areas. According to their website[30], 'urban flooding' is caused by the limited capacity of existing storm water infrastructure or drainage systems. Again, TRCA's cultural model situates their interests and homogenizes their beliefs surrounding causes as physical and primarily infrastructure-related. Contrary to the official position of TRCA, public groups who participated in this study identified three main causes for non-river flooding in Toronto, including: heavy rain, blocked sewers or improper drainage, and the

[30] https://trca.ca/conservation/flood-risk-management/understand/

increase of impermeable surfaces in the City, which suggests an alternative model is relied upon by public groups interpreting causes. More specifically, the data reveal publics' understanding built upon clear connections each made between three interacting factors of meteorology, infrastructure, and hydrological impact, regardless of the category assigned to the participant. These findings illustrate how publics' understanding of causes is multi-faceted, linked with atmospheric condition and with notions of urbanization, and at times where causes and impacts perceived by some as one in the same. Participants elaborated on the three main causes identified above by adding that tree roots penetrating and blocking pipes contributed to their ideas about poor drainage, as did ideas about the inadequacies of an aged underground system in Toronto. Institutional representatives and communicators extended their beliefs to include poor land-use planning. For example, communicator Kevin from the CBC demonstrated the link he makes between development or land-use planning and flooding when he said:

Telephone Interview
July 12, 2016

Kevin: When I walk around downtown Toronto now and I see a condo building go up --
I think wow (.) there's an entire city block flipped up on its side --
and they didn't add any more storm drains below it -- you know.
And I just look at that and I go -- oh.
I don't care how green the roof is.
It's just a nightmare for urban {referring to non-river} flooding.

To which he followed up with:

Kevin: It's just even when I have like a non-severe thunderstorm
that is producing less than 50 mm of rain in 24 hours --
or less than 50 mm of rain in an hour --
you can still totally get under passes in this city that get washed out.

One of the underpasses Kevin referred to is at Lower Simcoe St., the newly emerging flood vulnerable area right in the heart of the City's downtown/sports entertainment district referred to earlier (Figure 8). It runs below the train tracks, is adjacent to Union Station and within a few hundred metres of the CN Tower, the Roger's Centre, the Scotiabank Arena, and Riley's Aquarium, to name several nearby popular tourist attractions. Connor, another communicator but with a different major television network, also commented on the effects of urban planning and growth in Toronto, or as he called it: the 'vertical city' at this highly travelled underpass. "It {referring to the Lower Simcoe underpass} doesn't manage water well and it doesn't look that deep. But every single time there's a flood event, there's like a car that gets lost ((he chuckles)) in the Simcoe underpass."

Perceptions of Responsibility for Urban Non-River Flood Warning

Along with differing social perceptions for 'urban flooding', its causes and impacts, responses given by institutional representatives, on-air communicators and members of the general public regarding the question of 'who might be responsible' were numerous and found to be linked with perceived causes and impacts. In total, all but two individuals from the public groups responded to identify a group or organization they imagined accountable for such service. That most participants identified an agency as responsible hints at the lasting effects of the welfare state's risk management approach described earlier. The acknowledgement of responsibility does suggest that policy engagement, both current river flood policy in Toronto as well as past policies publics have encountered, has likely provided a template and benchmark for what these individuals imagine to be possible when it comes to non-river early flood warning. Thus, while TRCA relied upon a cultural model structured by no expectation and was likely invoked

to rationalize their organization's behavior against warning, public groups' ideas surrounding responsibility were cognitively structured and guided by the belief that some*one* would be providing that information. Most notably, many of the institutional representatives and communicators who participated in this study mentioned TRCA as sharing in warning responsibility or having the responsibility entirely, which is counter to the official mandate of this conservation authority.

Reported below are the multiple and varied connections made by public groups between causes, impacts and responsibility. These linkages illustrate the inter-relatedness behind the decision concerning who audiences expect to provide a head's up was being given as well as demonstrates the interactive nature their cognitive reasoning is built upon. To begin, individuals who reported heavy rain as a cause tended to perceive ECCC as responsible, and those who considered poor drainage or impermeability as causes tended to perceive municipal departments as responsible. Two general public participants, Joseph and Leonard, who perceived the combination of rain, poor drainage, and impermeability as causes, imagined ECCC and municipal departments as jointly responsible for providing them with advanced warning. Leonard indicated a third group, media, as having a role, while Joseph similarly indicated a third group, the Ministry of Transportation, where each would be responsible for working with ECCC and municipal departments to notify public of urban non-river flooding. In two cases, rain was considered the sole cause and ECCC was imagined to be the group responsible for providing advanced notice together with municipal departments as well as either the police or media, as cited by Maggie and Donald, respectively. Another general public participant, Kate, reported heavy rain, poor drainage and impermeability as causes but did

not include ECCC as responsible; instead, this construction worker imagined municipal departments and media as the two groups who she expected to notify her in the event a flood was to take place.

Noah, who indicated poor drainage and impermeability as the causes of non-river urban flooding indicated municipal departments as solely accountable, yet interestingly he highlighted the ease with which such a responsibility could fall through the cracks. Rather than it being the job of some random and anonymous government employee or department that might play the "oh it's not my area card", Noah said, he imagined a City Councillor "designated to my area, who I am familiar with, someone I voted in" as the municipal representative who should give him the head's up. He followed this with, "If I got an email from her {referring to the City Councillor} and it was directed to my area of Toronto, I'd listen." Ingrid and Heather, two women with grown children living in the suburbs of Toronto, reported poor drainage as the main cause, however, contrary to most general public participants who imagined one or more groups as responsible, the women imagined no one to be responsible. Instead, the two perceived that "people have to be sensible. A large part of society is more interested in blaming other and not taking responsibility", as noted by Ingrid during the group interview, and Heather agreed, which speaks to their perception that individuals themselves are accountable for knowing when urban non-river floods are materializing.

Institutional representatives were less consistent in the overlap than the general public group. For example, where rain and poor drainage were perceived as causes and ECCC and municipal departments were often both deemed responsible by the general public group, institutional representatives who highlighted these same causes tended to

report ECCC and another group altogether as responsible, such as TRCA, media, or the Office of Emergency Management, or a combination of these three. On the other hand, one representative from a local private transit authority who indicated rain and either poor drainage or impermeability as causes, commented that ECCC alone was the group responsible. In a similar way, a representative from the Office of Emergency Management who reported rain as a cause indicated their office as the sole group responsible for offering advanced notice of flooding. In the only two other instances of self-accountability, Oakley, the representative from the Water Authority imagined the City's Strategic Communications Department as the wise choice for offering advanced warning. In his words, "they {referring to Strategic Communications group} would be interpreting Environment Canada and other flood-related information and then in a perfect world, ideally they would then be assessing the threat and then parlaying a message to all of the different groups." Likewise, Tim, the representative from the municipal Roads Department indicated the City as accountable, yet for this employee warning communication depended on where the problem, or flooding, existed. For example, if flooding was anticipated on surface roads then the City's Road Maintenance department should be involved, according to Tim. To this he added, if flooding was anticipated in the subway system then Toronto's Transit Commission would play a role. Stanley, a manager and more senior colleague to Tim over at the Roads Department indicated poor drainage and impermeability as causes for urban non-river flooding yet reported TRCA as the sole group responsible for providing advanced warning.

Similar to the general public group, communicators often associated the causes of rain and poor drainage or impermeability with ECCC and municipal departments as

mutually responsible for providing a warning. Kevin, one of the communicators at CBC also imagined the Office of Emergency Management as sharing the responsibility with ECCC and municipalities, however. Conversely, ECCC's Public Weather Communicator perceived rain as the cause and perceived municipalities as accountable but not ECCC. This communicator who represents the national meteorological agency imagined "a combination of local municipal officials and local conservation authority" as jointly accountable for giving a head's up to the public, not the group of federally-based meteorologists he belongs to, nor someone in his role as public weather communicator. Beatrice, the CBC journalist interviewed, also perceived rain as the cause of urban non-river flooding yet mentioned municipal departments as responsible for warning. In her words:

Second Cup Coffee Company
July 16, 2016

Beatrice: I think naturally --
when I hear Environment Canada warning for all of this rain --
and TRCA is warning about the Don River.
That's when I go to the city (.) like what's happening to the roads --
I feel like I don't need Environment Canada to tell me what it's going to do to the infrastructure.

Thus, according to this participant, ECCC gives the rain warning, TRCA provides the warning for river flooding, and infrastructure representatives would give the urban non-river flood warning. The communicator representing CTV highlighted the combination of rain and poor drainage as causes, yet neither ECCC nor municipal departments were perceived accountable; instead, for this participant TRCA was described as being the single group responsible for providing the public with advanced notice. Likewise, a briefing meteorologist at the Weather Network who cited poor drainage as the main cause

for non-river flooding labelled TRCA as the group she would be looking to for the head's up.

The discussion on responsibility shows that participants' beliefs were often linked to causes yet at times, they also were linked with impacts and where the impacts were being experienced. This is important because it shows the blurriness of urban non-river flooding as a hydro-meteorological risk and the tendency to merge the processes of cause and effect together when imagining who might be responsible for pre-flood warning. Second, participants reported any number of combinations regarding responsibility: ECCC as the singular agency, TRCA as the singular agency, ECCC and TRCA together or in conjunction with a third, municipalities as solely responsible, and in the rare cases- no agency as responsible, which lends insight into the complexities surrounding risk and perception. Of particular interest was the lack of self-accountability alongside declarations made for other groups deemed responsible, save for the two women mentioned. For example, the institutional representatives, a few of whom are City employees, and on-air communicators rarely perceived themselves as accountable for providing urban non-river flood warnings; only three of the 15 institutional representatives interviewed and zero of the communicators perceived themselves to have a role in giving the general public advanced warning. Ironically, media (a group in which the communicators interviewed for this study belong) was often cited by general public participants as the group they'd be looking to tell them about urban non-river flooding before it happens. This shows that these hydro-meteorological risks present as much dynamism as do the ideas regarding who participants perceive would be accountable to them or their organization for giving a head's up.

Conclusion

For over six decades, the discourse surrounding flood risk in Toronto has centred primarily on urban river flooding. Since Hurricane Hazel in 1954 public groups in the City have benefitted from TRCA's well-established urban river Flood Warning policy and formalized early warning practices. Launching early warning river flood policy accomplished several things on the ground and at the level of discourse: it was a classificatory act that officially identified urban river flood risk as problematic, which made it amenable to authoritative action; it assisted in creating specialized knowledge for TRCA flood forecasters by shaping their perceptions and everyday patterns of behavior; and this contributed to unique cultural model for this epistemic group which gave institutional authority to river flood risk as critical to manage through early warning. Once the policy was deployed and the discourse was put into practice, the agreement government made with publics to manage river flood risk and the repeated issuing of early warnings set up the terms of important reference and the relationship between government and its citizens, legitimized how river flood risk was to be managed, and also by whom. In keeping with Shore and Wright (2011: 1), urban river Flood Warning policy and the related implementation processes created new social and semantic spaces, new relations and new webs of meaning for TRCA flood forecasters and the various public groups they serve. Van Dijk (2014: 165) reminds us that this now historical system of practice enabled by early warning policy, or the myriad of micro-level actions among and across social groups in Toronto that take place in times of river flooding, was structured and continues to be structured by discourse at the macro-level, and accomplished through interaction. The mingling of discourse, models and knowledge, as mediated by social

practices related to policy, generated and continues to generate an ordering of people and of risk and the relationship between these two and government.

The near-disaster at 501 Alliance St. is one of the latest in a growing number of urban non-river flood events in Toronto, and the headlines regarding this event last August represent a shift in the broader flood risk conversation in the City. Despite the comparable social and financial consequences resulting from non-river flooding in recent years, the emergence of non-river flood risk and its related discourse on management has not enabled similar early warning policy possibilities as river flooding did in 1954. Currently, no formal early warning policy exists to account for non-river flood risk situations in Toronto, and as such, public groups are left on their own to protect themselves against the sudden onset of flooding, a threat for which they are neither experts in meteorology nor hydrology. Inspired by the way these comparable risks have generated discourses that allow for different early warning policy possibilities, in this paper I initiated a discussion focusing on how and why particular norms, imperatives, values and objectives related to past and current policy decisions came to be. In other words, this effort examined policy at the level of discourse. Particularly by emphasizing coherence as a mechanism for general and specialized social cognition, I examined how discourse makes possible different structures and rationalities to emerge, and the various ways they re-emerge, in everyday life as social representations of broadly shared knowledge.

As the discussion showed, the non-river flood risk discourse in Toronto includes physical challenges that discursively create the perception of meteorological impossibility. The theme of impossibility has created space in the discourse for

alternative policy possibilities, including ad-hoc early warning practices, short-term response strategies and long-term mitigation solutions. These alternatives and the overwhelming concentration on this trajectory of non-river flood risk management demonstrates a degree of social acceptability, however, which has contributed to a type of 'organized irresponsibility' and of regulatory neglect, one that has permitted early warning to exist beyond the realm of public accountability. Removing non-river flood early warnings from the government domain has negative implications because it renders public groups alone to prepare and manage a risk that has neither been formally identified nor communicated. Echoing van Dijk (2014), in the City of Toronto, publics are expected to know what non-river flood risk is, know that the risk is coming, and know how to prepare in the moment against potential impacts brought on by the risk, without having the knowledge available to them for generating understanding about the risk. The near-drowning of the two men in the elevator on August 8, 2018 exemplifies the repercussions of removing early warning for non-river flood risk from the domain of government and the devastating consequences that can arise from this approach to non-river flood risk management.

As much as the increased frequency in non-river flooding has contributed to an emerging non-river flood risk discourse and one not focused on early warning policy, the multiple social perceptions regarding 'urban flooding', the unique linkages made by participants between its causes and impacts, and their differing beliefs about accountability revealed considerable incoherence in the broader conversation. In other words, the results illuminated that there is no coherent way for describing non-river flooding, no common understanding regarding its causes and impacts, no consistent

understanding that this risk remains *unpolicied*, and rather an overwhelming belief that early warning would be given by some agency. These differences were accounted for by the differing cultural and mental models utilized by people to unpack meaning, which demonstrates the interconnectedness between knowledge and mental models, or ways of thinking. I borrowed from Macgilchrist's (2016) post-foundational critique of discourse studies to represent this incoherence as a fissure in the non-river flood discourse, one that I summarize here to exacerbate the challenges brought on by government irresponsibility, or lack of early warning, and amplify the risk for public groups when faced with non-river flood threat.

The fissure that was uncovered in this study is a reality experienced on the ground by everyday publics living and working in Toronto, more commonly now than ever before, and especially for those two men who were trapped in the elevator. The fracturing is a reality made possible by the structural features of discourse and the rationalities that contribute to its production and reproduction in society. This anthropological investigation justifies a closer look at the fracturing to see how meanings can be used to build more broadly shared knowledge and give rise to new policy practices.

References

Akrich, M. and B. Latour
1992 A summary of a convenient vocabulary for the semiotics of human and nonhuman assemblies. In *Shaping Technology/Building Society: studies in sociotechnical change*. W. Bijker and J. Law (eds). Cambridge, MA: MIT Press. Pp. 259-264.

Bakhtin, M.
1981 The dialogic imagination: Four essays by M.M Bakhtin, M. Holquist (ed), C. Emerson and M. Holquist (trans), Austin: University of Texas Press.

Beck, U.
2015 Emancipatory catastrophism: What does it mean to climate change and risk society. *Current Sociology*. Vol 63(1): 75-88.

1992 *Risk society: Towards a new modernity.* Sage Publications: London, California, New Delhi.

Bernard, R.H.
2002 *Research methods in anthropology: qualitative and quantitative approaches (3rd ed.)*. Walnut Creek, California: Altamira Press.

Boholm, Å
2015 Anthropology and Risk. Routledge: London and New York.

2003 The cultural nature of risk: Can there be an anthropology of uncertainty?. *Ethnos.* Vol. 68(2): 159-178.

1998 Comparative studies of risk perception: a review of twenty years of research. *Journal of Risk Research.* Vol. 1(2): 135-163.

Bohom, Å. and H. Corvellec
2011 A relational theory of risk. *Journal of Risk Research*. Vol. 14(2): 175-190.

Borriello, A.
2017 'There is no alternative': How Italian and Spanish leaders' discourse obscured the political nature of austerity. *Discourse and Society*. Vol. 28(3): 241-261.

Chilton, P.
2004 *Analysing political discourse: Theory and practice*. Routledge: London and New York.

Collier, C. G.
2007 Flash flood forecasting: What are the limits of predictability. *Quarterly Journal of the Royal Meteorological Society.* Vol. 133(S1): 3-23.

Craik, K.J.W.
1943 *The nature of explanation.* Cambridge University Press, Cambridge, UK.

Crook, S.
1999 Ordering risks. In *Risk and Sociocultural Theory: New Directions and Perspectives*. Deborah Lupton (ed). Pp. 160-185.

van Dijk, T.A.
2014 *Discourse and knowledge: A sociocognitive approach.* Cambridge University Press.

Doswell III, C.A., H.E. Brooks and R.A. Maddox
1996 Flash flood forecasting: An ingredients-based methodology. *Weather and Forecasting.* Vol. 11: 560-581.

Douglas, M.
1992 *Risk and Blame*. London and New York: Routledge.

1986 *How institutions think*. Syracuse University Press.

Douglas, M. and A. Wildavsky
1982 *Risk and culture: An essay on the selection of technological and environmental dangers*. University of California Press.

Elliott, J.R. and S. Frickel
2013 The Historical nature of cities: a study of urbanization and hazardous waste accumulation. *American Sociological Review*. Vol. 78(4): 521-543.

Entman, R.M.
1993 Framing: Toward clarification of a fractured paradigm. *Journal of Communication*. Vol. 43(4): 51-58.

Fairclough, N.
2016 A dialectical-relational approach to critical discourse analysis in social research. In *Methods of CDS. 3rd edition.* R. Wodak and M. Meyer (eds). Sage: London, Thousand Oaks. Pp. 86-108.

Feldman, G.
2005 Culture, state and security in Europe: The case of citizenship and integration policy in Estonia. *American Ethnologist*. Vol. 32(4): 676-694.

Fine, G.A. and T. Hallet
2014 Group cultures and the everyday life of organizations: Interaction orders and meso-analysis. *Organization Studies*. Vol. 35(12): 1773-1792.

Giddens, A.
1998 Risk society: the context of British politics. In. Franklin, J. (eds) *The politics of risk society*. Polity Press: Cambridge, UK. Pp. 23-34.

Goffman, E.
1974 *Frame analysis: An essay on the organization of experience*. New York: Harper & Row.

Hapuarachchi, H.A.P., Q.J. Wang and T.C. Pagano
2011 A review of advances in flash flood forecasting. *Hydrological Processes*. Vol. 25(18): 2771-2784.

Herman, G.R. and R.S. Schumacher
2018 Money doesn't grow on trees, but forecasts do: Forecasting extreme precipitation with random forests. *Monthly Weather Review*. Vol. 146(5): 1571-1600.

Henstra, D.
2011 The Dynamics of Policy Change: A Longitudinal Analysis of Emergency Management in Ontario, Canada, 1950-2010," *Journal of Policy History*. Vol. 23(3): 399-428.

Henstra, D. and G. McBean
2004 The role of government in services for natural disaster mitigation. Institute for Catastrophic Loss Reduction: Executive Report. February 2004. Pp. 1-15.

Henstra, D. and J. Thistlewaite
2017a Climate change, floods and municipal risk sharing in Canada. *IMFG Papers on Municipal Finance and Governance.* Pp. 1-44.

2017b Flood risk and shared responsibility in Canada: Operating on Flawed Assumptions. Centre for International Governance Innovation: Policy Brief. No. 116. Pp. 1-8.

Henstra, D., J. Thistlewaite, C. Brown, D. Scott
2018 Flood risk management and shared responsibility: Exploring Canadian public attitudes and expectations. *Journal of Flood Risk Management.* https://doi-org.proxy1.lib.uwo.ca/10.1111/jfr3.12346

Lerner, J. S. and D. Keltner
2001 Fear, anger, and risk. *Journal of Personality and Social Psychology*. Vol. 81(1): 146-159.

Macgilchrist, F.
2016 Fissures in the discourse-scape: Critique, rationality and validity in post-foundational approaches to CDS. *Discourse and Society*. Vol. 27(3): 262-277.

Morrison, A., B.F. Noble and C.J. Westbrook
2018 Flood risk management in the Canadian prairie provinces: Defaulting towards flood resistance and recovery versus resilience. *Canadian Water Resources Journal.* Vol. 43(1): 33-46.

Nader, L.
1974 Up the Anthropologist: Perspectives gained from studying up. In *Reinventing Anthropology*. D. Hymes (ed). New York: Vintage Books. Pp. 284-311.

Norman, D.A.
1983 Some observations on mental models. In D. Gentner and A.L. Stevens (eds). *Mental Models*. Lawrence Erlbaum Associates, Inc.: New Jersey. Pp. 7-14.

Power, M.
2014 Risk, social theories and organizations. In *The Oxford Handbook of Sociology, Social Theory and Organization Studies: Contemporary Currents*. P. Adler, P. du Gay, G. Morgan and M. Reed (eds). Oxford Handbooks Online. Pp. 370-392.

2007 Putting categories to work: The invention of operational risk. In Organized uncertainty: designing a world of risk management. Oxford University Press. Pp. 103-127.

Quinn, N.
2005 Introduction. In N. Quinn (ed). *Finding culture in talk: A collection of methods*. New York: Palgrave Macmillan. Pp. 1-34.

Quinn, N. and D. Holland
1987 Culture and cognition. In D. Holland and N. Quinn (eds) *Cultural Models in Language and Thought*. Cambridge: Cambridge University Press. Pp.3-40.

Rappaport, R.A.
1996 Risk and the human environment. *Annals of the American Academy of Political and Social Science*. Vol. 545(1): 64-74.

Rose, Nikolas
1996 The death of the social? Reconfiguring the territory of government. *Economy and Society*. Vol. 25(3): 327-356.

Rothstein, H., M. Huber and G. Gaskell
2006 A theory of risk colonization: The spiralling regulatory logics of societal and institutional risk. *Economy and Society*. Vol. 35(1): 91-112.

2003 Neglected risk regulation: The institutional attenuation phenomenon. *Health, Risk & Society*. Vol. (5)1: 85-103.

Sandstrom, K.L., D.D. Martin and G.A. Fine
2010 *Symbols, selves and social reality: a symbolic interactionist approach to social psychology and sociology* 3rd edition. New York and Oxford: Oxford University Press.

Schwegler, T. and M. Powell
2008 Unruly experts: Methods and forms of collaboration in the Anthropology of Public Policy. *Anthropology in Action*. Vol. 15(2): 1-9.

Shore, C.
2011 Section II. Studying governance: Policy as a window onto the modern state. Introduction. In *Policy worlds: Anthropology and the analysis of contemporary power*. Eds Shore, Cris, Susan Wright and Davide Però. Bergahn Books: New York, Oxford. Pp.125-129.

Shore, C. and S. Wright
2011 Conceptualizing policy: Technologies of governance and the politics of visibility. In *Policy worlds: Anthropology and the analysis of contemporary power.* Eds Shore, Cris, Susan Wright and Davide Però. Bergahn Books: New York, Oxford. Pp. 1-25.

1997 Policy: A new field of anthropology. In *Anthropology of policy: Critical perspectives on governance and power.* Eds. C. Shore and S. Wright. Routledge: London and New York. Pp. 3-42.

Smith, D.E.
2005 *Institutional ethnography: A sociology for people*. Rowman Altamira Press.

Stevens, A.L. and D. Gentner
1983 Introduction. In D. Gentner and A.L. Stevens (eds). *Mental Models*. Lawrence Erlbaum Associates, Inc.: New Jersey. Pp. 1-6.

Strauss, C. and N. Quinn
1997 Introduction. in *A cognitive theory of cultural meaning*. Cambridge University Press, Cambridge. Pp. 3-11.

Thistlewaite, J., D. Henstra, C. Brown and D. Scott
2018 How flood experience and risk perception influences protective actions and behaviours among Canadian homeowners. *Environmental Management*. Vol. 61(2): 197-208.

Thistlewaite, J. and D. Henstra
2017 Municipal flood risk sharing in Canada: A policy instrument analysis. *Canadian Water Resources Journal*. Vol 42(4): 349-363

TRCA
2013 Toronto and Region Conservation Authority Meeting #6/13. Friday, July 26, 2013. Pp. 282-337.

United States Global Change Research Program
2018 Summary Finding. *4th National Climate Assessment. Volume II: Impacts, Risks, and Adaptation in the United States*. Pp. 24-32.

Wedel, J.R., C. Shore, G. Feldman and S. Lathrop
2005 Toward an anthropology of public policy. *The ANNALS of the American Academy of Political and Social Science.* Vol. 600(1): 30-51.

Weinstein, N. D.
1989 Optimistic biases about personal risks. *Science.* Vol. 246(4935): 1232-1234.

Wertsch, J.
2001 The mutlivoicedness of meaning. In: *Discourse Theory and Practice: A Reader*. M. Wetherell, S. Taylor and S.J. Yates (eds). London: Sage Publications. Pp. 222-235.

Whorf, B.
1956 The relation of habitual thought and behaviour to language. In *Language, thought, and reality*. J.B. Carroll (ed). Cambridge, MA: MIT Press. Pp. 134-159.

Wright, S.
2006 Anthropology of Policy. *Anthropology News*. Pp. 22.

Yang, L., J.A. Smith, D.B. Wright, M.L. Baeck, G. Villarini, F. Tian and H. Hu
2013 Urbanization and climate change: An examination of nonstationarities in urban flooding. *Journal of Hydrometeorology*. Vol. 14(6): 1791-1809.

Chapter Five
Conclusion

This dissertation examines the interactional relationship between policy and risk in different weather and flood contexts. Each chapter focuses on unique policy situations and risk dilemmas. In Chapter Two, I investigated how meteorologists on the forecast floor navigate and manage weather risk when atmospheric conditions fall below ECCC policy's official 'severe' threshold criteria. In Chapter Three, I looked closely at TRCA flood forecaster negotiation of Flood Warning policy during an ambiguous river flood situation that did meet TRCA's official Flood Warning threshold criteria. Finally, in Chapter 4, I examined the broader discursive construction of urban river and non-river flood risk and how those threats have evolved over time in the discourse to produce and permit different early warning, or risk management, possibilities. Through a multi-sited, mixed-methodological approach I traced connections and gathered multiple, diverse perspectives from a number of actors involved in implementing, communicating, and using weather and flood information, or the manifestations of policy. These viewpoints were analyzed through the theoretical lenses of interaction and *facework*, mental models and discourse. What resulted from these micro and macro-scale analyses was a thick description of how and why, through the policy negotiation and appropriation process, meteorologists, TRCA flood forecasters and public groups perceive, assess, and manage risk in multiple ways.

This research has enhanced previous understandings of policy and risk as situated, relational and with abilities to socially organize (Shore and Wright 2011; Wedel et al. 2005). ECCC and TRCA have inherited the social floating categories of risk, which have

become embedded in their respective social, cultural and organizational thinking and their everyday practices. In keeping with Mary Douglas (1992), Åsa Boholm (2015) and Manning (2014: 283) the cases described in the preceding chapters illustrate how these elements blend together and influence ECCC meteorologists' and TRCA flood forecasters' interpretations of policy and their negotiation processes during warning generation. This situatedness is akin to the multiple layers experts must work through in order to assess risk upon which policy is applied situationally through processes of expert negotiation. At the same time, policy and risk processes were shown to socially order and organize by coordinating people and activities, especially in meteorological and flood forecasting organizational settings. It did so by binding the expert to certain workflows and practices, directing their interactions among colleagues, and enacting certain decision possibilities and risk management solutions, depending on the situation. The outcomes of these interactions and risk decisions were shown to effect how experts perceive themselves as well as how they present themselves in the workspace. In this way, policy shapes work practices and constructs relationships experts have with others as well as with themselves. Paying special attention to flooding as opposed to other weather and hazards, the results of this research shed unique light on policy and risk as it relates to the effects of weather (rather than weather itself) that materialize across geographic space and on situations where multiple agencies are involved in risk assessment and management practices.

In addition to building on previous scholarship, the context in which this effort was undertaken opened the anthropology of policy and risk up to new and valuable perspectives. Particularly, the insights gleaned from this research contribute to the

theoretical domains of policy and risk by advancing our understanding of the influential role of interaction in shaping these concepts and their related processes, and the effect interaction has in policy-work for propagating risk in unintended ways. Early in the dissertation I showed how working within the constraints of policy, meteorologists interacted relationally with the atmosphere, other experts on the forecast floor, the mental image publics have of them, along with the image they have of their publics, to construct and manage risk. There I argued that these interactions framed the management of high risk weather events in so much as they assisted in the development and communication of risk notifications, or meteorologists' pursuit of operational success, as well as influenced meteorologists' perceptions of achievement, both organizationally and personally. Relatedly, the discussion of alternative risk management solutions revealed the importance of habitual thought, coherence, framing and mental models on risk (Benford 2013; van Dijk 2014, Whorf 1956), and the ways these co-mingle to produce varied understandings and responses in public groups. In saying this, it was shown how alternative notifications must be thoughtfully framed in order to bridge understandings and how, when carefully articulated, information will have greater resonance. At the same time, the findings revealed that in some cases, attempts to create shared conceptualization are no match for the alternative mental model employed by individuals to make sense of risk situations.

In the case of flood forecasters and key recipients of their information, I showed that interactions reinforced and challenged people's ideas, expedited as well as delayed actions, and created effects within and beyond the walls of the immediate forecast environment. Chiefly, I argued flood forecaster negotiation and deliberation played a

critical role in in their implementation of urban river flood policy, which had the real effects of limiting the usefulness of the notification as well as weakening the established relationship between their group and key recipients. In other words, expert negotiation in this case revealed the instrumental role uncertainty has in shaping conceptualizations and management of risk and how these elements combine to influence improvisations of policy and creative agency on the part of the flood forecasters. Collectively, a focus on interaction revealed the triangulation of uncertainty, risk and policy-work and the trickling and unintended consequences that can result.

Lastly, I examined the evolution of different yet related flood risk discourses and argued that current non-river flood risk management in Toronto, coupled with the incoherence surrounding non-river flood risk, has left the general public on their own to prepare and protect themselves against the sudden onset of flooding in Toronto, a threat for which they are neither experts in meteorology nor hydrology. This chapter veered from the micro-level analyses of the previous chapters to focus instead on policy and risk at the level of discourse. Taking a step back and capturing the macro-level perspective helped to illustrate the scale of the policy and risk space, it showed how discourses are produced and perpetuated interactionally, and it exposed how these discourses shape the classification of *policied* and *unpolicied* risks. To that end, a look at discourse revealed how knowledges are produced and the influence of mental models and coherence on these understandings. This examination showed how, in the context of flooding, discourse assists in the identification and classification of risk, which has in turn influenced the ways in which risk becomes officially managed or not.

The comparative analysis underscored how policy and risk are social objects mobilized through negotiation and management processes. This is to say that as much as policy stands for the official rules that may be written on paper in a manual, it is itself an idea or set of ideas. The ideas travel through space to multiple sites and come to life, so to speak, by the actions of people negotiating them and appropriating them through various mechanisms, including verbal face-to-face, over the phone and text-based conversations. To that end, this particular investigation brought greater clarity to Nielsen's (2011: 69) notion of policy as an interconnected triad of themes. Including risk in her definition, the examination of flood discourses in Toronto revealed that risk-based policies emerge from experiences which inspire political rationalities that then inscribe everyday practices and methods for the purpose of governing and guiding people, which in turn, contribute to differing perceptions, experiences and forms of conduct in those who are governed. Reflecting upon Nielsen, the case illustrated how momentum in one strand of the triad influenced others, generating shaping effects to neighbouring strands. Altogether, the case of *policied* and *unpolicied* risk revealed how in the context of flooding, events and their impacts inspired political rationalities, which then culminated in policy in one circumstance but not in the other with deleterious and unintended consequences.

Altogether, the research complements existing literature by elaborating a dramaturgical and frame analytic perspective on the management of meteorological uncertainty. It also extends empirical research on meteorological uncertainty management and communication from weather to river and non-river flood forecasting practices, however the endeavour is not without limitations. For example, the geographic focus and relatively small sample size of participants is somewhat of a disadvantage of this research

in so much as the results are not generalizable beyond the cases presented here. Having said that, this is as much a strength of the study in the sense that keeping the project localized and looking densely at policy and risk in a handful of different organizational and urban residential environments enabled me to build from the ground-up a detailed accounting of perspectives. Furthermore, the approach included real-time, micro-scale interactions and involved, in the one case, a comprehensive view of the flood prediction process from its atmospheric beginnings to various interpretations and actions taken by publics in response to the notification. Therefore, despite the lack of generalizability, this method generated rich and contextual understandings of policy and its implementation as well risk and its management, and helped to expose subtle differences between and across groups, which uncovered unexpected insights.

In considering future research, worthwhile ideas include: (1) a closer look at expert interaction during large scale events characterized as certain and managed via *policied* risk to explore how certainty shapes negotiation and deliberation the same or differently in these circumstances, and with what effects on communication and public responses; (2) an examination of interaction in the social media environment and how policy and risk are experienced differently, particularly how risk propagates differently over platforms such as Instagram where videos are often used to share ideas; and (3) a national or international comparison of urban non-river flood management practices to highlight different approaches and to shed light on the ways different organizations navigate perceptions of meteorological impossibility to provide residents with advanced warning of imminent non-river flood threat.

Overall, as the experience of unpredictable weather and urban flood risk is predicted to increase, the findings from the three analyses herein offer both theoretical significance as well as useful insight for weather and flood policy-makers and policy implementers in Toronto to consider as they look toward enhancing policy and risk management initiatives for the protection of the publics they serve.

References

Benford, R.D.
2013 Social movements and the dramatic framing of social reality. In *The Drama of social life: A dramaturgical handbook.* C. Edgley (ed). Ashgate Publishing Company. Pp. 139-155.

Boholm, Å.
2015 *Anthropology and Risk*. Routledge: London and New York.

van Dijk, T.A.
2014 *Discourse and knowledge: A sociocognitive approach.* Cambridge University Press.

Douglas, M.
1992 *Risk and Blame*. London and New York: Routledge.

Manning, P.K.
2014 Organizational analysis: Goffman and dramaturgy. In *The Oxford Handbook of Sociology, Social Theory and Organization Studies: Contemporary Currents*. P. Adler, P. du Gay, G. Morgan and M. Reed (eds). Oxford Handbooks Online. Pp. 266-298.

Nielsen, G.B.
2011 Peopling policy: On conflicting subjectivities of fee-paying students. In *Policy worlds: Anthropology and the analysis of contemporary power.* Eds Shore, Cris, Susan Wright and Davide Però. Bergahn Books: New York, Oxford. Pp. 68-85.

Shore, C. and S. Wright
2011 Conceptualizing policy: Technologies of governance and the politics of visibility. In *Policy worlds: Anthropology and the analysis of contemporary power.* Eds Shore, Cris, Susan Wright and Davide Però. Bergahn Books: New York, Oxford. Pp. 1-25.

Wedel, J.R., C. Shore, G. Feldman and S. Lathrop
2005 Toward an anthropology of public policy. *The ANNALS of the American Academy of Political and Social Science.* Vol. 600(1): 30-51.

Whorf, B.
1956 The relation of habitual thought and behaviour to language. In *Language, thought, and reality*. J.B. Carroll (ed). Cambridge, MA: MIT Press. Pp. 134-159.

Appendix A: Participant List

Participant Category	Pseudonym	Organization/Description
ECCC		
1	Norma	Meteorologist- ECCC
2		Meteorologist- ECCC
3		Meteorologist- ECCC
4	Elon	Meteorologist- ECCC
5		Meteorologist- ECCC
6	Elaine	Meteorologist- ECCC
7		Meteorologist- ECCC
8	Samuel	Meteorologist- ECCC
9		Meteorologist- ECCC
10		Meteorologist- ECCC
11		Meteorologist- ECCC
12		Meteorologist- ECCC
13		Meteorologist- ECCC
14	Sam	Meteorologist- ECCC
15		Meteorologist- ECCC
16		Meteorologist- ECCC
17	Sadie	Meteorologist- ECCC
18	Hazel	Meteorologist- ECCC
19		Meteorologist- ECCC
20		Meteorologist- ECCC
21		Meteorologist- ECCC
22		Meteorologist brought in for TO2015
23	Nash	Meteorologist brought in for TO2015
24		Meteorologist brought in for TO2015
25		Meteorologist brought in for TO2015
26	Benny	Meteorologist- ECCC
TRCA		
1	Olivia	Flood Duty Officer
2	Stuart	Flood Forecaster
3	Nancy	Flood Forecaster
4	Ed	Chief Flood Duty Officer
5	Bobby	Flood Forecaster
6		Flood Forecaster
7		Flood Forecaster
8		Flood Forecaster
9		Flood Forecaster
10		Flood Forecaster
11		Flood Forecaster
12		Flood Forecaster

GENERAL PUBLIC (PUB_{XX})		
1	Theo	Sport Manager
2	Rebecca	Sport Manager
3	Brooklyn	Sport Manager
4	Gabriel	Sport Manager
5	Nasir	Sport Manager
6		Sport Manager
7	Stephanie	Sport Manager
8	Lucas	Sport Manager
9	Umberto	Sport Manager
10	Cathy	Resident
11	Donald	Resident
12		Resident
13		Resident
14	Ginny	Resident
15		Resident
16	Ingrid	Resident
17	Joseph	Resident
18	Kate	Resident
19	Leonard	Resident
20	Maggie	Resident
21	Noah	Resident
INSTITUTIONAL REPRESENTATIVES ($INST_{XX}$)		
1	Ron	Local Private Business (LPB) located along flood vulnerable Bayview Extension
2		Local Private Business (LPB) located along flood vulnerable Bayview Extension
3		Municipal Emergency Management
4		Municipal Emergency Management
5		Municipal Emergency Management
6		Municipal Emergency Management
7	Oakley	Municipal Water Authority
8	Sawyer	Municipal Hydro Authority
9		Local Private Transit Authority
10		Local Private Transit Authority
11		Local Public School Authority
12	Josh	Municipal Road Authority- East
13		Municipal Road Authority- East
14	Stanley	Municipal Road Authority- West
15	Tim	Municipal Road Authority- West1

COMMUNICATORS ($COMM_{XX}$)		
1		Public Weather Communicator ECCC
2		CTV meteorologist
3	Kevin	CBC meteorologist
4	Beatrice	CBC journalist
5		TWN
6		TWN
7		TWN
8		TWN
9		TWN
10	Connor	CP24 meteorologist

Appendix B: Special Weather Statement (SWS) issued on Tuesday, July 14, 2015

WOCN28 CWTO 141342
SPECIAL WEATHER STATEMENT
FOR THE PAN/PARAPANAM SITES IN SOUTHERN ONTARIO
UPDATED BY ENVIRONMENT CANADA
AT 9:42 A.M. EDT TUESDAY 14 JULY 2015.

SPECIAL WEATHER STATEMENT FOR:
CIBC PAN AM PARK ZONE
UNIVERSITY OF TORONTO DOWNTOWN CLUSTER AND RYERSON
ATHLETIC CENTRE
CIBC PAN AM AND PARAPAN AM AQUATICS CENTRE AND FIELD HOUSE AND
UNIVERSITY OF TORONTO SCARBOROUGH TENNIS CENTRE
CIBC PAN AM AND PARAPAN AM ATHLETICS STADIUM AND CANADIAN
TENNIS CENTRE
MISSISSAUGA SPORTS CENTRE AND CENTENNIAL PARK CLUSTER
MARKHAM PAN AM CENTRE
ANGUS GLEN GOLF CLUB
MILTON PAN AM VELODROME
HAMILTON SOCCER CENTRE
ROYAL CANADIAN HENLEY
WELLAND PAN AM FLATWATER CENTRE
AJAX PAN AM BALLPARK
WHITBY ABILITIES CENTRE COMPLEX
OSHAWA SPORTS CENTRE
CALEDON PAN AM EQUESTRIAN PARK
CALEDON EQUESTRIAN CROSS-COUNTRY CENTRE
TORONTO INTERNATIONAL TRAP AND SKEET CLUB
HARDWOOD MOUNTAIN BIKE PARK
MINDEN WILD WATER PRESERVE.

==DISCUSSION==

AS OF 9:30 AM, A BAND OF SHOWERS CONTINUES TO PUSH ACROSS SOUTHCENTRAL ONTARIO WITH THE LEADING EDGE FROM NORTH OF ORANGEVILLE THROUGH DOWNTOWN TORONTO INTO WESTERN LAKE ONTARIO. SCATTERED THUNDERSTORMS WERE ASSOCIATED WITH THIS LINE EARLIER THIS MORNING BUT LIGHTNING ACTIVITY HAS WEAKENED IN THE PAST 30 MINUTES AND WILL REMAIN A LOW RISK AS THE BAND PUSHES THROUGH THIS MORNING. ABOUT 5 MM OF RAIN IS POSSIBLE WITH THIS LEADING BAND WHICH SHOULD LAST AN HOUR OR SO AS IT PUSHES EAST. AFTER A BRIEF BREAK IN PRECIPITATION, ANOTHER ROUND OF SHOWERS AND POSSIBLE THUNDERSTORMS IS EXPECTED BY LATE MORNING THROUGH THE AFTERNOON AS A LOW PRESSURE SYSTEM TRACKS ACROSS SOUTHERN ONTARIO. IN GENERAL ABOUT 10-20 MM OF RAIN IS POSSIBLE ACROSS MOST VENUES TODAY, HOWEVER LOCALLY HEAVIER AMOUNTS OF 25 TO 40 MM ARE POSSIBLE WITH LOCAL THUNDERSTORMS. THE UNSETTLED WEATHER WILL CONTINUE INTO THIS EVENING BEFORE A COLD FRONT PUSHES THROUGH BRINGING CLEARING SKIES OVERNIGHT ALONG WITH BRISK NORTHERLY WINDS AND COOLER, LESS HUMID WEATHER FOR WEDNESDAY.

ENVIRONMENT CANADA METEOROLOGISTS WILL UPDATE ALERTS AS REQUIRED. FOR FURTHER INFORMATION, PLEASE CONTACT THE ENVIRONMENT CANADA PANAM BRIEFING DESK AT 416-739-5753.

END/MSC

Appendix C : Transcript of TRCA Flood Forecaster Recorded Interaction

Transcription Key

[ ]	overlapping speech
:	lengthened segment
__	speaker emphasis
--	brief pause
(.)	one second pause
?	rising intonation
!	exclamation
.	final intonation
(( ))	non-verbal gestures
< >	acronyms
{ }	reconstructed speech
XX	indicates personal name

Speakers:
Ed- Chief Flood Duty Officer (FDO)
Olivia- FDO
Stuart- Management/Flood forecaster
Nancy- Flood forecaster

A: October 28, 2015 at TRCA; approximately 1:49pm.
Data: fieldnotes

1	Olivia:	So we're not issuing the Warning right now?
2	Ed:	Holding off on the Flood Warning.
3	Nancy:	((popping head over the partition)) So we're just not going to do it?
4	Ed:	I'm thinking we're going to wait.
5	Nancy:	So far only Todmorden at risk.
6		What about the extension?
7	Ed:	Flooded
8	Nancy:	We could speak to what is flooding and tone down the --
9	Stuart:	you could also say Flood Warning based on.
10	Ed:	We have the Watch out to cover Bayview.
11		I'm thinking with the Warning -- at least right now --
12		to transportation that it {the water is} leveled -- receded but could climb.
13		You know what I mean,
14	Nancy:	Kind of wishy washy.
15		We either issue or don't issue.
16	Ed:	That's the thing -- I'm not 100% sure the DVP is going to flood.
17		Right now we're at 76.3m.
18		We're at .4m away and it's tapering off.
19	Nancy:	We don't have any rules around it.
20		The challenge has always been the flood location.
21		Since July 8th -- issuing covers off any questions that may occur.

Stuart: If I were operating alone -- if we were 40cm away from being flooded
I would call over to XX {the local private transit authority}
and ask them what they are seeing on the ground.
Are their tracks flooded?
Use Bayview extension flooding -- tracks flooded -- and potential for DVP as rationale.

B: October 28, 2015 at TRCA; approximately 2:00pm
Data: audio-recorded talk

.....Olivia returns from placing a phone call to the local private transit authority…

Olivia: So: I got off the phone with them {Local Private Transit Authority}
U::m: they're not going to run- they've cancelled
[those tracks]
Ed: [They're not going to run them?]
Olivia: They're going to run them -- [around]
Ed: [Okay]
Olivia: a different way [instead]
Ed: [Because of the flooding?]
Olivia: U::m yes
Ed: [Because they have]
Olivia: [Yes]
So they confirmed that there was water on the tracks.
They said about halfway up the tracks not completely submerged
10 feet {high} on either side.
Stuart: 10 -- feet (.)
Oh oh oh -- makes sense makes sense
So 10 feet on either side -- [so halfway]
Olivia: [Yeah]
Stuart: Okay -- so there's this much water on the track -- spreading 10 feet under them.
It's not completely submerged -- but that's enough for them to
That's flooding.
Ed: Did they mention water levels?
Olivia: Did they give -- or
Stuart: Yeah.
Ed: Do we know water levels?
Olivia: They never mentioned anything -- like that --
they did mention sending field staff out to -- u::m - confirm
Ed: Okay -- and see if we can get pictures,
not today -- maybe tomorrow give them a call and see if we can get photos just to see where it is.
And exact location -- so we see that.
{to Stuart} I absolutely see your point of view? (.)

61		but in the past and I can do that -- like we can issue the message
62		{Warning}
63		and it's a different set of eyes right? from what we see
64		based on what we've done in the past.
65		My hesitation about the Warning is --
66		I'm so associated with the DVP that this is the biggest u::m
67		the most u::m -- I guess -- highest level Warning that we have right,
68		and that's always been what my hesitation is
69		but I absolutely see your point of view.
70	Stuart:	I defer to you.
71	Ed:	Yeah -- Yeah.
72	Stuart:	Again -- you're the decision maker today so --
73		and not that one that one is more right than the other.
74	Ed:	No -- but we need -- I need a different
75		like reading u::h reading the actual definition of the Flood Warning,
76	Stuart:	Yeah.
77	Ed:	That makes sense what you're saying.
78		But going to back to like we issue this? to me -- it's a -- it's like a bigger --
79		issue.
80	Stuart:	Okay
81	Ed:	It's like u::h I see the Warning being more -- August or -- July 8th right?
82		but that's but that's not to say that it might
83	Stuart:	But the good thing is that we've confirmed with [XX]
84	Ed:	[There's flooding]
85	Stuart:	That they know
86	Ed:	Yes.
87	Stuart:	And that they have -- taken -- action to go around it.
88		So at least -- like from a covering of our butts perspective?
89		Right?
90		at least that's there.
91		Again -- I will -- defer to you -- your experience on that
92		The only thing I'm thinking of is do we want to --
93		make it clear [right?]
94	Ed:	[What] areas are flooding
95	Stuart:	That that area is and that area hasn't you know what I mean?
96		like there is some rationale from from the train.
97		Second of all – that – other people - right, know that it's
98		and I guess the other question is what about the DVP
99		because if we do actually think there is potential for it [then]
100	Ed:	[then]
101		Then we -- contact the right people -- for them to -- be -- on standby, that
102		you know we have to give -- just like with the u::h lower u::h Bayview
103		right?
104		we gave head's up that this is -- this is going to happen -- right?
105	Stuart:	Yeah that's true.
106	Ed:	Be ready for it and again with the DVP -- it's like it looks like right now

it's not as as imminent as it was earlier today
Stuart: Yeah
Ed: Because of the lull in rainfalls but there's still a potential right?
Stuart: My concern is that it's 2 o'clock right?
Ed: Exactly - we're in rush [hour.]
Stuart: [we're in]
Like at four -- it's going to be so much harder for them to go in at 4:30 --
Ed: Yeah.
Stuart: And close it {the DVP} than it is to tell people at [3:45]
Ed: [Stay off the roads]
Stuart: don't take the DVP home right?
Ed: Yeah
Stuart: So that's the -- like operationally -- right?
is there a benefit right?
to saying -- you know going into Flood Warning as in --
we've already experienced it here -- and a reminder that there is potential
on the DV--
And then when we say potential flooding like like potential -- then
people right?
{cross talk}
Stuart: What I would just rather have people do is no matter what
people should just shouldn't -- the action -- if I'm downtown right?
like what is the message that --
that Toronto Transportation would want to have people downtown know
right?
and I would say -- just in case take a different route home.
Because we know if more rain is going to come --
and we're this close ((thumb and pointer finger scrunched together)) --
And we have to do --
we don't want to have to do it when there's people on the road.
We want fewer people on the road --
that means fewer people diverting onto that side right?
and that means fewer people taking Avenue taking whatever
just -- not even going onto that area
And again -- I tr --
I de --
Knowing that one is no more right than the other
I'm just -- [voicing]
Ed: [That] frame of mind is good.
The message we need to send is -- the potential and not give the direction
To do it.
Stuart: I agree -- no no I agree so just and then but the potential for that so --
That that -- again -- leave it to that
And maybe that's where the wording in that {inaudible} goes in
leave it leave it to that that's my -- my stance I don't know
Ed: I don't want to put details in the actual message u::m [rather I'd]

Stuart: [Except that]
We've seen --
except that flooding has been reported on the tracks at Bayview Extension
Ed: Yeah yeah.
And- that's a good point -- there's potential there but I also don't want to
I'm wishy washy with this too what I'm afraid of later is -- you know --
we're so focused on this area there --
obviously there hasn't been any reports anywhere else? --
but are we going to get [slammed later]
Stuart: [I think you could say flooding is reported here]
Water levels
Ed: And then say
Stuart: No no -- in those areas and say water levels are high throughout the
rivers and streams throughout the GTA.
And then that covers it off and says {inaudible}
Ed: Yeah.
You know what -- let's issue the message.
And I'll talk to XX{Nancy} and confirm things because of the --
Previous -- the the -- you know the frame of mind that we were always in
{inaudible}
But that's a good point
We're not very u::m -- we haven't issued a lot of Warnings ((giggle))
Stuart: Fair fair
Ed: So it's something -- I guess -- we need to u::h figure out the details

C: October 28, 2015 at TRCA; approximately 2:10pm
Data: fieldnotes

Stuart and Ed continue to discuss reasons for and against issuing a Flood Warning and shortly after 2pm Ed decides to go ahead and upgrade the Watch, but then hesitates. Huddled altogether, the group continues:

Ed: We should still contact Toronto Transportation.
Nancy: Is the fuzzy process all clear in your head?
Stuart: What is the trigger?
Nancy: Easier to issue a flood warning --
balancing begins earlier.
When you're in the flood warning situation -- you're already in it --
you're not wrong.
Stuart: Maybe what we're saying in the Flood Warning
is we want people to be aware that precipitation continues to fall
will still come
and that we're not out of the woods yet.
Nancy: {to Stuart} you need to have conversation with XX and XX{upper
management} about flood warning.

190		Not issued very often and usually only when our key areas -- our key
191		vulnerabilities are at risk.
192	Stuart:	Does this also cover us off for areas that we don't have great monitoring?
193	Ed:	Going to issue a message but my gut feeling is that we don't need to.
194		{To Olivia} Did you issue the message?
195	Olivia:	No.
196	Ed:	Okay -- don't.
197		My feeling is that we are going to be creating chaos for the DVP
198		or at the DVP if we issue.
199		I want to call Environment Canada.
200		I know our timing is terrible but --

At 3:04pm Ed calls and explains the situation to a meteorologist at ECCC. He asks for a further breakdown and shares that the Don River at Dundas is what he is really worried about.

D: October 28, 2015 at TRCA; approximately 3:10pm
Data: fieldnotes
Ed is off the phone at 3:10pm. At 3:10pm, still unsure, Ed then looks to Nancy once again:

201	Ed:	Still another 5-10mm expected {according to ECCC}.
202		A little bit of drizzle here and there.
203		In one hour to 2.5 hours we'll see another 2.5-5 mm of rain.
204		Don at Dundas is at 76.2 and it's receding.
205		Send it {the Flood Warning} out and nothing and create chaos.
206		Send it out and flooding happens and we create chaos.
207	Nancy:	The arguments for doing it are just as valid as arguments against.
208	Ed:	Issuing is a big deal -- it's not just about people getting wet.
209		I am not liberal at issuing these kinds of messages.
210	Nancy:	This is predicated based on the assumption that as soon as you issue
211		the Warning they are going to close the road?
212		I seriously don't think they are going to do anything
213		directly based on your message.

Appendix D: TRCA October 28, 2015 Flood Warning

FLOOD WARNING

Date: **October 28, 2015**

Time: **3:20 PM**
Issued to: **school boards, municipalities, local conservation authorities, local police, emergency services and media**

Weather Conditions:
Toronto and Region Conservation advises that the Greater Toronto Area has received 25 - 50 mm of rainfall since early this morning. Environment Canada is forecasting another 15 mm of rainfall this afternoon.

Issues:
Flooding of the Bayview Extension and the Metrolinx rail line within the lower parts of the Don River watershed have been reported. With the additional rainfall, there remains a potential for flooding of low lying areas including the Don Valley Parkway.

The water levels and flow in TRCA's watersheds are higher than normal resulting in dangerous conditions. Flooding on roadways and underpasses may be experienced.

Actions:
Please stay away from rivers and streams and exercise caution around all bodies of water. Please avoid driving through flooded roadways in low-lying areas and at underpasses. Please alert any children under your care of these dangers and supervise their activities.

We will continue to closely monitor this system and will issue an update or cancellation to this Flood Warning by 10:00 am on October 29. For more information please contact the on-call Flood Duty Officer.

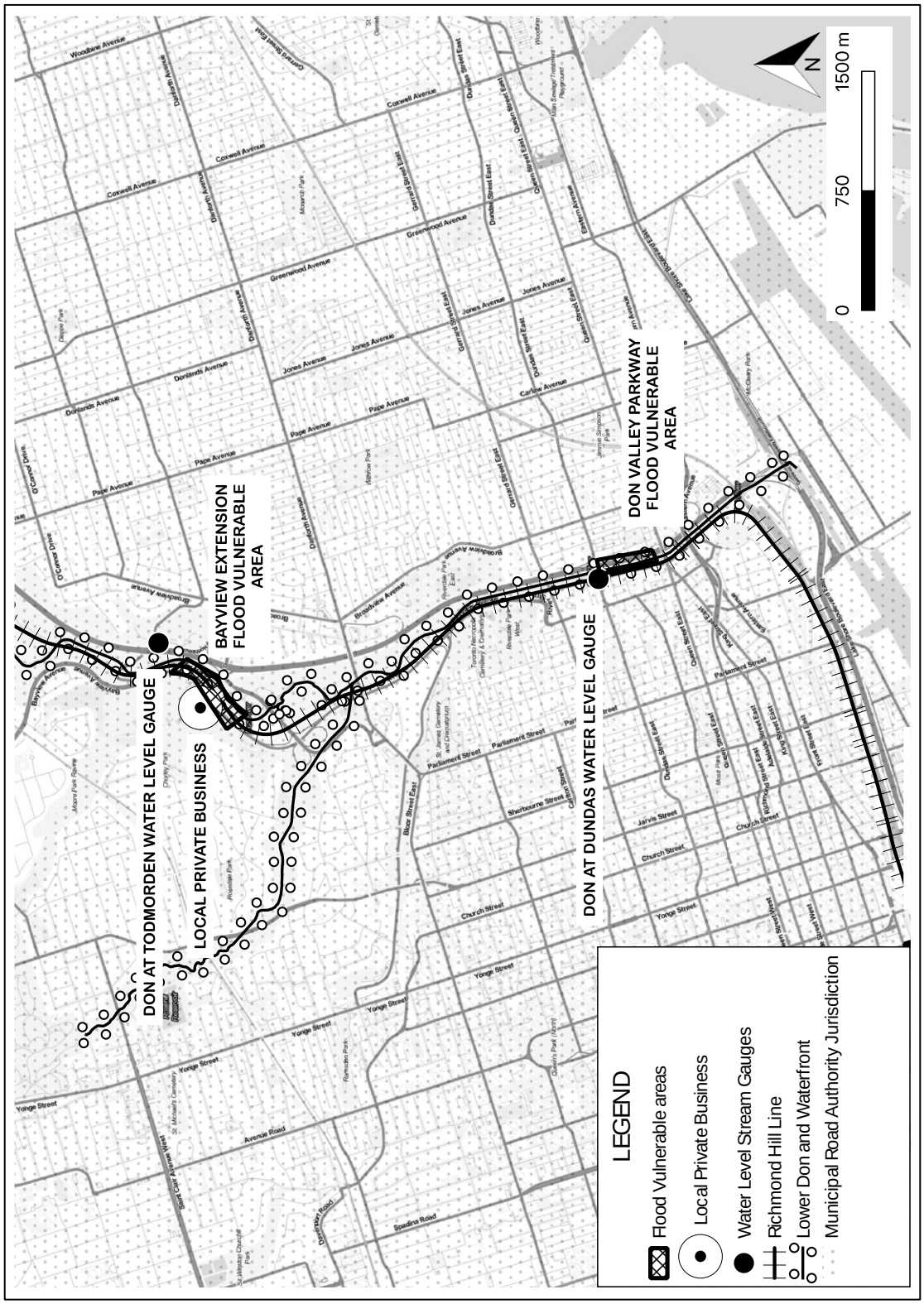
Flood Duty Officer	**Chief Flood Duty Officer**
$TRCA_1$	$TRCA_4$
416-661-XXXX	416-661-XXXX

Note: A Flood Warning is a notice that flooding is imminent or occurring in specific watercourses or municipalities. Municipalities and individuals should take action to deal with flood conditions. This may include road closures and evacuations

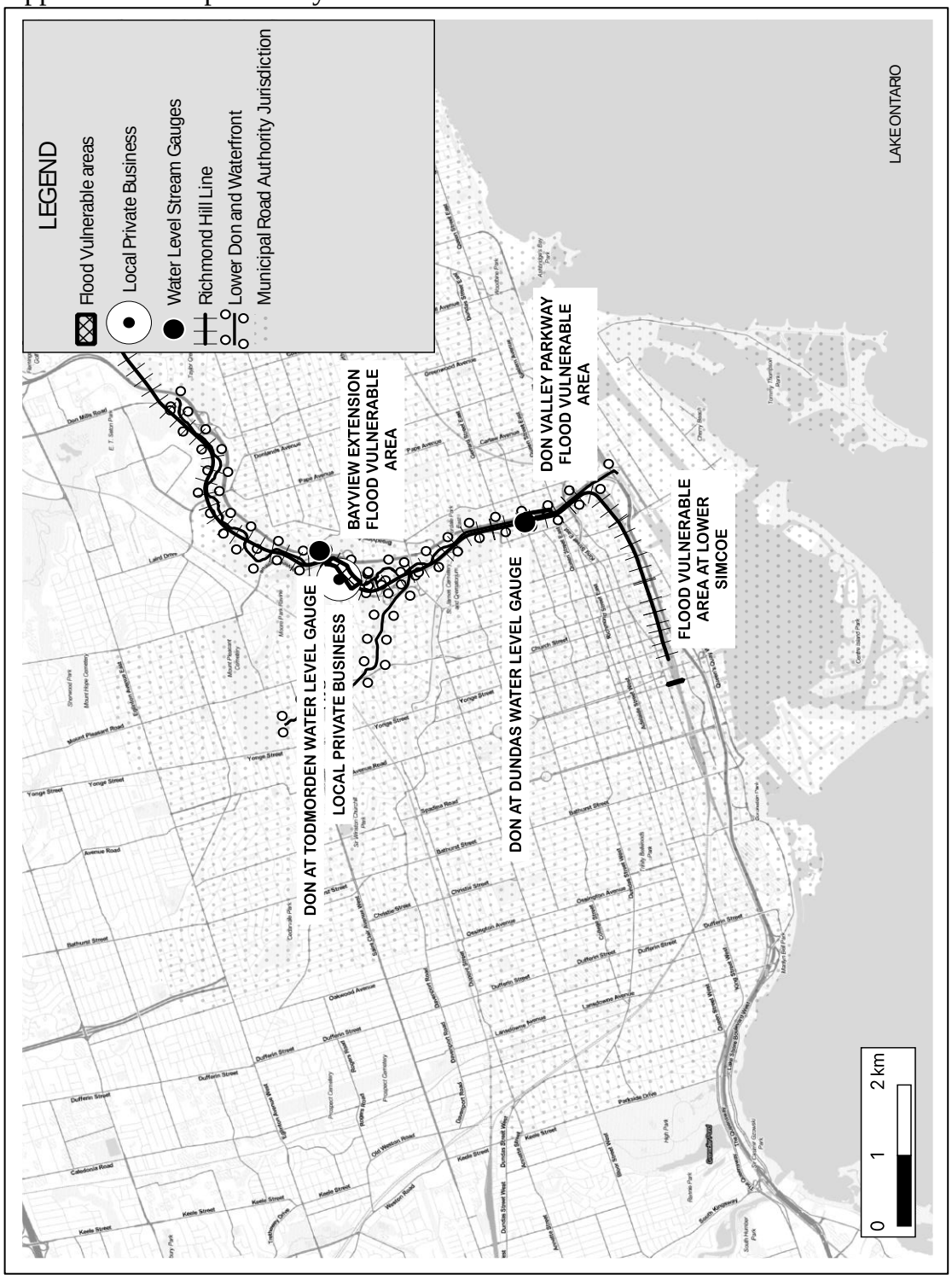
Appendix E: ECCC Severe Thunderstorm Warning
*emphasis added by Spinney

```
AMCIR <10> n
WUCN11 CWTO 230347
SEVERE THUNDERSTORM WARNING
FOR SOUTHERN ONTARIO
ISSUED BY ENVIRONMENT CANADA
AT 11:47 P.M. EDT MONDAY 22 JUNE 2015.
------------------------------------------------------------------------
SEVERE THUNDERSTORM WARNING FOR:
=NEW= CITY OF TORONTO
=NEW= PICKERING - OSHAWA - SOUTHERN DURHAM REGION.

------------------------------------------------------------------------
==DISCUSSION==

UPDATED OR ENDED BY 1:00 A.M. EDT.

AT 11:47 P.M. EDT, ENVIRONMENT CANADA METEOROLOGISTS ARE TRACKING A
SEVERE THUNDERSTORM CAPABLE OF PRODUCING VERY STRONG WIND GUSTS,
DIME TO NICKEL SIZE HAIL AND HEAVY RAIN.

A THUNDERSTORM NEAR MARKHAM WILL MOVE SOUTHEAST AND AFFECT
SCARBOROUGH THROUGH WHITBY TO OSHAWA BETWEEN MIDNIGHT AND 1.00 AM.
WIND GUSTS TO 90 KM/H, INTENSE LIGHTNING AND TORRENTIAL DOWNPOURS
ARE POSSIBLE WITH THIS THUNDERSTORM.

TAKE COVER IMMEDIATELY, IF THREATENING WEATHER APPROACHES. STRONG
WIND GUSTS CAN TOSS LOOSE OBJECTS, DAMAGE WEAK BUILDINGS, BREAK
BRANCHES OFF TREES AND OVERTURN LARGE VEHICLES. REMEMBER, SEVERE
THUNDERSTORMS CAN PRODUCE TORNADOES. AVOID DRIVING THROUGH WATER ON
ROADS. LIGHTNING KILLS AND INJURES CANADIANS EVERY YEAR. REMEMBER,
WHEN THUNDER ROARS, GO INDOORS(EXCLAMATION MARK)

THE OFFICE OF THE FIRE MARSHAL AND EMERGENCY MANAGEMENT RECOMMENDS
THAT YOU TAKE COVER IMMEDIATELY, IF THREATENING WEATHER APPROACHES.

ENVIRONMENT CANADA METEOROLOGISTS WILL UPDATE ALERTS AS REQUIRED.
PLEASE MONITOR LOCAL MEDIA OR WEATHERADIO. TO REPORT SEVERE WEATHER,
SEND AN EMAIL TO STORM.ONTARIO(AT)EC.GC.CA OR TWEET REPORTS TO
(HASH)ONSTORM.
```

Appendix F: Map of Study Area- Don Valley Flood Vulnerable Areas



Appendix G: Map of Study Area- Zoomed out



Appendix H: Map of Study Area- Lower Simcoe St.

Appendix I: REB Approval

Western Research

Research Ethics

Western University Health Science Research Ethics Board
NMREB Annual Continuing Ethics Approval Notice

Date: April 28, 2015
Principal Investigator: Dr. Karen Pennesi
Department & Institution: Social Science\Anthropology,Western University

NMREB File Number: 105263
Study Title: Producing and consuming flash flood information: an ethnographic exploration of working and living the weather
Sponsor: Ontario Graduate Scholarship

NMREB Renewal Due Date & NMREB Expiry Date:
Renewal Due -2016/04/30
Expiry Date -2016/05/22

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed the Continuing Ethics Review (CER) form and is re-issuing approval for the above noted study.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), Part 4 of the Natural Health Product Regulations, the Ontario Freedom of Information and Protection of Privacy Act (FIPPA, 1990), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941

Ethics Officer, on behalf of Prof. Riley Hinson, NMREB Chair

Ethics Officer to Contact for Further Information

Erika Basile	Grace Kelly	Mina Mekhail	Vikki Tran

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

Appendix J: Sample Survey Protocol – Producers of Weather and Flood Information

Producing and Consuming Weather Information:
An ethnographic study of working and living the weather

XXXXXXXX, PhD Student
University of Western Ontario
XXX-XXX-XXXX
XXXXX@XXX.XX

INTRODUCTION
You are being asked to complete this brief questionnaire in the above-titled research project. The purpose of the questionnaire is to gain a better understanding of risk communication from the perspective of XXXX employees. Responses will be used to inform the development of this study's interview and survey protocols intended for various members of the public.

CONFIDENTIALITY
The responses you give will remain anonymous and your identity will not be revealed. XXXXXX will compile all responses.

CONSENT
Your participation in answering this questionnaire is optional. While participation is optional, completion of the questionnaire indicates your consent to participate.

INSTRUCTIONS
Please answer the ten questions below. Once you have completed answering the questions, fold pages 2-4 of the questionnaire and place them in the sealed box located on the counter underneath the TVs of the room allocated as the Emergency Operations Centre. Please be as specific and descriptive as possible with your responses (use the back of page 2/3/4 if more space is required). TO REPEAT: ***Your responses will remain anonymous and your identity will not be revealed.***

QUESTIONS
If you have any questions about this study or the questionnaire, please contact the student researcher, XXXXX, at XXX-XXX-XXXX or by email at XXXXXXX

XXXXXXXX will retrieve the sealed box with responses on **XXXXXXXX.**

1. What is your role with XXXX? (circle most appropriate)
    a. Flood Duty Officer
    b. Other:

2. Explain, in your words, what is meant by 'urban flood' and identify what you believe is/are the cause(s) for urban flooding.

3. For each of the following TRCA message types please describe (in your own words) what you think each means and indicate all of the trigger(s) (including types of data, information from others, etc.) that influence your decision to issue.

Message Types	**Describe**	**Triggers**
Watershed Conditions Statement- Water Safety		
Watershed Conditions Statement- Flood Outlook		

Flood Watch		
Flood Warning		

4. In terms of TRCA flood information list the groups/organizations you feel comprise your target audience.

5. On a scale of 1 to 5, where 1 is least useful and 5 is most useful; please rate the perceived usefulness of each of TRCA's flood message types, according to you.

Watershed Conditions Statement- Water Safety	
Watershed Conditions Statement- Flood Outlook	
Flood Watch	
Flood Warning	

6. Given your role with TRCA, list the biggest challenges you experience in communicating flood risk with your target audiences. You may experience different challenges with different groups and with different products. Please elaborate as much as possible.

7. List what you believe the target audiences misunderstand when flood risk information is issued. Different target audiences may misunderstand different products in different ways. Please identify, as much as possible, what you believe each group misunderstands.

8. To improve communication, what would you like to know about how your target audiences relate to your suite of flood information products?

9. Referring to the examples below, explain (in the right-side margin) what makes each of these statements different?

WATER SAFETY
WATERSHED CONDITIONS STATEMENT

DATE: JUNE 8, 2015

TIME: 9:00AM

ISSUED TO: SCHOOL BOARDS, MUNICIPALITIES, LOCAL CONSERVATION AUTHORITIES, LOCAL POLICE, EMERGENCY SERVICES AND MEDIA

Weather Conditions:
Environment Canada has stated that the current weather system may result in approximately 10-20mm of additional rainfall occurring across parts of the Greater Toronto area. The forecasted rain may continue until approximately 2:00PM, with a chance of thunderstorms in the afternoon.

Issues:
While significant flooding is not expected at this time, the forecasted rainfall will cause higher than normal flows and water levels in Greater Toronto Area creeks and rivers, resulting in unsafe conditions.

Actions:
Please exercise caution around all bodies of water and low-lying areas. Please alert any children under your care of these dangerous conditions and supervise their activities.

Toronto and Region Conservation will continue to monitor the weather and watershed conditions and will issue further messages as necessary. This Water Safety Watershed Conditions Statement will be in effect through Tuesday, June 9, 2015. For more information please contact the on-call Flood Duty Officer.

FLOOD OUTLOOK
WATERSHED CONDITIONS STATEMENT

DATE: TUESDAY JULY 7, 2015

TIME: 2:30PM

ISSUED TO: SCHOOL BOARDS, MUNICIPALITIES, LOCAL CONSERVATION AUTHORITIES, LOCAL POLICE, EMERGENCY SERVICES AND MEDIA

Weather Conditions:
Toronto and Region Conservation is advising that Environment is forecasting that the frontal system moving through the GTA Tuesday afternoon and evening will cause 10-15 mm of rainfall through the Greater Toronto area and may result in localized rainfall of 30 to 40 mm or more in some areas. .

Issues:
Forecasted rainfall amounts will result in higher than normal water levels and flows. Rivers and streams will be faster flowing, creating unsafe and/or dangerous conditions. There may be flooding on roadways and in low-lying areas.

The combination of slippery and unstable banks will create hazardous conditions close to any river, stream or other water bodies.

Actions:
Please stay away from rivers and streams and exercise caution around all bodies of water. Please alert any children under your care of these dangers and supervise their activities.

This Flood Outlook Watershed Conditions Statement will be in effect through to Wednesday July 8, 2015. TRCA will continue to monitor streams and weather conditions closely. Further flood related messages will be issued as required. For more information please contact the on-call Flood Duty Officer.

10. Identify (underline, highlight, or circle) important words and phrases in each message above, those you expect your target audience to focus on during their decision-making process.

Appendix K: Sample Interview Protocol – Public User Groups

Urban Flooding:
Understanding the interpretation, communication and response to urban flood information in Toronto

In the survey below you will be asked questions about four different topical themes:

A. General weather knowledge
B. Flood specific
C. Different Weather Scenarios
D. Demographic information

This is a research effort intended to learn about the interpretation, communication and response to flood information and weather and flood events in the City of Toronto.

If you have any questions about this study or your treatment as a participant, please contact the study Investigator, XXXXXXX, at XXX-XXX-XXXX or by email at XXXX. If you have questions about your rights as a research subject, you may contact The Office of Research Ethics at The University of Western Ontario at XXX-XXX-XXXX or by e-mail XXXXX.

If you would like to receive a copy of the published results of this study or attend any public presentation of the results, please provide the researcher with your name and contact information.

A. General weather knowledge

As someone working in an urban community please think about your daily needs and uses for weather information as it relates to your employment and answer the following questions:

Q1. From May until October, to what extent do you pay attention to the following types of weather? Please select ONE option for each.

	To great extent	To some extent	To a small extent	Not at all
Rainfall				
Thunderstorms				
Tornadoes				
Flooding				
Lightning				
Heat				

Q2. In your own words, describe the difference between a weather **watch** and a weather **warning**.

Q3. Sumer time forecasts often include a percent chance of rain, or POP (probability of precipitation). When a weather forecast indicates a 40 POP for the City of Toronto, what does that mean? From the options listed below, select the ONE response you believe best describes 40 POP.

- ☐ That it will rain for 40% of the day in the City of Toronto
- ☐ That in 100 similar weather situations, rain has fallen 40 times at any point in the City of Toronto
- ☐ That rain is expected to fall on 40% of the City of Toronto
- ☐ That it rained 40 times out of 100 on that particular date in the past
- ☐ I don't know what is meant by 40 POP
- ☐ It means:

Q4. Read the following Rainfall Warning. Think about your needs and uses for weather information and the weather conditions noted in the warning message that are important to you. Consider how important each of the factors is in determining the success of the warning, or that the forecaster 'got it right'.

```
RAINFALL WARNING
FOR SOUTHERN ONTARIO
UPDATED BY AGENCY Y
AT 9:56 P.M. EDT TUESDAY 27 OCTOBER 2015.
-------------------------------------------------------------
-----
RAINFALL WARNING FOR:
      CITY OF TORONTO
-------------------------------------------------------------
-----
==DISCUSSION==
```

This Rainfall Warning would be successful if:

	Very important	Somewhat important	Not important
The rain fell in the manner described, or "heavy"			
The rain began at the described time, or "later tonight"			
The rain continued for the length of time described, or "until Wednesday evening"			
The warned amount of rain fell, or "45 to 55 millimetres"			
The warned amount of rain fell within the warned area, or "the City of Toronto"			
The conditions led to the described impacts, or "water pooled on roads"			
It rained			
I personally felt rain			
The Tuesday night warning allowed me to adjust my Wednesday plans			
The Tuesday night warning gave me the head's up I needed to modify my travel route to work on Wednesday			
Water pooled on my residential road			

Q5. Continue thinking about your daily needs and uses for weather information as it relates to your employment. Consider now what reasons you have for accessing weather information. List all of the different motivators you have for accessing weather information (for example, travel, commute).

B. Flood specific

Q6. People understand flood events and flood information in different ways. In thinking about flooding as it relates to your employment, how strongly do you disagree or agree with the following statements. Please select ONE option for each statement.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am knowledgeable about urban floods					
I am experienced with urban flooding					
I am aware of the risk of urban flooding in my jurisdiction prior to being officially notified or warned					
I think it is difficult to understand official flood warning information					
I think that urban floods may cause extreme destruction					
I can control our organization from being impacted by flooding					

Q7. List the different types of urban flooding you are familiar with.

Q8. What kind of urban flooding are you concerned about as an employee?

Q9. Based on your understanding, what is a riverine flood?

Q10. In your opinion, what is the difference between a riverine flood and a non-riverine flood in an urban setting?

Q11. In your opinion, what are the causes for urban flooding of areas away from rivers and watercourses?

Q12. In your opinion, which group/organization do you imagine is responsible for providing flood information for you and other employees in your organization as it relates to flooding of roadways and basements (away from rivers)?

Q13. How do you learn about flooding in your work community? (Check all that apply)

- ☐ Radio
- ☐ TV
- ☐ Someone at work
- ☐ smartphone app
- ☐ website

- if radio- which station(s):

_____

- if TV- which station(s):
  _____
- if smartphone app- which one(s):
  _____
- if website- which one(s):
  _____

Q14. Presented here are three different levels of flood information issued by Agency X. Rank each in the order of increasing flood threat, where 1 is the most threatening and 3 is the least threatening.

- ☐ notice of the potential for flooding
- ☐ flooding is imminent or already occurring in specific watercourses or municipalities
- ☐ flooding is possible in specific watercourses or municipalities

Q15. As someone who works in the City of Toronto or the GTA, and in terms of your daily needs and uses for weather information as it relates to your employment, at what point in time do you begin paying attention to the threat of urban flooding? Please select ONE option for each statement.

	Not at all	A little	Some what	A great deal	N/A
Once rain is forecast for my work area					
Once the rain begins to fall					
Once rain exceeds a certain millimetre threshold					
Once I am notified by official sources					
Once I hear about possible flooding on the radio					
Once a warning alert pops up on my phone/computer					
Once water begins pooling on my work street					

Q16. If rain is one factor motivating you to pay attention to the threat of a flood, from the different ways that rain is characterized below please indicate the extent to which each characterization/phrasing motivates you to pay attention. Please select ONE option for each statement.

	Not at all	A little	Somewhat	A great deal	N/A
50 millimetres over the next three hours					
50 millimetres over the next 24 hours					
Band of showers					
Isolated cells					
Heavy rain					
Drizzle					
Torrential downpour					
Thunder-storms					

Q17. People can have multiple experiences with flooding over the course of their lifetime. Please think about all of your experiences with flooding and indicate how much experience you have with each of the statements listed below. Please select ONE option for each statement.

	No experience	A little experience	Some experience	A great deal of experience
My workplace has been threatened by a flood				
My workplace has been under a flood warning				
I have seen a flood firsthand				
I have altered my driving route as a result of flooding near my workplace				
I have worried about my home due to a flood				

I have had property damage due to a flood				
I have heard or watched live news coverage of a flood as it was happening				
I have seen the aftermath of a flood firsthand (people who were affected, damaged areas or debris)				
I have seen news coverage about the aftermath of a flood (people who were affected, damage, images)				
I have volunteered to help others who were affected by a flood				
I have taken action to protect myself or loved ones from a flood threat that did occur				
I have taken action to protect my property from a flood threat that did occur				
I have prepared an emergency kit in response to a flood threat				

Q18. Approximately what is the closest (in kilometres) that you have ever been to a flood?

- ☐ _____ (kilometres)
- ☐ not applicable

Q19. People can also have multiple experiences with flooding *that was warned for, but* ***did not occur***. Please think about all of your experiences with flooding that ***did not occur*** and indicate how much experience you have with each of the statements listed below. Please select ONE option for each statement.

	No experience	A little experience	Some experience	A great deal of experience
I have taken action to protect myself or loved ones from a flood threat that was *unnecessary*				
I have been inconvenienced by responding to a flood threat that *did not* occur				
I have been warned about a flood that *did not* occur				

C. Weather Scenarios

Q20. Agency Y issues a Severe Thunderstorm Warning for several areas, including the City of Toronto on Sunday, July 19, 2015:

```
SEVERE THUNDERSTORM WARNING
FOR SOUTHERN ONTARIO
ISSUED BY AGENCY Y
AT 4:27 P.M. EDT SUNDAY 19 JULY 2015.
-------------------------------------------------------------------
SEVERE THUNDERSTORM WARNING FOR:
=NEW= CITY OF TORONTO
=NEW= VAUGHAN - RICHMOND HILL - MARKHAM
=NEW= PICKERING - OSHAWA - SOUTHERN DURHAM REGION.

-------------------------------------------------------------------
==DISCUSSION==

AT 4:27 P.M. EDT, AGENCY Y IS TRACKING A
SEVERE THUNDERSTORM CAPABLE OF PRODUCING VERY STRONG WIND GUSTS,
QUARTER TO TOONIE SIZE HAIL AND HEAVY RAIN.

THE THUNDERSTORM IS CURRENTLY LOCATED NEAR RICHMOND HILL AND IS
TRACKING EAST TO SOUTHEASTWARD AT ABOUT 40 KM/H.

COMMUNITIES IN THE PATH INCLUDE: EASTERN SCARBOROUGH. PICKERING AND
AJAX.

TAKE COVER IMMEDIATELY, IF THREATENING WEATHER APPROACHES. REMEMBER,
SEVERE THUNDERSTORMS CAN PRODUCE TORNADOES. GO INDOORS AND MOVE AWAY
FROM WINDOWS AND SKYLIGHTS. LIGHTNING KILLS AND INJURES CANADIANS
EVERY YEAR. REMEMBER, WHEN THUNDER ROARS, GO INDOORS(EXCLAMATION MARK)

THE OFFICE OF THE FIRE MARSHAL AND EMERGENCY MANAGEMENT RECOMMENDS
THAT YOU TAKE COVER IMMEDIATELY, IF THREATENING WEATHER APPROACHES.
```

In reference to the Severe Thunderstorm Warning above:

a. This Severe Thunderstorm Warning is issued to the public at 4:27pm on Sunday, July 19, 2015. What are you normally doing at this time on a Sunday?

b. List/circle the important words and phrases that you are focusing on when you read this Severe Thunderstorm Warning.

c. What are the main weather-related threats discussed in this Warning?

d. What are you doing with this information? (for example: making decisions, changing plans, communicating with others)

e. Given the timing of the Warning, the activities you are normally engaged in at 4:27pm on a Sunday, and the track and speed of this storm system, has the warning been issued with enough time to prepare/act?
   - ☐ Yes
   - ☐ No

f. What does 40km/hr mean to you? Is 40km/hr fast or slow?

g. In assessing the threat and how it relates to you and your employment, what important information is missing from this Warning, if anything? (What do you wish you were told…)

h. Based on where you work and the location and track of this storm system, is the Severe Thunderstorm Warning issued by Agency Y intended for you?
   - ☐ Yes
   - ☐ No

Q21. Agency X issues a Flood Outlook on Tuesday, July 7, 2015:

FLOOD OUTLOOK
WATERSHED CONDITIONS STATEMENT

DATE: TUESDAY JULY 7, 2015

TIME: 2:30PM

Weather Conditions:
Agency X is advising that Agency Y has issued a Special Weather Statement and is forecasting a frontal system moving through the GTA Tuesday afternoon and evening. Total rainfall amounts are forecasted to be 10-15mm through the Greater Toronto Area, but there is also a risk of isolated thunderstorms that may bring higher rainfall amounts in a short period of time in localized areas.

Issues:
Forecasted rainfall amounts will result in higher than normal water levels and flows. Rivers and streams will be faster flowing, creating unsafe and/or dangerous conditions. There may be flooding on roadways and in low-lying areas.

The combination of slippery and unstable banks will create hazardous conditions close to any river, stream or other water bodies.

Actions:
Please stay away from rivers and streams and exercise caution around all bodies of water. Please alert any children under your care of these dangers and supervise their activities.

In reference to the Flood Outlook above:

a. This Outlook is issued to the public at 2:30pm on Tuesday, July 7, 2015. What are you normally doing at this time on a Tuesday?

b. List/circle the important words and phrases that you are focusing on when you read this Flood Outlook.

c. What are the main weather-related threats discussed in this Flood Outlook?

d. What are you doing with this information? (for example: making decisions, changing plans, communicating with others)

e. Given the timing of the Outlook, the activities you are normally engaged in at 2:30pm on a Tuesday, and the timing of the forecasted weather conditions, has the Outlook been issued with enough time to prepare/act?
   - ☐ Yes
   - ☐ No

f. What does 'frontal system' mean to you? -OR- What does 'localized rainfall' mean to you?

g. In assessing the threat and how it relates to you and your employment, what important information is missing from this Flood Outlook, if anything? (What do you wish you were told…)

h. Based on where you work and the location and track of this storm system, is the Flood Outlook issued by Agency X intended for you?
   - ☐ Yes
   - ☐ No

Q22. Agency X issues a Flood Warning on Wednesday, October 28, 2015:

FLOOD WARNING
Date: October 28, 2015
Time: 3:20 PM

Weather Conditions:
Agency X advises that the Greater Toronto Area has received 25 - 50 mm of rainfall since early this morning. Agency Y is forecasting another 15 mm of rainfall this afternoon.

Issues:
Flooding of the Bayview Extension and the Metrolinx rail line within the lower parts of the Don River watershed have been reported. With the additional rainfall, there remains a potential for flooding of low-lying areas including the Don Valley Parkway.
The water levels and flow in [the region's] watersheds are higher than normal resulting in dangerous conditions. Flooding on roadways and underpasses may be experienced.

Actions:
Please stay away from rivers and streams and exercise caution around all bodies of water. Please avoid driving through flooded roadways in low-lying areas and at underpasses. Please alert any children under your care of these dangers and supervise their activities.

In reference to the Flood Warning above:

a. This Flood Warning is issued to the public at 3:20pm on Wednesday, October 28, 2015. What are you normally doing on a Wednesday at this time?

b. List/circle the important words and phrases that you are focusing on when you read this Flood Warning.

c. What are the main weather-related threats discussed in this Flood Warning?

d. What are you doing with this information? (for example: making decisions, changing plans, communicating with others)

e. Given the timing of the Flood Warning, the activities you are normally engaged in at 3:20pm on a Wednesday, and the forecasted weather conditions discussed, has the Flood Warning been issued with enough time to prepare/act?
   - ☐ Yes
   - ☐ No

f. The Flood Warning mentions reports of "flooding of the Bayview extension", flooding of "Metrolinx rail line within lower parts of Don River Watershed", and the potential for flooding of "low-lying areas including the Don Valley Parkway". Do you find knowing about flooding in these areas useful for you in carrying out your work operations? If so, why?

g. In assessing the threat and how it relates to you, what important information is missing from this Flood Warning, if anything? (What do you wish you were told…)

h. Based on where you work and the location and track of this storm system, is the Flood Warning issued by Agency X intended for you?
   - ☐ Yes
   - ☐ No

D. Demographic Information

Q23. Indicate whether you are:
- ☐ male, or
- ☐ female

Q24. Which of the following age categories describes you:
- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ >65

Q25. Please indicate your occupation:

Q26. Please indicate your highest level of education/training:

Q27. Please provide the postal code for your place of employment:

Appendix L: Curriculum Vitae

Jennifer A. Spinney |

Education

2019	Ph.D. Socio-Cultural Anthropology, Western University Dissertation: Weathering Storms and Flooded Waters: Anthropological Perspectives of Policy and Risk in Toronto, Ontario
2010	M.A. Socio-Cultural Anthropology, Western University
2002	Bachelor of Exercise & Sport Science, University of Manitoba

Professional Experience

2019- present	Research Associate, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder
2016	Teaching Assistant, Language & Culture, Anth2245

Grants & Awards

2018	American Meteorological Society Student Presentation Award
2017	American Meteorological Society Student Presentation Award
2015-2016	Social Science Humanities and Research Council Scholarship (*waitlisted)*
2015-2016	Ontario Graduate Scholarship recipient

Refereed Publications

1. Stiller-Reeve, M.A., Md. Syed, T. Spengler, **J. Spinney**, and R. Hossain. 2014. Complementing scientific monsoon definitions with social perception in Bangladesh. *Bull. Amer. Meteor. Soc*. doi: http://dx.doi.org/10.1175/BAMS-D-13-00144.1

2. **Spinney, J.** and Pennesi K. 2012. When the river started underneath the land: social constructions of a (severe) weather event in Pangnirtung, Nunavut, Canada. *Polar Record.* Vol.49(251): 362–372