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REPATRIATING FOLLOWING MASS FATALITIES ABROAD

Mass Fatality Management: Issues in Identifying and Repatriating Following
Mass Fatalities Abroad

by

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Abstract

Globalization has led to increases in foreign nationals, including Canadians, perishing abroad as a result of a mass fatality event (MFE). Despite ongoing efforts to establish comprehensive mass fatality management plans (MFMP), there isn't an effective "one-size-fits-all" model. Due to the complexity and numerous factors following MFEs, there is a need for ongoing innovation regarding MFMP. I will use the New Haven School of International Law decision-making model as it provides a structured framework in which previous MFM decisions can be appraised, and proposals can be made. Following the analysis of three MFE case studies, I will provide recommendations regarding mass fatality management (MFM), with specific considerations paid to the various legal issues surrounding jurisdiction over the deceased. I will analyze decisions made by international actors regarding recovery and the forensic identification of deceased following these three events in an effort to illustrate the requirement for flexible and agile MFMP.

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Introduction

Background and Argument

Events resulting in large-scale destruction and loss of life are always challenging due to the necessary coordination of many different departments and organizations. Following a mass fatality event (MFE), local governments and emergency agencies such as fire and police services, must act quickly to implement a mass fatality management plan (MFMP) in an effort to reduce further casualties and successfully manage operations. The timeliness and efficacy, in which a MFMP is implemented, can have lasting implications that can be seen throughout the execution of the MFMP. Consequently, there is only a brief window of opportunity to establish and deploy a comprehensive MFMP that will address both short-term and long-term needs relating to the recovery and identification of deceased. Any mistakes or missteps following the initial evaluation and assessment of an MFE can greatly reduce the success of identifying all individuals involved. It is critical that victim preservation and identification is at the forefront of any MFMP, especially when foreign nationals are among the deceased. Despite local interests, it is important that local and foreign governments work jointly to recover and preserve all human remains until they have been identified, thereby, increasing the likelihood of repatriations.

Whether these MFEs happen within Canada or abroad, there is an ongoing need to review previous and current MFMPs to understand what was, and what was not, effective following MFEs involving across the globe. The reality is that no country is immune to MFEs and the subsequent devastating effects of these events. This is partly due to the ef-

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fects of globalization writ large, but also because many countries are significant players in the humanitarian world. This increase in global mobility also means Canada is more likely to experience loss of citizens during global MFEs. Alternatively, at minimum, the Canadian government will be called upon to provide international humanitarian aid to affected countries. If Canada is unfortunate enough to suffer casualties, Canadian scholars have a vested interest in ensuring MFMPs are carried out effectively and efficiently. Through the recognition that each MFE is unique and different from one another, we can encourage innovation and transformation of existing MFMPs to better fit future MFEs. A flexible approach will benefit all as it seeks to ensure victims are recovered, identified, and repatriated in a timely manner.

Through the application of the New Haven School of International Law to the 2004 Thailand tsunami, 2010 Haiti earthquake, and the 2001 9/11 Twin Tower attacks, I will engage in a critical review of the decision-making process that led to each event's MFMP. Although each event is unique in terms of type of disaster, number of victims and country in which it occurred, they can be broken down into New Haven's five developmental stages to understand their subsequent MFPMs. Once the challenges and issues have been addressed, I will forecast the likelihood of similar events occurring by assessing academic research, geological trends, and government data. Finally, this paper will offer insight and recommendations regarding responses to future MFEs with a focus on policy suggestions for international participation in an effort to mitigate legal and political obstacles. My goal is to create a discussion piece that encourages Canadian public servants and academic scholars alike, to continue researching and improving the ways in which Canadians and the international community conduct and participate in MFMP.

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Specifically, I will highlight the importance of flexibility and adaptability when planning MFMPs in response to events. Through the analysis of these three case studies, it will become clear there is no “one size fits all” when responding to MFEs and, as such, every MFMP should be individually tailored to the location and event it seeks to support.

Theoretical Framework

Through the analysis of three recent MFE case studies, this paper will apply the chosen theory of New Haven School of International Law in an effort to dissect and understand previous MFMP interventions and their successes and failures. By analyzing past natural disasters and terrorist incidents, this thesis will apply the theoretical framework of the New Haven School of International Law to questions pertaining to the recovery, identification, and repatriation of Canadian citizens. Specifically, attention will be paid to the five developmental stages that the New Haven School identifies as central to policy creation: “(1) Delineation of the problem; (2) identification of conflicting claims; (3) analysis of past trends in decisions; (4) projection of future trends; and (5) provide appraisals and recommendations” (Smith, 2013, p. 144). The New Haven School and its potential role in modern policy development offers a means to evaluate the terror attacks of September 11, 2001, the 2004 Thailand tsunami, and the 2010 Haiti earthquake. On September 11, 2001, over 2,500 individuals were killed instantly when terrorists hijacked commercial airliners and flew them into the Twin Towers in New York City. Of the over 2,500 who perished, twenty-four of the victims were Canadian citizens (Public Safety Canada, 2013). In Thailand on December 26, 2004, over 250,000 individuals were killed

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in what would be one of the largest MFEs in history. Of the 250,000 killed, fifteen of those individuals were confirmed Canadian citizens (Public Safety Canada, 2017). Most recently, in 2010, the Haiti earthquake killed over 58 Canadians and injured 31 in Port-au-Prince (Public Safety Canada, 2017). Each of these three events involved a significant number of Canadian casualties, and will aid in a systematic evaluation of Canadian government and the international community responses as a whole in regards to identifying and processing human remains abroad. I will consider various international and domestic disaster response and humanitarian organizations in an effort to explore their legal role in MFM, identification, and the repatriation of Canadian citizens. Specifically, I will focus upon the dynamic relationships between various foreign, domestic, and international organizations and their legal influence over MFM.

Between 1996 and 2004, 2,410 Canadian citizens died abroad, illustrating that Canadian death abroad is not uncommon (MacPherson, Gushulak & Sandhu, 2007). Death abroad is becoming increasingly common due to globalization and, as a result, individuals are traveling outside their country of citizenship more frequently than ever before. The events listed above have more than globalization in common with one another; they share two other factors. The first commonality is that all three events resulted in unprecedented numbers of fatalities that exceeded existing MFMPs, leaving Thailand, Haiti and the United States scrambling to deal with the aftermath of the disasters. Second, and more importantly, these events illustrate that MFEs can occur anywhere, often with little notice, and that they can cripple any nation.

Understanding that MFEs are unpredictable and inevitable, Canada must continually improve its policies in an effort to mitigate obstacles faced during these events.

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Whether travelling for family, business, or pleasure, a death abroad can result in complex political and legal challenges between the deceased's country of citizenship and the host country in which the individual died. Specifically, legal issues often arise when host countries, operating under domestic law, conduct autopsies or cause of death investigations as part of their MFM on foreign nationals using local procedures and operations (Nithin & Rani, 2015). Depending on the host country's medical and legal compatibility with the deceased's country of origin, problems can arise with communication, cause of death terminology, and timely return of the deceased. These differences may result in dramatic delays, incorrect analysis, destruction of evidence, and serious miscommunication between countries. Further compounding these realities are language and culture barriers that also have a dramatic influence on all matters, including legal, medical, and death proceedings.

Despite formal international regulations regarding victim identification and human remains processing by the United Nations, there are numerous reported cases involving insufficient regulations and mishandling of foreign human remains across the world. In an ideal situation, every country would abide by the International Criminal Police Organization's (INTERPOL) established standards for processing human remains. However, many countries lack the appropriate resources and infrastructure to comply with these principles. For example, during the Thailand tsunami, the sheer volume of fatalities was so high that local authorities were unable to effectively perform autopsies on all of the deceased in a timely matter (Scanlon, McMahon & Van Haastert, 2007). The inability to conduct effective mass autopsies resulted in a large number of foreign nationals being burned or buried before autopsy and positive identification (Scanlon et al., 2007). Most

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importantly, those involved in the MFMP process need to be prepared to deviate from existing MFMPs in order to effectively adapt to current obstacles and issues.

Methodological Approach

The sources chosen for this thesis were selected based on relevance to government practice and their applicability to policy development. Specifically, this thesis relies heavily on Canadian government sources in accordance with the underlying goal of understanding MFEs and MFMPs through a Canadian lens. The majority of the sources used throughout the thesis are published on the sites of Global Affairs Canada, Public Safety Canada, and the Royal Canadian Mounted Police (RCMP). Literature on death certificates, forensic techniques, and definitions of death are explored using North American definitions and practices. Through the selection of primarily Canadian and American literature, the North American scope of this thesis is limited to the most relevant information regarding the three case studies.

Importantly, information regarding dates, locations, and numbers of Canadian fatalities were gathered solely from Public Safety Canada's website in an effort to standardize facts. Secondary sources in the form of academic papers and non-government organizational (NGOs) reports were integrated in an effort to validate or expand on claims made in Canadian government reports and statements. Additionally, individual accounts of those involved in the three case study recoveries were used where published reports were available. These individual accounts and stories provide personal experiences from those who operated on the ground aiding in the recovery and identification of victims. These

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personal experiences attest to the trauma and difficulty of locating and identifying the deceased.

The use of images has been added to this thesis to serve two very different functions. The first function is to provide easily digestible visual graphs depicting the rise of different types of MFEs across the world. Secondly, specific images illustrating all three case studies were selected based on clarity of obstacle or issue, learning value, and emotional impact. Although the German Wings aviation accident was not discussed in this thesis, an image from the scene was used during the discussion of the 9/11 Twin Towers Attacks to illustrate an isolated aviation accident. The reasoning behind this is to illustrate to readers the severity of destruction following an aviation accident. Although difficult to look at, the use of specific images conveys the direness and devastation of MFEs. Most importantly, the images offer individuals fortunate enough to have never experienced an MFE a grim glimpse into the complexity of such events.

Why Do We Need To Research Mass Fatality Events?

MFEs warrant ongoing research and innovation in order to reduce future loss of life as well as increase efficacy surrounding MFMPs practices. With the knowledge that large-scale disaster is inevitable, we must seek to make continual improvements with respect to the way we respond to and manage these disasters. As technology changes, so does our capacity to recover and perform enhanced forensic identification of victims. These new forensic methods and capabilities will undoubtedly have an impact on the way we approach MFM and planning following MFEs. Additionally, as technology becomes

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more readily available to us, it also becomes more accessible for radical terrorist groups looking to inflict global harm.

While our technology is advancing and improving the ways in which we can respond to MFEs, it also increases the risk of individuals accessing technology and tools that can cause large-scale damage with minimal effort. As seen with the Twin Tower attacks, terrorist groups are finding innovative ways of inflicting maximum loss of life using everyday technology. With the advent of certain technological weapons and explosive device advancement, the global public is at an increased risk of explosive style attacks as well as natural disasters. As such, scholars must attempt to get ahead of future MFEs and proactively develop MFMPs that account for ongoing evolutions in technology.

Structure of Thesis

The first chapter will start by exploring basic definitions relating to MFEs, MFM and relevant forensic science terminology. Important terms will be discussed and definitions provided for key concepts relating to death, Canadian citizens, and MFE procedures. Following this, the chapter explores current Canadian legislation and policy relating to the MFM and the repatriation of Canadians back into the country to provide examples of types of legislation involved in the repatriation process. Although each country will have different legislation and processes in place, this section illustrates how MFMP can have a large impact on the effective and timely return of human remains. Specifically, how destruction of human remains can interfere with the identification process that in turn can impede issuance of appropriate legal documentation required for repatriation.

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This section discusses the required documentation for the importation of human remains as well as the various organizations involved in the repatriation process. Finally, the chapter finishes by reviewing Canadian statistics regarding death abroad and outlining the key domestic and international players following a MFE.

The second chapter summarizes the three MFEs in detail while outlining the sequence of events, forensic science techniques for identification, and the manner in which the MFMPs were created and implemented. I will be exploring the 2010 earthquake in Haiti, the 2001 9/11 Twin Tower attacks, and the 2004 Thailand tsunami. Each case study is dissected in great detail to aid in understanding the impact of three types of MFEs in three different countries. Attention has been paid to local and international actors and their role in establishing all aspects of the MFMP effort. This chapter will illustrate the various cultural, legal, socioeconomic, and political obstacles that can be faced by professionals following MFEs.

Lastly, the third chapter will include the application of the New Haven School of International Law to the three case studies outlined in chapter two. Through the application of New Haven's five-step decision-making model, I will evaluate the MFE as well as the MFMP components of the 2010 earthquake in Haiti, the 2001 9/11 Twin Tower attacks, and the 2004 Thailand tsunami. Following analysis of these events I will provide future recommendations highlighting the need for further research promoting flexible approaches to MFMPs.

Chapter One

Mass Fatality Events and Management

The expression “mass fatality event” conjures images of aviation accidents, terrorist attacks, and destructive natural disasters. Such events are defined by significant disaster and death; however, there are specific factors required for an incident to be deemed a MFE. A MFE is an incident in which there are more human bodies and remains than existing local resources can handle efficiently (Ralph, 2015). There is no minimum loss of life required for an event to be deemed a mass fatality emergency event, as the designation of MFE depends on the country or region in which the event has occurred. As a result, every country will have its own unique individual capacity to manage varying volumes of fatalities (Ralph, 2015). Many countries outline their region’s “mass fatality-processing capacity” within their MFM plans (Ralph, 2015). In Canada, policies regarding domestic MFEs are structured in a practical, straightforward manner, similar to other government policy involving processes that require multiple agencies and departments to work in parallel. For the purpose of this thesis, Canadian federal and provincial policy regarding MFEs can be used as a measure of comparison against MFM efforts conducted abroad.

Although emergencies are commonly managed at the territorial or provincial level, the federal government is prepared to assist if the emergency exceeds provincial capacity (Public Safety, 2011). The *Emergency Management Act* (2011) defines emergencies management as the preparedness, mitigation, response, and recovery from emergency situations. Some examples provided within the act are terrorism, critical infrastructure

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interruptions, disease, and climate related disasters (Emergency Management Act, 2011). Consequently, it is the federal government's responsibility to maintain an emergency policy that focuses on an intergovernmental approach between Canada and its ten provinces.

The *Emergency Management Act* (2011) does not explicitly state which department is responsible for the management of human remains but acts as an overarching governing structure of federal and provincial departments operations. According to the act, the Emergency Support Functions (ESFs) outline the various departments' roles and responsibilities if deployed by the federal government. ESFs are governmental and private sector groups that possess specialized capabilities in relation to emergency services (Public Health Emergency, 2015). For example, ESFs often contribute resources, services and partake in program implementation as it relates to critical infrastructure, health services, victim assistance, and community support (Public Health Emergency, 2015). Each department's ESF directly relates to its mandate and corresponding area of expertise within the Government of Canada. For example, the Public Health Agency of Canada (PHAC) and Health Canada (HC) can be mobilized during an event in which the public's health may be at risk (Emergency Management Act, 2011). Of note, the listed ESFs under PHAC and HC do not explicitly refer to operations relating to MFM or the handling of the deceased. Similar to PHAC, the Royal Canada Mounted Police (RCMP) have very general ESFs that do not explicitly state their function regarding deceased. The RCMP's ESFs relate to law enforcement operations but do not mention their forensic identification capacity (Emergency Management Act, 2011). Presumably, forensic identification and operations may be covered under the ESF regarding the "full range of law enforcement services" (Emergency Management Act, 2011). Providing general knowledge regarding

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government departments and their mandates, connections can be drawn between various departments and their assumed ESFs.

Where federal legislation lacks granular detail, provincial policies address micro issues of processing human remains in a mass fatality environment. Provincial MFM plans expand on processes such as the identification and management of the deceased. For example, the British Columbia's Coroner Service has developed a provincial Mass Fatality Response Plan regarding emergency events that result in a high volume of fatalities. BC Coroners Service Mass Fatality Response Plan (2011) provides details on planning assumptions, scope of programs and services, and decision-making authority as well as logistics relating to identification and recovery during a MFE. Specifically, there are sections of the plan that refer to morgue operations, transportation, and storage of remains, as well as the repatriation and disposition of the deceased (BC Coroners Service Mass Fatality Response Plan, 2011). Although British Columbia's (BC) MFMP is a good example of a comprehensive plan, MFEs within Canada would potentially be easier to respond to as Canada designed these plans with data regarding climate, threats and resources. Therefore, what is effective within Canada may need to be drastically altered and adapted in order to prove effective in different regions of the world and is why MFMPs need to be flexible.

An essential component of any MFM plan is the involvement and expert guidance of qualified forensic professionals. Forensic guidance is imperative for the timely and accurate identification of the deceased and the subsequent management of their bodies. For example, during the Indian Ocean tsunami, the delayed availability of immediate professional forensic services proved to be detrimental for later recovery efforts. Due to the

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sheer volume of death experienced following the tsunami and subsequent lack of forensic professionals, bodies were not processed effectively. Forensic science plays a critical role during MFEs by combining the use of highly technical scientific analysis with relevant domestic and international laws. Two of the three case studies discussed in this thesis involve economically poorer countries that lack comprehensive MFM plans or formal forensic capacity—countries which are disadvantaged, underdeveloped, or lack the economic and material resources of wealthier countries (Greene, 1980). As a result, MFEs in such countries often pose greater challenges due to limited forensic resources and overall resource capacity (Morgan, Sribanditmongkol, Perera, Sulasmi, Alphen & Sondorp, 2006). Subsequently, valuable information can be recorded inaccurately or incompletely. Conversely, in situations where MFEs occur within a wealthier country such as the United States, complex terrorism plots can exceed the capacity and resources of existing MFM plans.

Whether one is dealing with a MFE or an isolated incident in which a Canadian citizen dies abroad, adequate forensic training is key to successfully identifying and determining the cause of death. This was evidenced recently in the case of Shawn Edmonds, a forty-two year-old Canadian man who died while vacationing in Costa Rica (Maharaj, 2017). After the autopsy was performed in Costa Rica, local authorities reported the cause of death as heart failure (Maharaj, 2017). The situation surrounding Edmond's death was suspicious, so a second autopsy was scheduled in Canada in an effort to confirm the cause of death (Maharaj, 2017). Given the battered condition of Edmond's body, Canadian authorities deemed the second autopsy necessary in an effort to understand the inconsistent circumstance around his death (Hunter, 2017). The Canadian

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Chief Coroner's office conducted the second autopsy and found that Edmonds' entire brain had been removed along with half his heart (Hunter, 2017). This forensic negligence by Costa Rican authorities made it impossible to perform an accurate second autopsy. This lack of care by Costa Rican officials could lead to legal consequences in terms of Edmond's death certificate and any insurance policy he may have had. Without delving too far into Costa Rica's medico-legal system, it is clear how inadequate forensic examinations can cause severe repercussions for Canadians who die abroad.

Forensic science is defined as the study and application of science to law and how this unique relationship can be critical in the legal examination and identification of human remains (Rosenblatt, 2015). The specific role of forensic science and its corresponding practices in relation to MFEs will be explored further in this chapter. Prior to examining functions of forensic techniques, it is important to have a holistic understanding of how successful MFM plans are structured and executed. INTERPOL holds the gold standard for Disaster Victim Identification (DVI) and provides templates such as Principles of Good DVI Governance. Most recently, INTERPOL deployed their DVI teams on November 13, 2013, following the super typhoon Haiyan that left over 7000 individuals missing or dead (Disaster Victim Identification Fact Sheet, 2017). Prior to that, INTERPOL's DVI team assisted with managing the Nairobi mall terrorist attack in Kenya where over 60 people were killed and over 175 were wounded (Disaster Victim Identification Fact Sheet, 2017). Depending on the country, MFM or DVI plans may vary but INTERPOL is almost always consulted when countries need assistance when dealing with an event.

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Literature on MFM plans suggests that its first stage is critical as this phase establishes the rules and guidelines that govern the search and recovery of human remains (Ralph, 2015). These guidelines help to institute standardized processes for documenting information relating to human remains (Ralph, 2015). This is achieved most effectively by employing crime scene mapping techniques as a method of recording and protecting all human evidence (Ralph, 2015). This approach, although time-consuming, significantly increases the probability of a positive identification of the victims (Ralph, 2015). Forensic experts label, flag, photograph, and number remains in accordance with a detailed log and mapping chart (Ralph, 2015). After this is complete, the bodies are transported to the morgue in an effort to prevent decomposition and begin post-mortem operations. (Ralph, 2015). If possible, it is always preferable to carry out the process of identifying victims within a morgue or medical institution, as it reduces the risk of contamination and degradation of remains. The final phase of MFM seeks to provide family assistance and appropriate care to those affected by the mass fatality (Ralph, 2015). The family plays an integral role in the positive identification of the deceased by providing information such as DNA samples, dental records, and other useful documentation related to the deceased. All of these steps are critical in the positive identification of the remains and the subsequent issuance of death certificates and completion of the repatriation process.

Autopsies

Autopsies are medico-legal examinations that are most often required in situations involving suspicious or unexpected death (Rutty & SpringerLink, 2013). Autopsy, obduc-

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tion, and post-mortem examination are highly specialized technical procedures in which the corpse is surgically dissected and examined in an effort to determine the cause of death or what may have contributed to the death of the individual (Tejaswi & Periya, 2013). Consequently, the forensic pathologist determines the cause of death and documents his/her medical opinion in a legal document referred to as a death certificate (A Dictionary of Epidemiology, 2016). Cause of death refers to all morbid conditions, diseases, or injuries that contributed to the death of the individual (A Dictionary of Epidemiology, 2016). The forensic pathologist or medical examiner analyzes and notes if there is any internal or external injury, illness, disease, or toxin found within the corpse (Tejaswi & Periya, 2013). Physicians that conduct autopsies are referred to as forensic pathologists and are specialized medical doctors who have obtained extensive training and certification in human pathology, disease progression, and injury in relation to the legal system (Ellis, 2007). Autopsies are a critical component of any MFMP as they play a key role in the proper identification of victims following an MFE. The type of MFE and number of deceased will determine or influence post mortem practices.

Death Certificates and Legal Implications

Death certificates are legal documents that provide information regarding the specified cause of death; they play a critical role during the process of repatriating the human remains of Canadians abroad. The Canadian government requires an authentic death certification issued by authorities of the country in which the Canadian was declared dead before the remains may be imported into Canada. Subsequently, delays in

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issuing the appropriate legal documentation can result in complications and delays during the repatriation process. Death certificates are legally binding documents that are required for most legal proceedings involving death (Thornton, 2006). The death certificate is arguably the most valuable piece of information in situations involving disputes over the deceased's cause of death and any subsequent legal action or repatriation efforts (Thornton, 2006).

Legal issues regarding inaccurate or non-existent death certificates can be amplified when the autopsy has been conducted abroad, specifically in developing countries. For example, a study conducted on the validity and accuracy of 202 death certificates produced in Karachi, Pakistan discovered an inaccuracy rate of 87% related to cause of death of the analyzed cases (Haque, Shamim, Siddiqui, Irfan & Khan, 2013). Over 62% of the cases were marked by errors that would affect or change the initial reported cause of death listed on the death certificate (Haque et al., 2013). As a result, when foreign nationals travel to developing countries, they are subject to the investigative technology, skills, and procedures in place. As a result, there is always an increased risk of delayed repatriation.

Defining Death

The definition of death employed in this thesis refers exclusively to the narrow medical definition in which the human subject has experienced a "cessation of life" (Beluso, 1976, p. 313). The narrow definition of "cessation of life" was chosen, as only individuals who have been declared legally dead will be considered. Therefore, individuals who are critically injured will not be analyzed, as they are not yet subject to the various

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legal procedures explored. For the purpose of analysis, deceased subjects will be deemed relevant as they raise issues concerning death tolls, autopsies, death certificates, and other post-mortem legal activities involving repatriation. Following recent debates surrounding human death, there are emerging concerns regarding artificially prolonging life and staving off death. As a result of the growth of technological innovation, medical interventions are in place that can sustain human life under conditions in which was previously believed impossible (Capron, 2004). Although these technological advances should be acknowledged, as they clearly influence the definition of death, they will not be explored in this thesis as this situation falls outside the scope of this thesis. My focus will be on victims who have been declared medically and legally dead as per one of many controversial definitions concerning the cessation of life which states death occurs once the body is unable to maintain functions required to independently sustain life (Beluso, 1976). Consequently, only individuals killed instantly or following medical intervention within the context of a MFE will be considered in this thesis.

Defining Canadian Citizens

Individuals referred to as “Canadian citizen” signify individuals that hold either a Canadian birth certificate or have obtained Canadian citizenship through formal immigration processes (*Citizenship Act*, 1985). An individual can also become a Canadian citizen if they were born outside of Canada but one of their parents was either born in Canada or was naturalized prior to the individual’s birth (Immigration, Refugees and Citizenship Canada, 2017). Alternatively, an individual can gain citizenship if they were naturalized

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as a minor when their parent or legal guardian applied to naturalize them on their behalf (Immigration, Refugees and Citizenship Canada, 2017). Individuals cannot obtain citizenship if they renounced their Canadian citizenship or had it revoked (Immigration, Refugees and Citizenship Canada, 2017).

Notably, individuals born to foreign diplomats during their stay in Canada are not Canadian citizens despite being born in Canada (Immigration, Refugees and Citizenship Canada, 2017). When considering refugee claimants, it is important to note that being granted refugee status does not necessarily mean that one will be granted Canadian citizenship (Immigration, Refugees and Citizenship Canada, 2017). Likewise, marrying a Canadian citizen does not necessarily confer Canadian citizenship; the spouse must apply for citizenship (Immigration, Refugees and Citizenship Canada, 2017). My focus will be on Canadian citizens who meet the criteria within the *Citizenship Act* (1985) and are subsequently deemed Canadian citizens at the time of a given MFE. Consequently, this includes individuals who were born in Canada, became naturalized citizens, or were born outside of Canada to Canadian parents.

Forensic Science Definitions

Forensic science plays a critical role within MFMs, as it serves as a mechanism to identify human remains based on a variety of scientific methods. In this paper, I will make reference to a variety of forensic science methods, techniques, and terms. Some of these terms are “pre mortem”, “post mortem”, “forensic odontology”, “DNA analysis”, “DNA data bank”, “buccal swab”, and “fingerprint analysis”. “Pre mortem” refers to the

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human body prior to death and “post mortem” refers to the body after death. One of the most valuable forensic methods is the use of forensic dentistry, otherwise known as “forensic odontology”. Forensic odontology is a form of dental analysis in which dental evidence (patient history, includes X-rays, and dental procedure histories) is used for identification purposes in legal proceedings (Shamim, 2012). Forensic odontology is particularly useful in identifying individuals whose remains are fragmented or dispersed across a large area. For example, dental analysis can be very useful in situation where the body has been subjected to high impact and only teeth can be recovered. Alternatively, forensic odontology is very effective at identifying remains that have degraded to such an extent that fingerprint analysis is no longer an option.

The second internationally recognized form of forensic identification is the use of “DNA analysis”. DNA analysis incorporates the scientific analysis of genetic material to aid with biological identification during legal proceedings (Norris, 2009). This method is highly valuable where the deceased’s remains are reduced to tissue fragments, such as what happened as a result of the terror attacks in New York City on September 11, 2001. With this method, forensic scientists are able to gather large samples of amalgamated tissue and test for known individual DNA profiles. DNA material is stored within the Canadian National DNA Data Bank to facilitate accessible screening and points of reference for DNA comparison (Norris, 2009). One method of obtaining DNA is through the use of a buccal swab which involves the swabbing of the inside of the cheek for cellular material (A Dictionary of Law Enforcement, 2015).

The third and final universally accepted method of positive identification among those partnered with INTERPOL is the use of fingerprint analysis. Fingerprint analysis

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involves the evaluation and comparison of individual fingerprints by examining unique features called whorls, loops, and arches (Huynh & Halámek, 2016). After the Thailand tsunami, recovery teams were able to rehydrate hardened finger tissue by boiling the hands of the deceased and fingerprinting the tissue to identify individuals. Fingerprint identification is highly valuable as it is inexpensive and highly accurate. As digital fingerprints become common practice for security processing, the availability and effectiveness of fingerprint analysis will only increase.

Lastly, it is important to note that the legitimacy of forensic science has historically been questioned due to errors made during forensic evidence analysis and legal proceedings (Christensen, Crowder, Ousley & Houck, 2014). Although this is important to acknowledge, it will have little influence on the positive identification of victims during MFEs as the scientific methods used are not scrutinized within a court of law. It is also important to be sympathetic to the forensic circumstances of MFE scenarios as they often involve large quantities of human remains, which are often contaminated with other materials and human remains.

Canadian Legislation and Regulations

Canadian Repatriation Legislation

The Government of Canada regulates the importation of human remains through federal legislation enforced by officers of the Canadian Border Services Agency (CBSA), as outlined in *Memorandum D19-9-3*. These laws and policies govern the way in which Canadian citizens can be repatriated into Canada following their death abroad. It is the responsibility of the attending CBSA officer to ensure all importation requirements are

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met at the port of entry prior to allowing the release of human remains. An “officer” refers to a person designated as a screening officer under subsection 5(1) or subsection 2(1) of the *Customs Act* (1985). This officer is responsible in collaboration with the Public Health Agency of Canada (PHAC) with the administration of the *Quarantine Act* (2005) and *Quarantine Regulations* (2017), as it relates to the importation of human remains into Canada. Consequently, CBSA officers function as highly trained gatekeepers responsible for enforcing legislation as it relates to the importation of human remains at a Canadian port of entry.

The *Quarantine Act* (2005) was implemented in an effort to reduce the introduction of communicable disease and illness into Canada through regulating importation of living persons or human remains. The primary concern of importing human remains into Canada, especially from less developed countries, is the spread of disease or other dangerous microorganisms. For example, when considering the mobility of pandemics such as the outbreak of Ebola in West Africa in 2014, it is imperative that Canada has legislation and regulations in place to limit potential health risks. Canadian authorities have established that a communicable disease refers to “any disease caused by an infectious agent or biological toxin that poses a risk of significant harm to the public health” (*Quarantine Act* 2005, p.1). Subsequently, when importing human remains or cadavers back into Canada, the importer must be able to illustrate that the body has been medically cleared and that there is no risk of communicable disease.

The type of MFE and available MFM response will often determine the type or quality of human remains being imported into Canada. For example, human remains are commonly reduced to small fragments of tissue following aviation accidents and terrorist

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events. Following natural disaster MFEs, the physical integrity of the body may be preserved resulting in the importation of an entire cadaver. As a result, Canadian authorities have widely defined human remains within Memorandum D19-9-3 as the body of a deceased person in its entirety, part(s) of the human body including: the head, limbs, trunk, appendages, organs, tissue or cells; skeletons; skulls; anthropological or archaeological specimens and other bones (2009, p.1). Consequently, all types of human tissue repatriated into Canada are subject to the above-mentioned legislation regardless of condition.

Additionally, a copy of the official death certificate must also accompany human remains at the time of importation. This certificate must clearly illustrate in either English or French that the remains do not possess communicable disease (Memorandum D19-9-3, 2009). Countries that speak official languages other than English or French will issue the death certificate in their official language and will need to be translated prior to exportation. This translation requirement lends way to further risks regarding incorrect translation. Therefore, it is encouraged that those responsible for the repatriation of the deceased use a credible translation service. The death certificate must be signed by an authorized individual within the jurisdiction in which the death occurred and must state the location, date, and cause(s) of death (Memorandum D19-9-3, 2009). In North America, death certificates are customarily signed by the attending physician or coroner but this practice can vary by country depending on local laws and regulations (Memorandum D19-9-3, 2009). Consequently, medical and legal accuracy regarding cause of death are dependent on the laws and regulations of the country which the body was exported.

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Death Abroad: Government Resources

The Government of Canada has developed a set of guidelines for family and friends of Canadian citizens who die abroad. It is entitled the “Death Abroad Factsheet”. This document details various cultural, legal, and financial impediments that Canadians may face when trying to coordinate the burial or repatriation of a Canadian citizen. The Death Abroad Factsheet (2016) advises individuals seeking to repatriate loved ones that there may be “strict time constraints involved in the cremation or burial process” (p.1). Additionally, it emphasizes the fact that some countries lack the capacity to transport, embalm, or prepare human remains for relocation or repatriation (Death Abroad Factsheet, 2016). The Government of Canada advises those dealing with death abroad to consult resources such as local policies, procedures, and laws relating to foreign death in the country in which death occurred (Death Abroad Factsheet, 2016). It is important to note that some countries do not have their laws and regulations available readily, much less in English. The reality is that many Canadians will need the direct help of Canadian embassies or consulates located in the region or city in which remains of the deceased are held. Further, there will often be additional obstacles and logistical hurdles that can render the accessibility of dealing with death abroad difficult, if not impossible.

It is important to understand that the deceased is under the legal jurisdiction of the country in which he/she died and that local laws apply first and foremost (Death Abroad Factsheet, 2016). Therefore, aside from the general difficulties engendered by a death abroad, the ease with which bodies are repatriated may depend upon political relationships at the time of death. Due to local laws and procedures, the processing of the de-

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ceased may take substantially longer than it would in Canada (Death Abroad Factsheet, 2016). Local authorities are responsible for issuing a certificate of death and this may be done in one of their official languages (Death Abroad Factsheet, 2016). As a result, those repatriating the body will be responsible for obtaining a translated copy of the death certificate to present at various stages of the process (Death Abroad Factsheet, 2016). In situations involving suspicious death or local investigation efforts, the deceased may need to be accompanied by specific documentation, such as toxicology reports, autopsy reports, or police reports (Death Abroad Factsheet, 2016). Lastly, it is important to note that family of the deceased Canadian has little control over whether or not an autopsy will be conducted abroad (Death Abroad Factsheet, 2016). Depending upon local laws, some countries may require a mandatory autopsy to be carried out prior to burial or repatriation (Death Abroad Factsheet, 2016). Consequently, once an individual travels outside of Canada, the Government of Canada often has little jurisdiction over what happens to her or his body in the event that they perish abroad.

Canada keeps track of its citizens' deaths abroad through a computer system that provides data and communication services from Canadian embassies to Global Affairs Canada (GAC), previously known as the Department of Foreign Affairs and International Trade (DFAIT) (MacPherson, Guérillot, Streiner, Ahmed, Gushulak & Pardy, 2000). A database called the "The Consular Management and Operations System" assists in the delivery of consular services and to link the headquarters in Ottawa with other missions across the world (MacPherson et al., 2000). The Consular Management and Operations System has an internal database that is called "death abroad" and includes all data collected in relation to the deceased individual, including the reported cause of death (Mac-

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Pherson et al., 2000). For example, this database collects information relating to age, gender, date, and cause of death while abroad (MacPherson et al., 2000). As of 2007, the Consular Management and Operations System was still functioning as the primary database for data relating to Canadian citizen death abroad (MacPherson et al., 2007).

Research by Scanlon, McMahon, and Van Haastert (2007) illustrates that despite effective Canadian data management systems, documenting death abroad continues to raise significant problems. For example, following the Indian Ocean tsunami, the Thai government relied heavily on volunteers to assist with the logistics of the recovery (Scanlon et al., 2007). The volunteers relied on ad hoc procedures to aid with the documentation of the deceased, especially with respect to note-taking, photography, numbering, and informal systems of record-keeping (Scanlon, 2007). In Sri Lanka, the government established an ad hoc disaster committee to assist in dealing with the identification of victims (Morgan et al., 2006). However, due to communication issues, those working on identification efforts did not receive instructions to proceed with facial identification until days later, by which point the facial tissue in question had decomposed (Morgan et al., 2006). In Asia, this breakdown in infrastructure and resources resulted in delays in successful identification, which directly and indirectly impacted information management (Morgan et al., 2006). Consequently, despite Canadian efforts to implement accurate and reliable information management effectively while abroad, information entered into Canadian databases is highly dependent upon the organizational structure of those responding to the MFE.

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Domestic and International Organizations

Canada currently has a variety of government departments and organizations that share responsibilities surrounding the identification and repatriation of human remains following MFEs. The Disaster Victim Identification (DVI) is the primary operational unit that responds to instances of mass Canadian fatalities (Royal Canadian Mounted Police, 2017). DVI is deployed in response to mass fatality situations such as accidents, acts of terrorism, and natural disasters (Royal Canadian Mounted Police, 2017). The DVI unit is composed of multiple police departments, government and non-government organizations, and medical professionals (Royal Canadian Mounted Police, 2017). The DVI unit was established with the goal of creating a federal, provincial, and municipal group of partners who could collaborate and develop a comprehensive team of DVI professionals (Royal Canadian Mounted Police, 2017).

The DVI is composed of an assessment team that consults and evaluates the total scope of the event and creates an operational plan detailing the logistics and resources needed (Royal Canadian Mounted Police, 2017). There is a family liaison assistance group that works closely with the family of the victims to offer support and guidance during and after the event (Royal Canadian Mounted Police, 2017). The body recovery team is tasked with the responsibility of collecting all personal remains and human bodies throughout the operation (Royal Canadian Mounted Police, 2017). An ante mortem team prepares files of missing persons and collects personal information such as dental images, medical records, DNA, and fingerprints to aid in the identification process (Royal Canadian Mounted Police, 2017). This is a critical process as it provides reference data for the

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comparison of pre and post mortem samples. For example, the ante mortem team may collect a toothbrush from the family of the deceased as a method of DNA comparison. The team can then compare the DNA found on the known toothbrush to unknown remains in an effort to match DNA profiles.

Consequently, the ante-mortem team is responsible for collecting quality DNA and other identifying samples during the autopsy for comparison (Royal Canadian Mounted Police, 2017). The reconciliation team is responsible for the subsequent analysis and identification of both the ante mortem and postmortem samples (Royal Canadian Mounted Police, 2017). Following identification, it is the reconciliation team that drafts and presents a report to the identification board for review (Royal Canadian Mounted Police, 2017). Lastly, the identification board reviews the recommendations drafted by the reconciliation team and formally establishes the identities of the victims (Royal Canadian Mounted Police, 2017). DVI teams play a crucial role in MF incidents, as their members are often an integral part of international recovery and identification efforts.

When a MFE occurs outside of Canada, it is the host country or the country affected by the disaster that contacts INTERPOL to ask for assistance from DVI (Royal Canadian Mounted Police, 2017). The Government of Canada must approve the request, and in the event that such approval is forthcoming, the RCMP begins to organize and collect a team of DVI professionals for the mass fatality response (Canadian Mounted Police, 2017). The majority of DVI teams are comprised of Canadian Forces personnel, members of the Integrated Forensic Science Identification Service (IFIS), forensic odontologists, forensic pathologists, and partner police organizations (Royal Canadian Mounted Police, 2017). DVI teams are only deployed within Canada when current federal, pro-

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vincial, and territorial resources become overwhelmed and require the additional capacity and resources (Canadian Mounted Police, 2017). Despite Canada's efforts to organize and deploy an effective team of DVI professionals, cases such as the Indian Ocean tsunami and the Haiti earthquake have highlighted the need to improve Canada's practices surrounding the identification and repatriation of its citizens (Royal Canadian Mounted Police, 2017). DVI works effectively with INTERPOL with respect to international events when INTERPOL is notified within a reasonable time. Problems can arise when host countries or local authorities delay requesting DVI assistance from INTERPOL and execute their own MFM practices and procedures, seen during the tsunami recovery effort in Thailand.

International Response (INTERPOL)

The International Criminal Police Organization (INTERPOL) is an international policing organization that collaborates with 190 countries across the globe to deal with issues relating to crime and security. INTERPOL (2017) assists with a variety of international matters involving crime, terrorism and incident of mass fatalities. INTERPOL (2017) has two separate response teams (IRT's) that are deployed depending on whether the country has experienced a disaster or a criminal event. INTERPOL defines a disaster as "an emergency response to unforeseen catastrophic events, such as large-scale accidents or natural disasters" (INTERPOL, 2017, p.1). INTERPOL (2017) has a specialized forensic unit that manages databases of DNA profiles, fingerprints and facial images that assist with the identification of victims. A potential issue relating to the identification of

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Canadian citizens abroad is the lack of uniform international identification standards across countries.

INTERPOL (2017) has established the international standard for positive identification as only achievable through DNA Analysis, Forensic odontology analysis and fingerprint analysis. INTERPOL (2017) uses an online fingerprint database called Automated Fingerprint Identification System (AFIS) to assist with matching and identifying the fingerprints of deceased individuals. The forensic team at INTERPOL (2017) is highly qualified and specialized and engages in all types of forensic work across the world. The practices and operations of INTERPOL (2017) fall under international law as it is recognized by the UN as an international organization. Subsequently, INTERPOL (2017) operates subject to international rules and regulations and must act in accordance with the principles of international law. INTERPOL's (2017) constitution was established in 1956 as an agreement between obliging countries that encourage all forms of mutual assistance between all criminal-policing organizations. INTERPOL (2017) personnel are considered "international civil servants" and thus fall under international protection pursuant to international law guaranteeing their independence. One concern surrounding the efficacy of INTERPOL is that the MF plans it designs and executes under the assumption that the majority of human remains will be in one central location (Scanlon et al., 2007). INTERPOL operates under the assumption that the country's official emergency response teams will properly document and photograph the human remains prior to removal (Scanlon et al., 2007). However, as seen with previous MFEs such as the Indian Ocean tsunami, New York Twin Tower attacks and the Haiti earthquake, assumptions run the risk of creating a

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sense of false security. Even in developed cities such as New York, robust MFE plans did not account for the events that took place on September 11, 2001.

Conclusion

The goal of this thesis is to provide a critical analysis of previous MFEs in which Canadian citizens died abroad by drawing upon the work of the New Haven School of International Law. Through the evaluation of MFMPs forensic science techniques, and intergovernmental relations, Canada can better situate itself to aid in times of international disaster. This theoretical framework will assist in deconstructing MFE variables, primary problems, conflicting claims and controversies, future trends, and recommendations. A contemporary re-evaluation of previous MFEs are important considering that the world is becoming increasingly more globalized, terrorist groups are evolving, and global warming progresses, challenging Canadians abroad with new threats.

Chapter Two

Introduction

This chapter will discuss the 2010 Haiti earthquake, the 2004 Indian Ocean Earthquake and the 2001 New York Twin Tower attacks. These case studies have been selected as they included mass casualties involving Canadian citizens, yet the events were significantly different from each other and offer insight into three different types of disasters. Specifically, they are different in terms of the type of MFE, as well as the rate of success in regard to specific elements of MFM procedures. Responses to the Haiti earthquake were hindered by weak physical infrastructure and a lack of resources to manage the disaster. Haiti's struggling economy and poor living conditions resulted in devastation, and few individuals were properly identified following the earthquake. By contrast, the Twin Tower MFE demonstrates how even wealthy countries are at risk of experiencing MFEs that exceed even the most robust MFM plans and sound infrastructure. For its part, the Indian Ocean earthquake illustrates the exceptional domestic and international challenges faced by multiple countries that suffer an international disaster, in this case one that caused over 250,000 casualties. The differences between these case studies allows for a comprehensive evaluation of how dynamic and challenging MFEs can be and how certain organizations and procedures facilitated or inhibited effective identification and repatriation of Canadian citizens.

2010 Haiti Earthquake: Introduction

On January 12, 2010, a 7.0 magnitude earthquake occurred off the coast of Haiti affecting over 3,500,000 people (Disaster Emergency Committee, 2015). During the earthquake, over 220,000 individuals died and over 300,000 were injured (Disaster Emergency Committee, 2015). There has been much debate around the death toll, as different governments and organizations have published varying numbers over the years. Initial figures released by the Haitian government in 2010 reported the death toll at 222,570, but there was controversy over the exact number (Pallardy, 2017). In 2011, the Haitian government increased the death toll estimate from 222,570 to 316,000 (Pallardy, 2017). Confusion ensued when the U.S. Agency for International Development (USAID) published a report in 2011 claiming that no more than 85,000 individuals had perished (Pallardy, 2017). Despite debate surrounding the exact death toll, the number of dead and injured was undoubtedly exacerbated by Haiti's inadequate infrastructure and poorly constructed buildings.

The destruction in Port-au-Prince was due partly to Haiti's lack of building codes, which resulted in individuals being crushed and trapped within structures and homes across the region (Pallardy, 2017). For reference, Haiti ranks 145 out of 169 countries on the UN Human Development Index, making it the least developed nation in the Western Hemisphere (Disaster Emergency Committee, 2015). It was reported that over 86% percent of individuals in Port-au-Prince were living in slum conditions at the time of the earthquake (Disaster Emergency Committee, 2015). Similar to other developing countries, Haiti also suffers from a struggling economy and growing population, which adds

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strain to ongoing efforts to improve the country (McEntire, Sadiq & Gupta, 2012). According to McEntire et al., (2012), Haiti is subject to an extremely disparate income structure; most Haitians live on a daily budget of just \$2.00 per day and some even less than that (McEntire et al., 2012). Prior to the earthquake, over half the population in Port-au-Prince lacked access to tap water and latrines, further exacerbating post-earthquake problems (Disaster Emergency Committee, 2015).

Following the earthquake, over 188,383 structures and houses were significantly damaged and over 105,000 were completely destroyed (Disaster Emergency Committee, 2015). Of those that remained, over 19 million cubic meters of debris and rubble covered them (Disaster Emergency Committee, 2015). Among those who survived the initial quake, many would later perish due to lack of power, water, and medical assistance (Pallardy, 2017). Sadly, emergency response efforts were delayed so long that those who survived in some areas were eventually presumed dead due to starvation and dehydration (Pallardy, 2017). Those who required medical treatment were often forced to wait long periods of time to receive medical attention as many hospitals had been destroyed in the earthquake (Pallardy, 2017). Subsequently, morgues quickly exceeded their capacity and were unable to deal with the number of deceased persons (Pallardy, 2017). Similar to the 2004 Thailand tsunami, bodies began accumulating and decaying in the streets, leading to panic and subsequent mass grave burial. The use of mass graves contributed greatly to the uncertainty of the exact death toll as well as proper identification of the deceased. Despite uncertainty surrounding the overall death toll, Canadian officials reported that of the 1,911 registered Canadian citizens in Haiti, 58 were killed during the 2010 earthquake (Public Safety Canada, 2017).

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Forensic Science: Identification of Victims

Following the earthquake, friends, neighbours, and family members were left with the task of recovering the majority of the deceased. (Gupta & Sadiq, 2010). Some individuals were successfully identified because people searched corpses for wallets and other forms of ID (McEntire et al., 2012). This ad hoc approach to body recovery resulted in the construction of large mass graves (see Figure 1) and at times on-site incineration of decomposing bodies using gasoline and fire (Gupta & Sadiq, 2010). The problem with these types of practices is that they often result in permanent destruction of remains, making later identification nearly impossible (Gupta & Sadiq, 2010). Interviews conducted by Gupta & Sadiq (2010) reveal that those involved in the earthquake recovery effort did not keep information logs regarding the deceased after they were processed. According to a physician at one of the functioning local hospitals, bodies removed from the hospital and buried in mass graves were not issued death certificates (Gupta & Sadiq, 2010).

Figure 1. No burials for thousands of victims. Most of the victims of Haiti's earthquake were buried in mass burial sites such as this one in Titanyen. Photo by N. Dominic, 2010, <https://www.wsj.com/articles/SB100014240527487059804575007782151239548>. Copyright 2010 The Wall Street Journal.

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On January 3, 2010, the Morgue Director of the General Hospital in Port-au-Prince reported that over 2,200 tags were used to number the dead by 3 pm local time (Gupta & Sadiq, 2010). Later that evening, the government of Haiti implemented the rule that all deceased were to be disposed communally in mass graves (Gupta & Sadiq, 2010). In the case of those bodies that made it to the local morgue, the available technology and resources were outdated and inadequate (Gupta & Sadiq, 2010). Existing morgue infrastructure was already so outdated and inadequate prior to the 2010 earthquake that the Morgue Director claimed it was “of the lowest category” and incapable of housing all the deceased (Gupta & Sadiq, 2010, p.7). For example, there was poor regulatory enforcement by Haiti’s national health authority and low levels of supervisory capacity across the health care system (Pan American Health Organization, 2010). In terms of mortuary operations, death certifications were only completed in roughly 1 out of 20 deaths and of those completed, 1 in 3 certificates provided poorly defined cause of death (Pan American Health Organization, 2010). The General Hospital morgue had almost reached capacity prior to the flood of earthquake victims and as a result, only the bodies of foreign nationals, including Canadians, were housed in the morgue (Gupta & Sadiq, 2010).

The Haitian government made little effort to identify deceased locals, focusing instead on locating the bodies of foreign nationals (Gupta & Sadiq, 2010). This was due to the large volume of deceased and partly to the lack of forensic facilities capable of performing fingerprinting, DNA testing, or dental comparisons (Gupta & Sadiq, 2010). On February 12, the Disaster Mortuary Operations Response Team (DMORT) was deployed to Port-au-Prince to aid in the recovery and identification of the dead (Gupta & Sadiq, 2010). The main objective of the DMORT team was to search for and identify deceased

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American nationals who perished in the earthquake (Gupta & Sadiq, 2010). DMORT successfully located 35 American citizens and was able to positively identify 32 of the deceased using dental records and fingerprint analysis (Gupta & Sadiq, 2010). Despite DMORT's efforts in the identification of American citizens, over 103 Americans were reported to have died in Haiti, with 5,000 unaccounted for as of March 2010 (Margesson & Taft-Morales, 2010). To date, the majority of those killed in the earthquake lie in mass graves.

Haiti Earthquake: Mass Fatality Management Plan

As already discussed, the Haitian government provided little instruction on how to systemically recover and identify the deceased. The main concern following the earthquake was that all bodies be disposed of as quickly as possible due to the perceived health risk. A lack of public communication regarding recovery efforts also compounded these obstacles (Gupta & Sadiq, 2010). Most communication was simply through word of mouth (Gupta & Sadiq, 2010). This is due in part to the obstructed cellular service after the earthquake and the general lack of viable electronic communication systems (Gupta & Sadiq, 2010). As a result, many individuals who recovered bodies were unable to disseminate valuable information that may have aided in the identification of victims. Some of those interviewed by Gupta and Sadiq made reference to one website that was created to aid with communication after the earthquake, but there was a lack of information regarding specifics about the website (Gupta & Sadiq, 2010). All efforts to recover bodies

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were planned and executed by the general public, which explains the lack of coordination and resources (Gupta & Sadiq, 2010).

Apparently, there were no official MFM plans in Haiti and most efforts were coordinated by members of the public (Gupta & Sadiq, 2010). Domestic and international planning efforts prior to the 2010 earthquake focused on responses to hurricanes, as they are the most common natural disaster in Haiti (Margesson & Taft-Morales, 2010). President Preval appealed to the international community for support following the earthquake but there were international concerns regarding alleged political corruption and a lack of stable government (Margesson & Taft-Morales, 2010). Decades of government policy aimed at benefiting the elites have resulted in the majority of Haitians feeling marginalized and forgotten (Fatton, 2011). As a result, foreign donors have previously focused providing all monetary aid to NGO's due to suspicions of government corruption and social inequality (Fatton, 2011). As such, the government receives very little foreign aid, which contributes to the weakened state's inability to assume responsibility for its own people (Fatton, 2011). This in turn, raised serious questions regarding the country's ability to stabilize long-term (Margesson & Taft-Morales, 2010). Prior to the destructive earthquake, Haiti was already flagged as being ecologically and socially at risk as it had some of the lowest ranking socioeconomic indicators in comparison to other countries (Margesson & Taft-Morales, 2010). Political conditions were turbulent despite President Preval's efforts to improve the rule of law in Haiti and to create jobs (Margesson & Taft-Morales, 2010). Consequently, the 2010 earthquake gravely injured an already crippled country that could be seen as on its way to repair.

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Most importantly, the earthquake represented a devastating reminder of how important MFM plans are for every country (Winthrop, 2010). Following the 2010 earthquake, the American Red Cross launched a disaster preparedness program in Haiti to assist the country in preparing for future disasters (American Red Cross, 2013). This preparation took the form of stabilizing roads, digging draining ditches, reinforcing shelter and identifying evacuation roads. Given Haiti's poor infrastructure, limited resources and susceptibility to natural disasters, maintaining access to supplies is critical in disaster preparation (American Red Cross, 2013). In an effort to address emergency supply accessibility, the American Red Cross (2013) strategically housed water, blankets, tarps, first aid kits and kitchen supplies in different locations within Haiti in an effort to provide emergency assistance to up to 25,000 families. Although these efforts helped to reduce future risk, many natural disaster recovery requirements exceed the limited supplies provided by the American Red Cross or similar organizations. The reality is the Haitian government needs to establish its own official MFMP and procedures to deal with future incidents.

Haiti Earthquake: Conclusion

The 2010 Haiti earthquake serves as a painful reminder of the brutality of natural disasters across the globe. More to the point, it highlights how a MFE can cripple an entire nation, rendering a country incapable of the effective recovery and identification of the deceased. The 2010 earthquake highlights the need for immediate international action

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and assistance following large-scale natural disasters in vulnerable countries with weakened economies and inadequate infrastructure. Most importantly, immediate international forensic assistance following large MFEs is critical in order to prevent the practice of mass graves and improper disposition of victims. The New Haven School of International Law will illustrate how the 2010 earthquake can be evaluated using a 5 step process referred to as decision mapping. Through the exploration of this event and the decisions made during and following the earthquake, I seek to gain a better understanding of international processes and operations. Furthermore, I will seek to dismantle the decision-making process in an effort to identify international shortcomings and provide recommendations for future MFEs.

2001 Twin Tower Attacks: Introduction

On September 11, 2001, members of a terrorist organization hijacked multiple commercial airliners and flew them into the Twin Towers in downtown New York City, killing over 2749 individuals (Biesecker et al., 2005). Of the 2749 victims killed, 24 were Canadian citizens (Public Safety Canada, 2013). The terrorist attacks that took place at roughly 9:00 am on September 11 would soon be known as, among other things, one of the largest forensic recovery undertakings in US history. Efforts to recover and identify victims would take years to complete and even then US officials knew it was unlikely that every fragment of human remains would be identified. A decision had to be made early in the process whether the scope of the operation was to include the identification of every victim (National Institute of Justice, 2006). This was the single most important

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question asked, and the answer would determine the scope and duration of the recovery efforts (National Institute of Justice, 2006). In the end, it was decided that recovery and identification efforts would operate with the goal of identifying every fragment of recovered human remains (National Institute of Justice, 2006). The decision to identify all human remains led to the creation of policy requiring unidentified human remains to be saved and stored until future technology could identify them (National Institute of Justice, 2006). Consequently, the goal was not only to identify every victim, but also to ensure that all individual remains were collected.

Forensic Science: Identification of Victims

A site like the Twin Tower attacks is logistically overwhelming for multiple reasons. For example, the number of deceased, the quality of the human remains, and the overall destruction of the site made it incredibly difficult for first responders to locate identifiable remains. The Twin Towers attack has since been termed the largest forensic identification challenge in American history (Ritter, 2006). The US had few methods in place at the time for DNA analysis procedures for mass fatalities exceeding 500 individuals (Biesecker, Bailey-Wilson, Ballantyne, Baum, Bieber, Brenner, Walsh, 2005). Additionally, given the physically destructive nature of the MFE, DNA analysis had to be the primary method of identification due to the number of fragmented and severely disarticulated remains (Ritter, 2006). In an effort to understand the obstacles faced by forensic experts during the 9/11 recoveries, we need to appreciate the complexity of aviation accident recoveries. Victim recovery following an aviation accident is incredibly difficult as

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it usually involves remains that are scattered, contaminated, disintegrated, and mixed with other human remains (see Figure 2) (Chaturvedi, Craft, Kupfer, Burian & Canfield, 2011). Due to the prevalence of contamination, it can be near impossible to isolate individual fragments of remains for forensic process and subsequent DNA identification (Chaturvedi et al., 2011). In aviation accidents, it is often easiest to separate remains by types of tissue, such as separating by muscle, lung, heart, or teeth (Chaturvedi et al., 2011). In one case study, a four-person plane crashed, resulting in remains so fragmented and comingled that the National Transportation Safety Board (NTSB) had to match victim remains based on similarities of tissue and then label them numerically until they were able to obtain DNA reference material from the family (Chaturvedi et al., 2011).

Figure 2. Rescue workers conduct search operation near the site of the Germanwings plane crash near the French Alps, La Seyne les Alpes, France., by F. Pellier, 2015, <https://www.cnn.com/2015/04/04/france-halts-search-for-bodies-at-germanwings-crash-site.html>. Copyright 2015 by CNN

Despite the numerous difficulties associated with aviation accidents, there is a silver lining when comparing aviation MFEs to other types of MFEs. Fortunately, most airlines have a detailed passenger log of who has purchased a ticket, scanned in, and board-

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ed the plane. The documentation begins when an individual purchases the ticket, checks in for the flight, passes through security, and finally when they are scanned into the system while boarding the plane. This entire process is of use to forensic professionals assisting with the scene of an aviation accident, as they already know how many crew-members and passengers are on board as well as a list of those who are registered. Subsequently, most aviation accidents are closed MFE incidents, as there is credible information regarding the affected population (Ritter, 2006). Alternatively, if the population is not known and credible information cannot be obtained, the population is considered “open” (Ritter, 2006).

If the aviation accident is deemed a “closed incident,” forensic professionals can obtain access to the flight manifest in order to begin a rough identification of passengers aboard the plane (Ritter, 2006). It is important to note that the manifest may not always be accurate but it can provide a near complete roster of those potentially involved in the MFE (Ritter, 2006). This also means that forensic experts can begin to gather DNA samples from known family members, which will aid in the efficient identification of the deceased. Despite having valuable information such as the flight manifest, the task of collecting and effectively identifying victims of even small aviation accidents are time-consuming. Notably, in the case of 9/11, forensic experts dealt with the challenge of two simultaneous aviation accidents combined with the collapse of two buildings housing thousands of employees. Consequently, following the collapse of the Twin Towers, the scene quickly became an “open” incident with an unknown population. Due to the international status of the Twin Towers, it was probable that foreign nationals and other visi-

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tors had been in the building, adding to an already long list of employees and persons potentially inside the building.

The forensic identification efforts following the 9/11 attacks were centered exclusively on the scientific use of DNA analysis (International Institute of Justice, 2006). This method was chosen due to the fragmented condition of the victims as well as the lack of alternative methods. DNA analysis is the modern gold-standard method for positively identifying victims of destructive MFEs because of its precision and accuracy when dealing with damaged remains (Ritter, 2006). Although nearly 3,000 individuals were killed in the attack, over 21,906 exhibits of human remains were collected from the scene (Toom, 2016). Additionally, there was over 1.8 million tons of debris following the collapse of the Twin Towers, which was composed of large sections of concrete, plumbing, steel, office furniture, and debris from the commercial airliners (Toom, 2016). One of the largest challenges was separating the scattered human remains from the debris and rubble that blanketed the entire site (Toom, 2016). Due to volatility of the planes crashing into the towers, many of the human remains had been cremated, destroyed, or pulverized into such small fragments that DNA samples were difficult to collect (Toom, 2016). As a result, the recovery effort varied from using cadaver dogs (see Figure 3) to emergency personnel locating remains through the smell of decomposition (Toom, 2016). Debris was collected from the scene and laid out on the floor while individuals combed through sections looking for remains (Toom, 2016).

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Figure 3. The 9/11 rescue dogs: Portraits of the last surviving animals who scoured ground zero one decade on, by B. Wallis, 2011, <http://www.dailymail.co.uk/news/article-2033628/Surviving-9-11-rescue-dogs-scoured-Ground-Zero-bodies-commemorated-decade-difficult-mission.html>. Copyright 2011 by the Daily Mail.

One challenge that hindered forensic identification and that provides context on the damaged remains related to the separation of animal remains from human remains (Toom, 2016). It was discovered that there had been multiple restaurants within the Twin Towers that served a variety of pork, poultry, and beef foods that were hard to distinguish from the human remains (Toom, 2016). For example, forensic anthropologists documented a “significant number of hotdogs” while analyzing remains that had been brought to the temporary morgue facility (Toom, 2016, p. 694). As a result, the emergency personnel working the scene received on-the-job training for how to differentiate human and non-human remains (Toom, 2016). Once back at the morgue, the human remains were processed through examining, documenting, and photographing everything believed to be human (Toom, 2016). Subsequently, the remains were stored in labeled folders and sent to another room to be formally entered into a database (Toom, 2016). Forensic scientists then extracted viable DNA from the human remains and began the process of matching

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the post mortem DNA to familial DNA samples (Toom, 2016). The match between ante mortem and post mortem DNA had to pass the statistical confidence level of one in a million in order to be assessed as a match and assigned an identity (Toom, 2016). This level of statistical certainty is critical in terms of legal implications such as death certificates and civil matters relating to ownership of the remains and insurance policies (Toom, 2016). Finally, it was the designated forensic specialists that had the authority to legally assign an identity to the remains following analysis (Toom, 2016).

2001 Twin Tower Attacks: Mass Fatality Management Plan

When considering the magnitude and destructiveness of the 9/11 attacks, the US was well positioned to deal with the recovery and identification of the victims. Arguably, if this type of attack had occurred in a less developed country, the damage and loss would have likely exceeded the death toll in New York. Despite America's advanced technology and abundance of resources, the scene during 9/11 exceeded all existing MFM plans and as a result, the National Institute of Justice collected a number of experts to act as advisors during the recovery (Ritter, 2006). The team was designated the Kinship and Data Analysis Panel (KADAP) and were responsible for making recommendation regarding policies, procedures, and forensic techniques relating to the identification of the victims (Ritter, 2006). Arguably, the identification efforts of 9/11 were successful because the city of New York consulted forensic professionals and established a comprehensive MFM prior to the deployment of resources.

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The KADAP team was composed of forensic DNA scientists, human geneticists, statisticians, genetic researchers, information management experts, database managers, and even program managers (Ritter, 2006). The KADAP team encompassed all areas of MFM that are critical to the successful planning and execution of a large-scale operation. The KADAP team consisted of law enforcement, medical professionals, academics, and military personnel that brought together an unparalleled depth and breadth of experience (Ritter, 2006). Additionally, the KADAP consulted private companies and other police forces such as the RCMP for advice regarding compatible database systems and computer programs (Ritter, 2006). After KADAP had established a rough MFM plan, resources and capabilities were measured and laboratory managers were consulted, who estimated DNA workload templates that provided a rough estimate of the materials and labour required to conduct the operation (Ritter, 2006). Once labs had been consulted and their needs assessed, project management staff worked closely with KADAP to establish a suitable project management framework (Ritter, 2006). Due to KADAP's extensive planning prior to the execution of MFM, they were able to explore options such as hiring consultants to increase lab capacity and limit staffing obstacles during the operation (Ritter, 2006). The planning approach following the 9/11 attacks was so successful that the National Institute of Justice was able to utilize the lessons learned from the KADAP team to assist with future MFEs such as the 2004 Thailand tsunami.

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2001 Twin Tower Attacks: Conclusion

The scope of the Twin Tower attacks far exceeded any MFM plans the US had at its disposal. Despite existing MFM plans, the Twin Tower attacks were unprecedented and resulted in chaos. Fortunately, existing generalized MFM planning frameworks were in place prior to the attacks which made the execution and coordination of all the critical stakeholders in MFM more successful. The US's efforts in engaging in extensive MFM planning and consultation prior to formal recovery and identification, resulted in effective and efficient recovery and identification of victims. Despite the overall success of the 9/11 response, there are specific areas of decision-making and MFM that can be improved upon for future events. The New Haven School will be used to critically analyze the U.S's immediate and long-term response to the attack as well as the various levels of decision-making that resulted in both successes and failures. Specifically, the New Haven School will provide a framework in which I can break down the phases of the recovery as well as the decisions that were made throughout the operation.

2004 Thailand Tsunami: Introduction

On December 26, 2004, an unexpected and powerful earthquake erupted on the floor of the Indian Ocean causing tsunamis to lash surrounding Southeast Asian regions (Public Safety Canada, 2017). At approximately 8:00 am local time, the level 9.1 earthquake erupted along the seafloor of the Indian Ocean offering little warning to unsuspecting locals and tourists occupying coastlines (Encyclopaedia Britannica, 2017). Over the

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next several hours, waves exceeding 30 feet would violently thrash the islands and coastal regions of South-East Asia (Encyclopaedia Britannica, 2017). In total, over 225,000 individuals were confirmed killed in Sri Lanka, Indonesia, India, and Thailand (Encyclopaedia Britannica, 2017). Among the 225,000 confirmed killed, over several thousand foreign tourists were declared missing or dead (Encyclopaedia Britannica, 2017). The confirmed death toll of Canadian citizens is listed at 15; however, 11 Canadian citizens remain unaccounted for (Public Safety Canada, 2017). Of the 11 missing Canadians, 6 individuals are considered to be missing and 5 citizens are suspected dead but not recovered (Public Safety Canada, 2017).

Similar to the 2010 Haiti earthquake, a lack of available local resources, fresh water, food, and medical treatment contributed to further fatalities following the quake (Encyclopaedia Britannica, 2017). The transportation of supplies was often inhibited by the destruction of roads in remote areas, which led to further death (Encyclopaedia Britannica, 2017). Entire tourist resorts and villages were leveled following the violent tsunamis and flooding (Encyclopaedia Britannica, 2017). The scene was psychologically and logistically overwhelming and various regions lacked adequate resources to effectively deal with both the disaster and the number of deceased. As a result, victims were identified through “visual” identification—visual analysis by individuals who may know the identity of the deceased (Morgan et al., 2006). Unfortunately, due to hot and humid conditions this method was only viable for a couple of days, after which the bodies began to decompose at such a rate that visual identification was no longer feasible (Morgan et al., 2006). Lack of refrigeration combined with limited forensic processing capacity resulted in the eventual international intervention and assistance (Morgan et al., 2006). Few

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countries would be able to deal adequately with a MFE of this magnitude and scale. Additionally, the high number of foreigners in the affected regions meant that several countries had personal investment in the successful recovery and identification of the victims.

Forensic Science: Identification of Victims

The forensic identification efforts following the 2004 Indian Ocean earthquake were ad hoc and disorganized. Due to the high number of fatalities, and environmental factors such as heat and water, bodies decomposed quicker than authorities could recover and identify them. As mentioned above, initial identification efforts involved collecting bodies and displaying them in large flat areas, such as religious temples, so individuals could walk through and visually identify victims (Morgan et al., 2006). However, given the heat and humidity of the country, the bodies quickly bloated and began to decompose beyond visual recognition (Morgan et al., 2006). Furthermore, increases in the number of bodies soon made it unfeasible to lay them out for public identification (Morgan et al., 2006). Due to a lack of refrigeration, there were efforts early in the recovery to cool the decomposing bodies with dry ice but the number of dead quickly became overwhelming (Scanlon et al., 2007). In Sri Lanka, medical professionals at hospitals attempted to reduce decomposition by brushing formaldehyde to the exterior of the bodies (Scanlon et al., 2007).

Much like the earthquake in Haiti, the large number of decomposing bodies resulted in public panic in much of Thailand and fear of disease epidemics (Morgan et al., 2006). The public perceived the dead bodies to be a grave health concern and this result-

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ed in the use of mass grave burials and body disposal before appropriate forensic identification (Morgan et al., 2006). Mass grave burials were problematic as the graves lacked standardized procedures and as a result bodies were just combined haphazardly one on top of the other (Morgan et al., 2006). For example, bodies were stacked one on top of the other with multiple layers of victims in one grave pit (Morgan et al., 2006). Consequently, any future efforts to exhume and identify the victims were unlikely and logistically improbable (Morgan et al., 2006). It was later assessed that the large number of decomposing bodies presented no health risks to the public and that future identifications following MFEs should be approached systemically and logically (Morgan et al., 2006).

The identification process following the Indian Ocean earthquake included the use of visual identification, DNA, fingerprints, as well as dental records (Scanlon et al., 2007). While bodies were still in an identifiable condition, people were able to identify victims by comparing the deceased to antemortem photos posted on billboards and on websites (Scanlon et al., 2007). For example, family members posted photos in public areas of missing individuals that had not yet been found or identified as deceased. Initially, identifications were being conducted in temples (see Figure 4) or compounds in which the bodies could be laid out and analyzed (Scanlon et al., 2007). The use of morgue refrigeration was not available until a Norwegian team showed up and built a morgue to process the bodies (Scanlon et al., 2007). Of course, by this time many of the bodies had bloated and decomposed past visual recognition and the number of dead remained overwhelming.

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Figure 4. In this Dec. 30, 2004 file photo, Thais walk outside a Buddhist temple, near Takuapa, Thailand, where more than 1,000 bodies have been gathered, by D. Lejano, 2004, <http://newsinfo.inquirer.net/658827/a-look-back-the-2004-indian-ocean-tsunami-in-photos>. Copyright 2014 by AP.

The Norwegian morgues consisted of 18 containers so the bodies could be systematically processed similar to an assembly line (Scanlon et al., 2007). These containers housed x-ray equipment, pathology workspace and fingerprint analysis stations (Scanlon et al., 2007). Unfortunately, there were so many bodies that thousands of corpses were sent to mass graves where they were buried without x-ray, fingerprint, or DNA records (Scanlon et al., 2007). Similar to the 2010 earthquake in Haiti, the use of mass graves resulted in an inability to identify and issue death certificates (Scanlon et al., 2007). Additionally, many of the mass grave locations were not recorded nor were any of the bodies tagged or labeled with identifiable information (Scanlon et al., 2007). As seen with other MFEs such as the Haiti earthquake, the use of mass graves without issuance of death certificate can cause numerous legal issues such as compensation, insurance, inheritance and separation proceedings (Morgan et al., 2006). Lack of MFM planning and forensic coordination acted as a catalyst to an already desperate MFE scene.

2004 Thailand Tsunami: Mass Fatality Management

The day following the Thailand tsunami, Thai forensic professionals began to arrive in the affected areas to assist with the identification of deceased (Morgan et al., 2006). The deployed forensic professionals came from individual organizations and institutes to set up ad hoc forensic processing facilities across the region (Morgan et al., 2006). After the initial local forensic professionals arrived, international forensic teams began to arrive to assist with the identification of both their own citizens and local victims across the country (Morgan et al., 2006). The Thai Tsunami Victim Identification Centre (TTVIC) was created and was composed of Thai police, forensic professionals, and international forensic teams (Morgan et al., 2006). TTVIC collaborated with INTERPOL in an effort to establish a central mortuary in Phuket as well as to implement INTERPOL's stricter standardized victim identification protocol (Morgan et al., 2006). Following the creation of the TTVIC and the arrival of INTERPOL, it was decided that all remaining and previously identified victims would be re-examined using INTERPOL's DVI standard (Morgan et al., 2006). Over 3,777 victims were re-examined in the central morgue using various methods of external and forensic pathological identification methods (Morgan et al., 2006).

There was a substantial time gap between when Thai authorities began processing and identifying victims to when international assistance and forensic team arrived to aid in the effort (Morgan et al., 2006). As a result there were significant delays in implementing a command centre and establishing standards and guidelines for the processing of victims (Morgan et al., 2006). Consequently, the coordination of recovery efforts was not

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effectively planned and there were no clear operating procedures or mandates for organizations and individuals assisting in the recovery (Morgan et al., 2006). None of the affected countries had existing adequate MFM plans to deal with the Indian Ocean earthquake and this resulted in a lack of delegation surrounding who collected, identified and disposed of the dead (Morgan et al., 2006). The Indian Ocean earthquake served as a harsh reminder of the importance of established MFM plans as well as the importance of effective international coordination and response following a large scale MFE.

Most importantly, the reaction to the earthquake resulted in the implementation of processes that lacked a comprehensive understanding of how to efficiently and effectively approach MF situations. Subsequently, increased confusion resulted from a lack of initial international guidance in terms of establishing MF processes and standards and a lack of technical and practical field support (Morgan et al., 2006). This deficiency in organizational legal jurisdiction over the recovery, identification and disposition of remains led to errors in processing and identifying victims efficiently (Morgan et al., 2006). Due to the rate in which bodies were decomposing and the lack of refrigeration available, temporary shallow mass graves were used in an attempt to reduce decomposition by keeping the bodies underground in lower temperatures (Morgan et al., 2006). Although there were intentions to eventually exhume the temporary graves and identify the victims, the bodies had decomposed to such a condition that it became near impossible (Morgan et al., 2006).

2004 Thailand Tsunami: Conclusion

The 2004 Indian Ocean earthquake and subsequent tsunami, has been one of the largest modern MFEs in the world. The sheer volume of death and destruction surpassed both the 2010 Haiti earthquake and the 2001 Twin Tower attacks in the US. Furthermore, the high number of foreign tourists vacationing in Thailand at the time of the tsunami made the recovery effort more demanding, as numerous countries had to work together to identify and repatriate both Thai and foreign citizens. The Thailand tsunami illustrates how essential the planning and coordination stage of MFM is following an event as large and complex as the Indian Ocean earthquake. Similar to Haiti, Thailand lacked the necessary resources and infrastructure to fully support the recovery efforts on their own. International teams have to arrive quickly to set up forensic stations as well as refrigeration containers to assist with processing and managing of human remains and data. Through the use of the New Haven School, I will explore decisions made following the Thailand tsunami in an effort to identify areas of strength and weakness. New Haven's decision-making model will be used to map out the events and decisions made in response to the tsunami with the goal of isolating the main problem and providing recommendations for future events.

Conclusion

The 2010 Haiti earthquake, 2001 Twin Towers attacks and the 2004 Indian Ocean earthquake represents three different types of disasters in three radically different locations. The Twin Towers attack in New York illustrated the difficulties experienced by even a highly developed and wealthy country when faced with a large-scale MFE. Despite the U.S.'s relatively autonomous response to the events on September 11, those involved had to take existing MFM procedures and adapt the processes and policies to accommodate the specific nature of that MFE. Subsequently, although the US did not have existing MFM plans to address the fallout from the attacks, their access to other MFM plans and resources aided in responding effectively to the event. Conversely, both Haiti and Thailand struggled to establish immediate effective responses to their respective MFEs, resulting in initial ineffective and inadequate MFM procedures.

All of these countries utilized different decision-making models and practices that contributed to either the success or failure of their MFM plan. In order to dig deeper into these three events and how they unfolded, I will be employing a legal theory that facilitates the systematic breakdown of the different authority figures roles and responsibilities as well as their decisions. This is an important aspect of MFM as MFM plans are only as effective as those in power making the decisions. Subsequently, The New Haven School of International Law was selected because of its focus on decision-making and practical policy development.

Chapter Three

Introduction

In light of the frequency, in which MFEs such as the Twin Tower attacks, 2004 Thailand tsunami, and the 2010 Haiti earthquake can occur, it is imperative that Canada is well-positioned to deal with future MFE events. As such, governments and international organizations should maintain open channels of communication with respect to MFM, both domestically and internationally. An ongoing review and discussion surrounding international MFM should be of particular interest to Canada as Canadians have become more globalized, and as a result travel frequently outside of Canada for work and pleasure. The Canadian government should expect and plan for future Canadian citizen deaths abroad, and be prepared to assist with identification and repatriation efforts. It is important to understand that there is no one-size-fits-all model when approaching MFM abroad as much of MFM planning is dependent on local infrastructure and resources. For example, following the Haiti earthquake, local hospitals quickly reached capacity and lacked the infrastructure and resources to adequately deal with the volume of injured and dead (Disaster Emergency Committee, 2015). The earthquake had either destroyed or damaged existing poorly constructed infrastructure and as a result many Haitians were unable to get clean drinking water, let alone deal with the hundreds of thousands of dead bodies (Disaster Emergency Committee, 2015).

Conversely, the United States faced obstacles incorporating existing MFM plans following the Twin Towers attacks. The United States has both the infrastructure and resources to handle a MFE exceeding 2000 individuals, and it was considered a pioneer in

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the field of mass DNA analysis management. Although each of the three countries discussed thus far (Haiti, Thailand, and the United States) faced unique challenges, MFM efforts were either inhibited or facilitated by the organization and implementation of standardized DVI procedures and processes. Arguably, the most influential component of all three MFM responses was the timeliness of a comprehensive evaluation before the deployment of resources. Due to the complexity and multi-dimensional nature of MFEs, it is imperative that the affected country has considered every element of the MFM plan. For example, having sufficiently robust forensic capacity to deal with the volume of death is important, but it is only one part of the MFM equation.

Those responsible need to factor in other equally important components of the process such as records and information management. Without effective record management, forensic-processing capacity becomes redundant, as one cannot reliably issue an accurate death certificate without the appropriate documentation. These are only two of many interdependent components that comprise effective MFM plans. Consequently, it is not a matter of creating a universal “best practice” MFM plan but to engage in an ongoing effort to research and understand the evolution of MFEs across the world and how they impact different regions and countries in different ways. Due to the diverse nature of MFEs, it is in Canada’s best interest to develop and maintain flexible MFM plans that are capable of being adapted to a wide range of global threats. With this goal in mind, I will analyze the MFMP’s of Haiti, Thailand, and the United States through the lens of the New Haven School of International Law. I will do so in an effort to explore the various legal and logistical implications of decision-making following MFEs by applying New Haven’s decision-making model.

New Haven School of International Law: Overview

The New Haven School of International Law was originally developed by scholars Myers S. McDougal and Harold D. Lasswell in a revolutionary effort to combine law with the analytical methods of the social sciences (Reisman, Wiessner & Willard, 2007). The New Haven School uses social-scientific methods to explore social problems in an effort to promote the general goal of “human dignity” (Reisman et al., 2007). It seeks to develop new legal and policy tools to facilitate improvements within the public sphere (Reisman et al., 2007). The focal point of the New Haven School is thus a “tangible methodology” that can be applied to a variety of international legal issues (Smith, 2013, p.144). New Haven methodology is centred on the examination of authoritative processes of decision-making with the goal of promoting human well-being and contributing toward normative processes that benefit the public (Koh, 2009). Suzuki describes this as follows:

The New Haven school does not describe the world’s different community decision processes through a dichotomy of national and international law, in terms of the relative supremacy of one system of rules or other interrelations of rules. Instead, it describes them in terms of the interpenetration of multiple processes of authoritative decision of varying territorial compass.... International law is most realistically observed, not as a mere rigid set of rules but as the whole process of authoritative decision in which patterns of authority and patterns of control are appropriately conjoined (Suzuki, 1974, p. 30).

Reisman, one of the school's leading exponents, confirms New Haven's central tenet that individuals should seek to encourage and maintain relationships between law and policy (Koh, 2009). Reisman claims that international law needs to be flexible in order to reflect the current needs of various international policy issues (Koh, 2009). In this sense, law provides a basis for evaluating the effectiveness of previous and future decisions based upon their compatibility with specific goals while offering alternative options (Reisman et al., 2007). The decision-making process is broken down into five steps: "(1) Delineate the problem; (2) identify conflicting claims; (3) analyze past trends in decisions; (4) project future trends; and (5) provide appraisals and recommendations" (Smith, 2013, p. 144). Among other things, these five steps map the ways in which material resources are used and manipulated by different actors involved in the management of resources to ensure the optimization of desired outcomes (Reisman et al., 2007). This mapping of decisions assists the individual responsible for pragmatic change, to orient themselves in the situation with the hope of influencing positive outcomes (Reisman et al., 2007).

In the first phase of New Haven's decision-making process, delineation must occur in order to identify the main problem or issue that requires analysis and change (Smith, 2013). In the case of MFM, this is crucial as it can break down highly dynamic and interactive processes involving numerous domestic and international actors. Situations or events involving multiple countries will have several participants invested in outcomes and will likely want to be included within the response. For example, it may be difficult to marry the needs of foreign governments, international organizations, and general public following a major event such as a MFE (Reisman et al., 2007). Therefore, the

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first phase of the New Haven decision-making process is to apply a mapping procedure to each event that will minimize the risk of overlooking critical components of the event while maximizing the use of resources (Reisman et al., 2007). Once the event has been mapped systemically, those involved in the planning can begin to delineate the key problem.

The second step is the identification of conflicting claims (Smith, 2013). This can be seen following MFEs around the world in situations where cultural and religious practices can impede the MFM process of recovery and identification. For example, following the 2004 Thailand tsunami, some areas of Thailand cremated unidentified victims on account of religious concerns (Scanlon et al., 2007). In this example, forensic teams and family members of victims were left scrambling to find those believed to be deceased before they were destroyed (Scanlon et al., 2007). Alternatively, in the 2010 earthquake, many unidentified victims were thrown into large mass graves within the twenty-four hours required by local religious burial customs (Gupta & Sadiq, 2010). Thousands of victims were placed into unmarked pits without identifiable markers or records of where individual bodies were placed for future recovery (Gupta & Sadiq, 2010). As a result, religious practices can impede immediate MF recovery efforts as well as limit future recoveries and subsequent identification. Therefore, when evaluating global MFM efforts, it is important to understand that there is often conflicting social and legal norms at work in each MFE (Smith, 2013). It is unreasonable to assume that every MFE will fit into a single, standardized MFM response.

Once the focal problem and conflicting ideologies have been identified, the third step is to analyze existing legal structures and past decision-making practices (Smith,

2013). In reference to the three case studies discussed in this paper, all relevant domestic and international legal guidelines have been explored within the second chapter and will be analyzed below. Evaluating previous decisions will offer insight into what elements of the MFM process were effective and what could be improved in future approaches. This section also provides an opportunity to review disagreements between the relevant institutions, such as local government and international organizations. Disagreements or miscommunication between local government and international aid organizations can have an impact on the timeliness and execution of MFM. For example, following the 2010 earthquake, international aid organizations had a difficult time responding to the needs of the Haitian government due to a lack of effective telecommunications and concerns over political corruption (DesRoches et al., 2011). Consequently, existing political relationships can play a critical role in the decision-making process.

The fourth step requires the prediction of future trends or developments in order to develop strategies for future action (Smith, 2013). Depending upon the phenomenon in question, this can be done through the analysis of past, current, and future trends. In the case of 9/11, it is important to review the history of attempted and successful terrorist attacks in the United States to effectively predict the likelihood of similar attacks. In regard to terrorism and security-related issues, it would be important to understand the frequency in which the group operates, the type of targets, its ideological goals, and its geographic location. These variables can be incorporated into New Haven's decision-making process to aid in trend analysis and offer predictive insight and subsequent recommendations. Alternatively, natural disaster trend analysis and projection is equally beneficial in terms of establishing potential areas of MFE vulnerability.

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The final step is the offering of new recommendations based on the systematic evaluation of all relevant material (Smith, 2013). The New Haven approach offers a flexible theoretical framework in which complex legal problems can be resolved (Smith, 2013). Reisman et al., (2007) acknowledges that although the mapping process of New Haven is intended to be objective, the outcome will be influenced by the position the observer occupies. Each observer brings with them a unique profile of socioeconomic status, gender, age, experiences, and culture will undoubtedly influence individual approaches (Reisman et al., 2007). Consequently, internalized beliefs and experiences shape the perceptions and eventual outcomes of those responsible for creating and implanting the law (Reisman et al., 2007). It is important to acknowledge these unintentional biases and beliefs as they can have profound effects on the way problems and participants are contextualized and understood (Reisman et al., 2007). The New Haven approach promotes objectivity insofar as it prioritizes mapping exercises, but it also acknowledges that no individual or process is capable of complete objectivity (Smith, 2013). With the goal of objectivity at the forefront of this mapping exercise, the fifth step concludes by providing recommendations generated through the five steps of decision analysis (Smith, 2013).

The New Haven School of international law was selected for this paper because of its practicality within the field of decision-making and policy development. Although other theories, such as critical legal theory and legal pluralism would offer valuable insight into any legal phenomena, New Haven was chosen as a methodology for analyzing MFEs because of its structured and sequential decision-making framework. In regards to the significance of processes within MFEs, New Haven was an optimal choice as it seeks to address specific global issues through the evaluation of their complicated processes,

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issue-specific factors, and trends in an effort to assist in effective forecasting and response to future events (Reisman et al., 2007). New Haven recognizes that some situations warrant more informal decision-making processes due to the urgency of situations and actors involved (Reisman et al., 2007). Specifically,

[t]he New Haven School adopts a more functional approach in which it focuses on the range of centralized and decentralized settings in which decisions are actually taken, their varying degree of organization and formality, the extent to which they are specialized or not specialized, and the extent to which they are continuous or episodic. We also consider it important to examine the extent to which participants in a particular situation perceive themselves to be in a state of crisis in which critical values are deemed to be at stake (Reisman et al., 2007, p. 578).

There is an inherent flexibility with the methodology of New Haven that allows for a thorough evaluation not limited to country, type of law, or type of situation. For example, New Haven evaluates individual situations and the unique social interactions that happen as a result of the event and the people involved (Suzuki, 1974). New Haven's flexibility is partly due to its belief that events such as MFEs are a matter of individual perception and can be appraised through many means and criteria (Suzuki, 1974). As such, there is not necessarily a "correct" or "desired" outcome with the New Haven approach as the success of a particular MFE response is subject to the values and expectations of the population involved in the evaluation process (Suzuki, 1974).

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Consequently, New Haven will be used to assess current global MFE processes within different countries, relevant institutions, legal processes, and government practices (Reisman et al., 2007). The goal of this chapter is not only to better understand the legal and political processes that follow MFEs, but also to provide actionable recommendations for future events involving significant loss of life.

Applying the New Haven Framework to the Haiti Earthquake

i. Introduction

The Haiti earthquake serves as an illuminating example of a catastrophic situation in which there is a lot of room for MFM improvement. Unlike the response to the attack on the Twin Towers, the response to the Haiti earthquake was delayed and lacked appropriate government planning and coordination. As previously discussed, many of the issues that arose following the earthquake were related to the country's vulnerable infrastructure (McEntire et al., 2012). Despite Haiti's economic and social disadvantages, the New Haven School can add value to existing MFM and high-level response. First and foremost, the MFE and response must be broken down into small components for comprehensive analysis, projection, and the exploration of plausible alternatives (Reisman et al., 2007). This can be achieved through the review of obstacles and issues faced by local government and international organizations following the earthquake and subsequent MFE.

Haiti Earthquake: Step One—Goal Formation/Problem Identification

When considering the events that followed the 2010 Haiti earthquake, it is apparent that there were multiple issues that contributed to an ineffective MFM plan following the earthquake. In order to evaluate the response to the 2010 earthquake, we must first distinguish between problems that pre-existed the earthquake, problems that were exacerbated by the disaster, and problems that were related to MFM efforts. Although not mutually exclusive, categorizing problems in this way helps to distinguish relationships between variables. DesRoches, Comerio, Eberhard, Mooney & Rix (2011) suggest that it is impossible to deny that much of the disaster following the earthquake was a direct result of an already poverty-stricken country. Undoubtedly, Haiti's weak infrastructure prior to the 2010 earthquake can be categorized as an independent problem.

However, it is also true that existing infrastructural weaknesses were magnified following the earthquake, leaving the country completely immobilized. Additionally, damage to existing infrastructure led to the closure of airports, roads, and hospitals (DesRoches et al, 2011). The destruction of the airport control tower at Haiti's international airport led to temporary suspension of all non-military aircrafts into Haiti (Reuters, 2010). These closures resulted in a reduction in ability to transport people and supplies following the earthquake, which led to further casualties (Pallardy, 2017). Highways and roads were blocked with rubble and large debris from collapsed structures (Linton, 2016). This paper will not focus on issues relating to closure of travel ports and infrastructure but it is important in the overall discussion of Haiti's MFM.

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A second problem pre-dating the earthquake was volatile corruption and violence within the Haitian government (DesRoches et al., 2011). Despite President Preval's efforts to implement an official rule of law, some members of the international community remained skeptical of his government's legitimacy and transparency (Margesson & Taft-Morales, 2010). A graduate student from a law school in Jeremie, Haiti, claims that Haiti lacks an officially recognized "code of legal ethics" (Bloch & Edmond-Dimanche, 2015, p.3). A "code of ethics" is a set of permissive or prohibitive behaviors that align with group values (Bloch & Edmond-Dimanche, 2015). Subsequently, a code of ethics often relates to personal or professional activities and is in nature, highly subjective (Bloch & Edmond-Dimanche, 2015).

A 2013 report by the US State Department titled the Haiti Human Rights Report suggests that several Haitian judicial officials illegitimately charged fees to initiate multiple criminal prosecutions (Bloch & Edmond-Dimanche, 2015). Furthermore, many of these judicial officials were court clerks and judges who refused to respond unless monetary fees had been paid (Bloch & Edmond-Dimanche, 2015). Likewise, in civil courts, judges accepted bribes from plaintiffs and defendants in exchange for processing cases through the court system (Bloch & Edmond-Dimanche, 2015). Lack of a code of ethics extends from Haiti's court systems into its correctional facilities (Bloch & Edmond-Dimanche, 2015). "Haiti is a land with such limited resources that conditions of inmate confinement defy international standards and can be understood as gross violations of human rights" (Bloch & Edmond-Dimanche, 2015, p.6). It is not uncommon to see a Haitian correctional facility functioning over capacity by at least four times the maximum number of offenders (Bloch & Edmond-Dimanche, 2015). In fact, some of the cells have

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over 50 men per unit and only a few are able to lay down at a time due to lack of room (Bloch & Edmond-Dimanche, 2015). Decades of illegitimate governance led to complete government paralysis following the earthquake, which resulted in further confusion (DesRoches et al., 2011). The Haitian government did not provide adequate direction following the earthquake, and as a result, recovery and restoration efforts were taken over by other countries (Gupta & Sadiq, 2010). The government failed to implement a formal MFM plan and this lack of coordination contributed to an overall recovery failure and increase in casualties (Pallardy, 2017). The problem of inadequate government remains front and centre to many of the governance issues experienced by local and international recovery teams following the 2010 earthquake.

Despite the vulnerable condition of Haiti, there were numerous problems that were directly or indirectly dependent on the 2010 earthquake. Two of the largest dependent problems following the 2010 earthquake were lack of government telecommunication and subsequent international responses to the crisis. Prior to the earthquake, Haiti only had one telecommunication system and wireline carrier with three wireless mobile vendors (Edwards, 2010). The earthquake resulted in the main telecommunication tower in Port-au-Prince collapsing and effectively suspended telecommunications within the region (DesRoches et al, 2011). In response, the Haiti earthquake elicited a massive international response that was large in scope and ready for quick deployment (Kirsch, Sauer, & Guha Sapi, 2012). Unfortunately, the international response was significantly hampered following the earthquake due to airport closures and infrastructural collapse (DesRoches et al., 2011). As a result, many of the international response teams lacked logistical support and clear leadership during the first month of the response (Kirsch et

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al., 2011). Lack of logistical support was only exasperated by the damage to airports and government buildings, and the complete destruction of Haiti's emergency operations center (Kirsch et al., 2011).

Following the review of the 2010 earthquake, it is evident that this MFE had some logistical issues that cannot be completely isolated from one another. That said, there is an overall problem related to less industrialized countries and international aid: the inability to provide effective international responses to MFEs. MFM plans designed for industrialized countries may not be implemented with the same level of efficacy when used in a less industrialized country due a variety of political, social, and economic factors. Therefore, the difficult question is how can Canada and other countries evaluate affected countries while simultaneously developing a successfully coordinated MFM. Perhaps this means that the international community should focus more on providing foundational aid such as electricians, engineers, and labourers prior to (or alongside) the deployment of medical and aid workers. In reality, the first few weeks of recovery efforts following the Haiti earthquake focused heavily on providing medical aid and the collection of data (DesRoches et al., 2011). In the case of the Haiti earthquake, it can be argued that an emergency response focused on rebuilding basic infrastructure such as telecommunications and electricity may have contributed equally to that of the medical response. Consequently, the core issue identified following the 2010 earthquake is the need for local government and international aid to engage in a complete evaluation of the situation before deploying aid.

Haiti Earthquake: Step Two—Identification of Conflicting Claims/Controversies

In an event involving numerous countries, multiple legal systems, various cultural practices and levels of power, there are bound to be conflicting claims or reports. Whether it is the exact number of fatalities, MFM practice preference, or success of international aid, differing opinions on processes can shape the outcome and future approaches to MFEs. The response to the 2010 earthquake was challenging in many ways, but there remains ample opportunity to improve on some aspects of the MFE response (Kirsch et al., 2011). There were over sixty-seven international urban search-and-rescue teams in operation, and over a dozen countries assisted in recovery efforts (Kirsch et al., 2011). To offer insight into the complexity of an operation of this magnitude, over twenty-six countries provided military assistance to recovery efforts (Kirsch et al., 2011). The solution was to integrate multiple teams and create “joint task forces” that were led by an established high-level coordination committee (HLCC), referred to as the Coordination Support Committee (CSC) (Kirsch et al., 2011). The CSC was responsible for strategic coordination between the Haitian government, these military forces, and the United Nations (Kirsch et al., 2011). The CSC shared responsibility with the Joint Operations and Tasking Centre (JOTC). Although JOTC exclusively managed the operational coordination, CSC managed both the humanitarian resources and military troops (Kirsch et al., 2011).

The destruction of UN offices in Port-au-Prince resulted in the death of many UN regional humanitarian experts, as well as executives of the UN Stabilization Mission in Haiti (MINUSTAH) (Kirsch et al., 2011). The destruction of UN offices in Port-au-Prince was a huge blow to the United Nations, leaving the organization short-staffed and

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unable to coordinate effectively with other international aid groups (Kirsch et al., 2011). MINUSTAH attempted to establish its role within the humanitarian effort but humanitarian relief work fell outside of MINUSTAH's mission and mandate (Kirsch et al., 2011). The UN Security Council temporarily extended MINUSTAH's mandate to include humanitarian efforts and provided the mission with additional resources (Kirsch et al., 2011). Unfortunately, this misalignment of mandate and mission resulted in delayed involvement and implementation of the UN cluster system, which would address all aspects of the MFE (Kirsch et al., 2011). In 2005, the Humanitarian Reform Agenda was created which modified the original approach to international coordination to include new coordination processes that would increase accountability, partnership, and predictability (Humanitarian Response, 2018). The Cluster Approach was created in 1991 by a General Assembly resolution in an effort to establish an international humanitarian coordination system (Humanitarian Response, 2018). One of these international coordination practices was titled the "Cluster Approach" and is still in use today (Humanitarian Response, 2018). The UN cluster system utilizes nine thematic clusters that assist with global operational responses (Humanitarian Response, 2018). The cluster system helps to establish a clear division of labour and responsibilities among the various organizations in regards to critical coordination (Humanitarian Response, 2018). For example, the cluster system (see Figure 5) is concerned with the management of critical resources such as health services, water and food security (Humanitarian Response, 2018). The UN's cluster approach was first applied in 2005 following the devastating earthquake in Pakistan and consisted of 9 clusters developed within 24 hours of the earthquake (Humanitarian Response, 2018). Since 2005, there has been 2 evaluations of the cluster approach that have illustrated the

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approach has yielded best results when focused on strategic operational planning and gap analysis (Humanitarian Response, 2018).

Figure 5. United Nations. Cluster Approach. How are disaster relief efforts organized?
Cluster approach and key actors, <https://business.un.org/en/documents/6852>.
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The failed implementation of the cluster system in Haiti led to numerous criticisms directed at the United Nations (Kirsch et al., 2011). The Under-Secretary General for Humanitarian Affairs was particularly displeased with the United Nations' delay in implementing a cluster system and its subsequent effects on operations (Kirsch et al., 2011). The humanitarian and recovery efforts following the 2010 Haiti earthquake resulted in several reviews and criticisms directed at different states and NGOs (Kirsch et al., 2011). Lack of coordination, funding, and infrastructure are all common problems amongst different groups of response teams (Kirsch et al., 2011).

Secondly, non-government organizations (NGOs) were scrutinized for their lack of gender-based violence (GBV) program initiatives following the earthquake (Davoren, 2012). Despite the promotion and availability of a variety of GBV programs, they were

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not integrated into the humanitarian response to the 2010 earthquake (Davoren, 2012). In the case of Haiti, emergency resources were focused on aid relating to the above-mentioned clusters and neglected to conduct a gender-based analysis (GBA) to assess risk of sexual violence during the emergency (Davoren, 2012). Leading up to the 2010 earthquake, USAID concluded that rates of GBV towards women in Haiti were high and women were highly marginalized compared to men (Davoren, 2012). Following the earthquake, large numbers of women were displaced from their homes and communities and lost family members and friends (Davoren, 2012). A women's rights organization named MADRE reported risk of sexual violence directed at women dramatically increased following the 2010 earthquake (Davoren, 2012). Specifically, women and children were housed in large makeshift temporary camps that had little lighting and lacked police protection (Davoren, 2012). MINUSTAH was not effective in reducing GBV problems as operatives of the task force refused to patrol some of the camps due to concerns regarding their own personal safety (Davoren, 2012).

Amnesty International reported during this time that women reported an increase in sexual assaults as men within the camp cut into their tents with knives and raped them (Amnesty International, 2011). However, the rates of sexual assault remain a controversial topic as there was little data regarding sexual assaults in Haiti prior to the earthquake (Davoren, 2012). Unfortunately, GBV is a common practice in Haiti and is concerned to be a private matter between families. For this reason, very few cases go to court or are even referred to the police (Davoren, 2012). Consequently, it is difficult to compare rates of GBV following the 2010 earthquake without having meaningful data to compare results (Davoren, 2012). One area that Davoren (2012) argues could be improved on is the

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addition of GBAs to the UN cluster approach. Currently, there is not a dedicated GBV cluster within the system, but only sub-clusters aimed at bolstering other clusters (Davoren, 2012). The GBV sub-cluster was highly criticized for not addressing the needs of local women following the earthquake (Davoren, 2012). For example, the sub-cluster initially communicated through the use of the English language while the majority of the local population spoke either Kreyol or French (Davoren, 2012). Criticism regarding the GBV sub-cluster's delay in consulting other key players such as grassroots organizations and the Haiti Women's Ministry gained much attention (Davoren, 2012). Had a GBV cluster been implemented and established at the same time as the other clusters and not delegated the status of "sub-cluster", it is possible that there would not have been such a high level of sexual violence in Haiti following the earthquake.

Haiti Earthquake: Step Three—Analysis of Past Trends in Decisions

Immediately following the 2010 earthquake, both the Haitian government and the international community were faced with many unknowns relating to the state of Haiti. Prior to the 2010 earthquake, there was little preparation for earthquakes as they were not a prominent threat within Haiti and therefore the country lacked appropriate earthquake awareness and planning (DesRoches et al., 2011). Before the 2010 earthquake, the Haitian government decided to focus on hurricane disaster responses as this presented the largest threat (Margesson & Taft-Morales, 2010). Therefore, Haiti was significantly disadvantaged due to lack of earthquake disaster contingency planning.

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Despite this lack of earthquake disaster planning, it remains important to analyze immediate reactions and subsequent decisions of the Haitian government following the 2010 earthquake. The apparent lack of formal earthquake preparedness likely contributed to the government's inability to effectively mobilize resources but cannot be seen as the only factor that influenced the response (DesRoches et al., 2011). Historically, Haiti has faced numerous challenges when responding to natural disasters (Perera, 2005). For example, in 2004, Hurricane Jeanne severely damaged Haiti and resulted in the death of several thousand individuals (Pielke, 2006). Despite the warning of the hurricane arrival, Haiti did not prioritize the creation of a risk management plan and as a result was not prepared to deal with Hurricane Jeanne (Perera, 2005). Haiti was not equipped to coordinate a national level response to the disaster let alone an international response involving multiple countries (Perera, 2005). Secondly, resources available following the hurricane were not utilized effectively due to ineffective planning and lack of strategy (Perera, 2005). Subsequently, a post mortem workshop was held the same year on the response to Hurricane Jeanne and numerous recommendations were provided regarding future MFEs in Haiti (Perera, 2005). However, after a review of the 2010 earthquake, it is evident that more MFM planning is necessary to assist Haiti in effectively dealing with future disasters.

Haiti Earthquake: Step Four—Projection of Future Trends

It is reasonable to predict that Haiti remains in a state of ongoing economic and political crisis, and as a result is highly susceptible to further damage to citizens and in-

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frastructure. Specifically, there is an increased risk to Canadian citizens as the Canadian government still maintains an embassy in Port-au-Prince and provides development aid to Haiti (Embassy of Canada in Haiti, 2018). The Canadian military was deployed to aid in stabilizing Haiti from 2004 to 2017 and has only recently withdrawn its forces (Embassy of Canada in Haiti, 2018). Canadian-Haitian relations have developed and solidified, and many Haitians have relocated to Canada (Embassy of Canada in Haiti, 2018). As a result, an increase in Canadian citizens travelling back to Haiti to visit family is likely, and further research is needed into Haiti's risk of MFEs and MFM planning.

Haiti is located in a region prone to seismic activity; it is situated on the Enriquillo-Plantain Garden Fault line, which is referred to as a strike-slip fault line (DesRoches et al., 2011). Over the last few decades, despite its location, Haiti hasn't experienced a great deal of severe seismic activity aside from the 2010 earthquake (DesRoches et al., 2011). The 2010 earthquake was complex in that it involved the Enriquillo-Plantain Garden Fault but also numerous others across the region (DesRoches et al., 2011). Historically, the largest seismic events within the region occurred between 1751 and 1860 and resulted in the destruction of buildings similar to that of the 2010 earthquake (DesRoches et al., 2011). Of note, before the 7.0 2010 earthquake, earthquakes within the region rarely exceeded a rating of 4.0 on the Richter scale (DesRoches et al., 2011). Therefore, although Haiti remains at risk of seismic activity, history has illustrated severity is unlikely to exceed a rating of 4.0 (DesRoches et al., 2011).

While the risk of severe seismic activity is relatively low, there is a high risk of political instability, deteriorating infrastructure, and desperate economic fortunes. These other factors are important, as they could have an elevated impact on any future interna-

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tional aid efforts. For example, an otherwise lower-grade earthquake measuring 4.0 could still result in significant damage to Haiti's already compromised infrastructure. Therefore, a level 4.0 earthquake may hit much harder and cause much more than damage than it would in a country with stronger infrastructure. In 2003 a study concluded that over 33% of homes in rural Haiti were composed of earth materials such as dirt (DesRoches et al., 2011). Roughly 19% of rural homes were built using intertwined tree branches and twigs (DesRoches et al., 2011). It is estimated that 40 to 50% of residential and commercial buildings were destroyed following the 2010 earthquake in cities close to Port-au-Prince (DesRoches et al., 2011). The city of Leogane suffered the worst destruction at a loss of over 90% of its commercial and residential buildings (DesRoches et al., 2011). Airport capacity is also of concern as the major airport in Haiti was severely affected following the 2010 earthquake resulting in international aid delay (DesRoches et al., 2011). Consequently, the earthquake highlighted weaknesses within Haiti's government and infrastructure, and as a result its vulnerability in regards to future destabilizing events (DesRoches et al., 2011).

When considering Haiti's future medical and forensic capacity, resources should be expected to remain static. Notwithstanding international intervention, there is no reason to believe Haiti would be in a better position to deal with future MFEs in terms of forensic and medical capacity. In general, disaster mass fatality forensic work is incredibly difficult regardless of economic stability and geographic location (Salado & Tuller, 2017). Unfortunately, existing difficulties in adjusting to MF forensic work are exaggerated in countries such as Haiti where there is little capacity to deal with rapid influx of mass casualties. In 2016 the Inspection and Evaluation Division (IED) within the UN

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Office of Internal Oversight Services (OIOS) conducted an evaluation of Haiti's national police capacity. The report illustrated that despite international encouragement to increase its policing capacity, Haiti had yet to overcome existing political issues hindering capacity building (Office of Internal Oversight Services, 2016).

The Haitian government failed to lead and implement national police training and instead, relied on bilateral donors to train the national police force (Office of Internal Oversight Services, 2016). Additionally, Haiti lacked the resources to facilitate long term specialized training operations and focused on short term immediate police officer production (Office of Internal Oversight Services, 2016). Despite numerous investments in improving training, equipment, and facilities, forensic capacity remained very poor (Office of Internal Oversight Services, 2016). Subsequently, there was an increase in the availability of equipment and facilities to train regular police officers but the country's forensic capacity fell below the threshold (Office of Internal Oversight Services, 2016). Those engaging in field observation confirmed reports of weak forensic operational capacity and limited electrical resources for laboratory work (Office of Internal Oversight Services, 2016). Between 70 to 80 percent of the forensic laboratory instruments were not working and chemicals and equipment required to perform analysis had not been replenished (Office of Internal Oversight Services, 2016). As a result, if there is another MFE in Haiti, it is likely that the government will be required to rely heavily on international aid regarding the recovery and forensic identification of local and foreign deceased.

Haiti Earthquake: Step Five—Conclusion/Recommendations

Following a thorough review of the 2010 earthquake, it is recommended that international aid and efforts relating to the recovery and identification of deceased come secondary to the evaluation and stabilization of existing local infrastructure in undeveloped countries such as Haiti. Although humanitarian assistance, recovery and identification of deceased is often the focal point of international aid, it is important not to get lost in a people centric approach to the MFE. Urgency to locate and identify all victims should be secondary to establishing critical foundational components such as electricity, roadways, airports, and the appropriate human resources. Although international aid plays a large role in the successful of MFE response, countries need to be sure their aid is useful and compatible with the specific incident. International aid may be quick to provide forensic technological aid and equipment but without adequate electricity and training, these donations are not overly useful (Office of Internal Oversight Services, 2016). By ensuring the affected country has access to basic infrastructural needs such as electricity and transportation, there is a better chance that Canadians who die abroad in MFEs will be identified and repatriated.

Applying the New Haven Framework to the 2001 Twin Tower Attacks

The 2001 terrorist attacks on the Twin Towers in New York demonstrated that despite robust MFM planning, a country could become overwhelmed with the problem of identifying deceased persons. The events of 9/11 highlight the important role of forensic

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science in dealing with MFE involving less than complete remains. Without the use of DNA testing, very few of the victims would have been identified due to the condition of the remains. Had this event occurred prior to the discovery of DNA testing, identification efforts following 9/11 would have been unsuccessful. 9/11 draws attention to forensic science's role within MFM, but also the significance of developing new forms of forensic science to aid in future MFEs.

2001 Twin Towers Attacks: Step One—Goal Formation/Problem Identification

The primary issue following the 9/11 attacks was the level of destruction caused by two airliners colliding into the two towers. The collision was highly volatile and resulted in numerous explosions and fires, which ultimately led to the complete collapse of the towers. Hundreds of victims aboard the airliners were incinerated upon impact, and other victims working in the towers were unable to escape the building. The recovery effort was exceptionally difficult due to the high number of victims and the condition of victim remains. Despite the U.S. having comprehensive MFM plans, New York was not equipped to deal with thousands of victims. The focal point quickly became the effective collection and identification of all possible human remains. Although extensive efforts to collect and identify all human remains were made, not all remains were collected and identified. For example, five years later in 2006, human remains were discovered at the World Trade Center site, which led to a second investigation in hopes of locating and identifying more of the victims (Warnasch, 2016). This discovery of undocumented human remains in 2006 ultimately resulted in another eight years of archaeological investi-

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gations that eventually came to a close in 2013 (Warnasch, 2016). Arguably, the strategic and operational priorities contributed to the exclusion of some sections from the primary investigation site (Warnasch, 2016). This undoubtedly resulted in remains being overlooked and excluded from ongoing operations following 9/11. The search for undiscovered victims remains has slowed down since 2016, however, 1,113 people remain unaccounted (Toom, 2018).

2001 Twin Tower Attacks: Step Two—Identification of Conflicting

Claims/Controversies

There are two major claims surrounding this event related to responsibility and ownership of the attack. Although not mutually exclusive, these claims present two very different perceptions of the events that occurred on 9/11. The first claim is that the 9/11 attack was an unprovoked demonstration of terrorist brutality and violence. Within this narrative, the United States is reduced to a victim, and responsibility and blame is cast upon a violent terrorist group and its ideology. The second narrative questions the ability and judgment of US officials in dealing with matters of national security and emergency response. Some critiques of the U.S response to 9/11 interpret the attack as a government-wide failure to effectively gather intelligence and regulate aviation security (Bazerman & Watkins, 2005). The hijacking of commercial airliners on the morning of September 11th caught the world off guard and left the United States paralyzed with grief and loss. Under President George W. Bush, the US military would soon launch one of its most aggressive offensive campaigns against terrorism in Iraq. Although the United States was quick to

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launch an anti-terrorism campaign and retaliate following 9/11, some critics were left wondering how top-tier intelligence agencies such as the Central Intelligence Agency (CIA) and the Federal Bureau of Investigations (FBI), were not able to predict and mitigate such an attack (Bazerman & Watkins, 2005).

2001 Twin Tower Attacks: Step Three—Analysis of Past Trends in Decisions

The recovery efforts following the attack on 9/11 were focused on searching for survivors and collecting victim remains. Despite best efforts, it was estimated that 1,113 victims were still unaccounted for following the first recovery effort at ground zero (Toom, 2016). The Office of the Chief Medical Examiner (OCME) led the first recovery effort immediately after the event occurred (Warnasch, 2016). The OCME attended the scene the morning of the attack and quickly began to triage and identify victims and personal belongings (Warnasch, 2016). One point of contention was that medical and legal professionals were primarily limited to mortuary operations and did not take part in the actual recovery effort unless they were specifically requested by firefighters or police services (Warnasch, 2016). Therefore, the majority of recovery logistics were assigned to emergency workers and not medical professionals (Warnasch, 2016). This raises the question of whether medical professionals may have been able to assist with the process of identifying human tissues and remains (Warnasch, 2016).

Remains from ground zero were then shipped by boat to Staten Island to be processed by police officers and federal investigators (Warnasch, 2016). When human remains were discovered, the material would be passed off to onsite forensic anthropolo-

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gists for confirmation and processing (Warnasch, 2016). After six days of searching and collecting remains, the Fire Department of New York (FDNY) called off the rescue mission and deemed it a human remains recovery effort (Warnasch, 2016). Unfortunately, this resulted in a change of site priorities and the focus became collecting debris and cleaning the site with heavy machinery (Warnasch, 2016). Human tissue that remained unidentified at ground zero was now in serious jeopardy of further cross-contamination and destruction. The “clean-up” phase of ground zero resulted in a decrease in government officials and experts on site and an increased presence of private construction companies and operators (Warnasch, 2016). The FDNY officially declared the ground zero recovery effort over following the removal of the final bag of possible human remains from a bank located near the site (Warnasch, 2016). By 2006 over 20,730 fragments of human remains were found between ground zero and the landfill operation on Staten Island (Warnasch, 2016). By this time, it was estimated that over 2,749 individuals were missing following the attack and only 1,959 (53%) had been identified (Warnasch, 2016).

The second recovery effort at ground zero was conducted in 2006 after someone found a human finger bone on the roof of a nearby building (Warnasch, 2016). Once again, the OCME was deployed to begin the second investigation that would last until 2013 (Warnasch, 2016). While conducting a secondary investigation on the rooftop with the human finger bone, forensic anthropologists discovered another 766 human bone fragments (Warnasch, 2016). This was a monumental discovery as it illustrated that human remains may have travelled further than previously expected. Additionally, forensic anthropologists eventually located further human remains in manholes initially thought to

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reside outside of the ground zero perimeter (Warnasch, 2016). As a result, the radius of ground zero had to be expanded to include the new territories (Warnasch, 2016).

2001 Twin Tower Attacks: Step Four—Projection of Future Trends

Political and social polarization in many countries has led to an increase in violent attacks. Many of these attacks target the use of aircrafts and explosive devices in highly populated areas. The goal of those carrying out these attacks are generally to maximize the number of killed in a manner that promotes fear among the public. Since 2004, terrorist attacks have been significantly increasing across the world (Global Terrorism Database, 2017). Between 2013 to 2016, there were over 57,196 suspected terrorist attacks globally with over 30,402 of those attacks involving hijackings or explosives (Global Terrorism Database, 2017). As the world becomes more globalized, terrorist groups like Boko Haram, Islamic State (IS), Taliban and Al-Shabaab have increased access to explosives and travel (Global Terrorism Database, 2017). Within the last five years there has been a dramatic increase in airline attacks by terrorist organizations that suggest this method of attack is not declining. Most recently, on February 2, 2016, Al Qaeda smuggled a laptop bomb onto Daallo Airlines (Flight 159) in an attempt to blow-up the aircraft (Bunker, 2017). Prior to that, IS succeeded in blowing up a Metro jet (Flight 9268) through a bomb onboard the aircraft disguised as a pop can (Bunker, 2017). Prior to these events, there has been an average of at least one attempt per year to attack and destroy commercial airliners across the world, excluding 2007 and 2011 (Bunker, 2017). Conse-

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quently, the possibility of commercial airliner attacks similar to those of 9/11 remains a significant global threat.

Figure 6. Terrorism Incidents Over time. Years: (between 1970 and 2016) by the University of Maryland, National Consortium for the Study of Terrorism and Responses to Terrorism, <https://www.start.umd.edu/gtd/>, Copyright 2018 by the University of Maryland

Although aircraft attacks seem to be a valuable target for certain terrorist organizations, other groups opt for simpler methods such as suicide and vehicle bombs:

“Between 1970 and 2016, more than 170,000 terrorist attacks took place around the world and more than half of these attacks (52%) involved the use of an explosive device. Explosives used in these attacks included suicide and vehicle bombs as well as roadside bombs, grenades, and rockets” (START Background Report, 2017, p. 3).

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Between 2013 and 2016, there were over 30,263 alleged attacks that used explosive devices such as dynamite, car bombs and body bombs (Global Terrorism Database, 2017). Large explosions of any sort have the capacity to destroy buildings and incinerate entire human bodies to a point where tissue is longer identifiable. Depending on materials used, explosions have the ability to displace debris and move human remains over great distances, thereby decreasing the probability of recovery and identification.

2001 Twin Tower Attacks: Step Five—Conclusion/Recommendations

Given a review of the terrorist attacks of 9/11, I recommend the establishment of both a primary and secondary zone that extends beyond the furthest known displacement of evidence. For example, given the scale of the disaster and multitude of variables, it would have been reasonable to extend the second zone into a tertiary zone in an effort to include material that fell beyond the estimated areas. The primary crime scene or zone is a designated area in which the majority of physical evidence is located (Horswell, 2004). This zone represents surface area with the most concentrated amount of material related to the event (Horswell, 2004). Subsequently, the secondary zone is an extension of the primary zone that accounts for the manipulation and travel of material related to the scene (Horswell, 2004).

Given that primary assessments may not account for all the environmental factors present during an event, the scene should be extended to include a secondary and even tertiary zone. For example, the zones must account for environmental factors such as wind, which can carry debris and human remains beyond the primary scene. Additional-

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ly, in the case of 9/11, the zones must accurately reflect the potential travel of any debris following the explosion and collapse of both towers. Following a comprehensive assessment, the MFM should include all areas that include or are suspected of including human remains. This zone will be the perimeter in which it is believed all human material is being held. In the case of ground zero, the primary scene was the initial perimeter excluding the buildings and streets, which were later discovered to have housed remains. Second, in order to reduce the possibility of an incomplete recovery, the perimeter of the first recovery zone should be extended to include a second zone. Subsequently, the perimeter of the forensic scene should be at a minimum, doubled as a precautionary effort to protect hidden material. Through precautionary widening of the forensic scene, MFM personnel are increasing the probability that all human remains are recovered and identified in a timely manner.

Applying the New Haven Framework to the Thailand Tsunami

The Thailand tsunami was one of the largest and most volatile MFEs that involved Canadian citizens. 15 Canadian citizens were among the over 225,000 deceased persons following the tsunami (Public Safety Canada, 2017). Globally, the 2004 tsunami represented one of the largest disasters and involved over 7000 foreign travellers and tourists (Encyclopaedia Britannica, 2017). Although difficult to prepare for a MFE as large and complicated as the 2004 tsunami, the international community can better position its response for future events. Specifically, the immediate need for a surplus of refrigeration services is paramount for the success of any tropical climate MFE. The tsu-

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nami illustrates that once a large disaster hits, there needs to be an immediate deployment of portable refrigeration services. Although the death toll and geographic destruction was high, the bodies of victims could have been better preserved, which would have led to an increased number of identifications and subsequent repatriations.

The reality is that by the time the temporary refrigeration units arrived, many of the bodies had been exposed to the elements for too long and were degraded beyond recognition. The decision to collect and lay out all of the bodies in large flat areas directly in the sun quickly resulted in rapid decomposition (Morgan et al., 2006). Response teams quickly realized this manner of storage was not sustainable and began attempting to cool down bodies using dry ice (Scanlon et al., 2007). Unfortunately, they soon realized the number of dead exceeded resources and became overwhelming (Scanlon et al., 2007). Had there been sufficient temporary refrigeration available following the 2004 tsunami, bodies would have been better preserved and professionals would have been able to efficiently manage workloads. Consequently, the immediate deployment of refrigeration services following a massive MFE is critical in the outcome of long-term operational success and efficacy.

Thailand Tsunami: Step One: Goal Formation/Problem Identification

The 2004 Thailand tsunami was a MFE that was very difficult to prepare for due to the location of the tsunami waves, the sudden onset and the subsequent volume of destruction. These issues were amplified when tsunami waves hit multiple shorelines in

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several different counties, resulting in hundreds of thousands deceased and injured. Given the large number of deceased and injured, most countries would struggle with effective and efficient collection and identification of the bodies. Therefore, although the disastrous effects of the Thailand tsunami could not have been prevented, the way in which the dead were managed could be improved. The key problem following the Thailand tsunami was a shortage of mortuary refrigeration resources (Morgan et al., 2006). Without adequate refrigeration resources, bodies quickly began to putrefy and decompose beyond recognition (Morgan et al., 2006). The hot and humid climate of Thailand, combined with large amounts of water, acted as a catalyst for rapid decomposition (Morgan et al., 2006). The timely deployment of additional refrigeration services would have greatly contributed towards a reduction in tissue decomposition and an overall increase in visual identification following the tsunami.

Thailand Tsunami: Step Two—Identification of Conflicting Claims/Controversies

This section of the New Haven decision-making model applies to the 2004 Thailand tsunami in that there was significant controversy surrounding post-mortem and bio hazardous safety protocols due to the large number of deceased and lack of refrigeration. Once the victims' bodies began to decompose, government officials and the public began to fear outbreak of disease and illness. The Centre for Disease Control and Prevention (CDC) (2005) was quick to learn there were no overall site safety and health plan in place and that staff members expressed concerns regarding the safety of their operations (CDC, 2005). Specifically, staff working in the morgues expressed concern regarding the risk of

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infection from bodies as well as the method they were using to dispose of liquid autopsy waste (CDC, 2005). Liquid biological waste was stored in large containers and transported to local hospitals for disposal (CDC, 2005). Although latex gloves, coveralls and respiratory protective equipment were available to staff, many workers failed to remove contaminated gear before leaving body processing zones and entering public areas (CDC, 2005). Eye protection instruments were available as a safeguard against bodily fluids but were rarely used by staff (CDC, 2005). In terms of resources, there were insufficient stations for washing hands and food was incorrectly stored in non-sterile areas (CDC, 2005).

Subsequently, staff were exposed to potential food and water contamination due to their close proximity to body processing sites (CDC, 2005). In addition, vaccine status for workers was unknown and little effort was made to address this (CDC, 2005). Tetanus vaccines were provided to staff that requested one but they were underutilized (CDC, 2005). At the occupational health clinic located in the morgue, a single day in January recorded over 28 eyewash procedures, 60 wound dressings, 50 vertigo cases, and 26 staff requiring tetanus immunizations (CDC, 2005). Although health and safety practices needed significant overall improvement, the staff did restrict certain high-risk areas (CDC, 2005). Those working in the morgues collected all waste and refrigerated it until it could be disposed of at a nearby hospital (CDC, 2005). Additionally, the staff were careful to collect all needles, tools and sharp instruments and store them in biohazard containers (CDC, 2005). Protective equipment including gumboots, eyewear and overalls were offered to all staff, however few excluding dentists elected to wear them (CDC, 2005). Lastly, there was concern among the public regarding bodies laying out in the open and potential outbreaks of disease. Although this proved to be an invalid concern,

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this concern resulted in the improper burial and cremation of unidentified victims (Morgan et al., 2006).

Thailand Tsunami: Step Three—Analysis of Past Trends in Decisions

The response to the 2004 Thailand tsunami was a logistical challenge as everyone involved in the response had to act fast due to the quantity and quality of deceased. There was an immediate awareness that this event would be highly challenging due to the hot and humid weather and lack of refrigeration services for the deceased. Bodies decomposed so rapidly that within 24 to 48 hours, individual facial features were so discoloured and bloated that visual recognition was quickly ruled out (Morgan et al., 2006). The inability to visually identify individuals after 48 hours led to a much longer and more difficult identification process. Among all countries involved, the body recovery and storage phase of the response was highly chaotic and uncoordinated (Morgan et al., 2006). Thailand was the only country able to mobilize large amounts of refrigeration resources within a reasonable timeframe (Morgan et al., 2006). Although Thailand was able to procure refrigeration services, it took over two weeks for refrigeration to arrive (Morgan et al., 2006). Additionally, Thailand was only able to acquire 100 refrigeration containers, which had a maximum capacity of roughly 3,600 bodies (Morgan et al., 2006). By the time they were able to deploy refrigeration services, bodies had decomposed so rapidly that visual identification was unlikely and refrigeration services were used to prevent further soft tissue destruction. Efforts to use dry ice to cool bodies were not effective as

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warm weather quickly melted the ice and the moisture contributed to further decomposition (Morgan et al., 2006).

Figure 7. Temporary burial of dead bodies in Thailand following the tsunami disaster on 26 December 2004, by the Pan American Health Organization, <http://helid.digicollection.org/en/d/Js13491e/7.html>, Copyright 2006 by AFP/Getty Images.

One effective method was to create a dry ice perimeter around groups of bodies and cover it with tarps to maintain a cooler internal temperature (Morgan et al., 2006). Dry ice can be used to preserve bodies if used at a rate of ten kg of dry ice per individual body but cannot be placed directly on top of the body (Morgan, Tidball-Binz, Van Alphen, 2006). If dry ice is placed directly on the corpse, even if wrapped or covered, it will damage soft tissue resulting in further difficulty identifying victims (Morgan, Tidball-Binz, Van Alphen, 2006). Although effective when used properly, the frequent use of dry ice was a hazard for response workers and resulted in cold burns (Morgan et al., 2006). Subsequently, response workers eventually deferred to the use of shallow graves in an attempt to keep bodies cool (Morgan et al., 2006). Temporary burial should only be used

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as a last resort and must be planned and constructed properly to ensure effective future recovery and identification (Morgan, Tidball-Binz, Van Alphen, 2006). For example, bodies must be clearly marked and labeled as per their identity and location within the grave (Morgan, Tidball-Binz, Van Alphen, 2006). Bodies must be at least 0.4 meters apart from one another in a flat line and never stacked (Morgan, Tidball-Binz, Van Alphen, 2006).

Thailand Tsunami: Step Four—Projection of Future Trends

It is likely that Thailand will experience future earthquakes and subsequent tsunamis due to its location near the Indian-Eurasian plate (Pailoplee, Channarong & Chutakositkanon, 2013). The collision between the Indian plate and the Eurasian plate, results in high levels of seismic activity and subsequent earthquakes (Pailoplee et al., 2013). Thailand is vulnerable to such earthquakes due to the complexity of regional seismic activity, blind fault lines in northern Thailand, and because earthquakes do not always conform to defined fault lines (Pailoplee et al., 2013). This means that locations of seismic activity can be difficult to predict and prepare for (Pailoplee et al., 2013). Globally, efforts directed at reducing the severity and numbers of casualties caused by earthquakes have made very little progress (Spence, 2007). The Centre for Research on the Epidemiology of Disasters (CRED) illustrates that not only have rates of earthquake casualties not been declining, the last few decades have had higher than average annual rates (Spence, 2007). For example, CRED highlights that by mid-2006, the annual rate of earthquake casualties was well over 66,000 (Spence, 2007). Although rates of earth-

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quake casualties have fluctuated over the last century, the overall trend of earthquake related injury has been higher (Spence, 2007). For example, between 1900 and 1960, 19,600 people were killed by earthquakes and between 1960 and 1970, only 5,200 people were killed (Spence, 2007). Conversely, there was a sharp spike in the 1970s (see Figure 8) due to one severe earthquake, which resulted in an annual death toll of 42,000 (Spence, 2007).

Figure 8. Annual rates of earthquake deaths since 1900 by decade. The earthquake death rate in the current decade is the worst, and reverses a general downward trend during twentieth century (source, Adapted from CRED), by R. Spence, 2007, doi:10.1007/s10518-006-9028-8, Copyright 2007 by Springer Science + Business Media

These data demonstrates that the rates of earthquake are unlikely to decline. Even if they did, statistical trends analysis suggests that the decline would only be temporary (Spence, 2007). Due to an increase in the development of large cities across the world, Spence (2007) cautions that future earthquakes may be more destructive and volatile than earlier ones. Additionally, there are many regions prone to seismic activity that have not seen an earthquake in decades, increasing the risk of future seismic activity (Spence, 2007). Data also suggest that although poorer countries are most susceptible to earth-

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quake damage and loss of life (see Figure 9), there are cases of affluent countries suffering large number of casualties (Spence, 2007).

Fig. 6 Annual death rates per million population since 1900: affluent countries. (HDI is the UN's human development index, which measures a country's state of development on a scale which includes measures other than economic). There is clearly huge and sustained improvement since 1960 (source: adapted from CRED 2006)

Fig. 7 Annual death rates per million population since 1900: poorer countries. No sustained progress can be seen (source: adapted from CRED 2006)

Figure 9. Annual death rates per million population since 1900: affluent countries (source: adapted from CRED 2006), by R. Spence, 2007, doi:10.1007/s10518-006-9028-8, Copyright 2007 by Springer Science + Business Media

Evidence suggests that risks of severe earthquakes are rising and as a result, there will likely be future earthquake-related casualties (Spence, 2007). Most disconcerting is that statistics demonstrate less developed regions are at the highest risk of future severe seismic activity (Spence, 2007). As seen with Haiti, these regions are at an increased risk due to building codes and lack of earthquake awareness (Spence, 2007). Similarly, areas of rural Thailand hit by the 2004 Indian Ocean earthquake and subsequent tsunamis suffered from poorly built infrastructure. Spence (2007) suggests that political leaders need to make an effort and invest in proper earthquake-resistant building codes in areas of high seismic activity. The reality is that future earthquakes and tsunamis are inevitable, and as a result related casualties are likely to plague locations with little resistance (Spence,

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2007). Consequently, it is not a matter of “if” a large earthquake will occur; it is a matter of when and how government authorities best prepare.

Thailand Tsunami: Step Five—Conclusion/Recommendations

After analyzing the response to the 2004 Thailand tsunami and projecting future earthquake trends, it is evident Thailand will suffer similar events in the future. Due to Thailand’s geographic location and proximity to the coastline, it is likely that the region will experience further earthquakes and tsunamis. Therefore, it is reasonable to predict Thailand is at risk of another earthquake event that would likely result in high numbers of local and foreign casualties. Beyond investing in predictive geological technology and strengthening local infrastructure to withstand natural disaster, efforts should be made to ensure adequate refrigeration for casualties. In terms of forensic intervention, sufficient refrigeration would increase the likelihood of effective individual identification through the preservation of soft tissue. Having ample room to store casualties would remove the need to engage in mass burials or cremation, preventing bodies from decaying in the streets. Additionally, the refrigeration of victims would provide international response teams’ additional time to prepare for large-scale forensic operations. The use of refrigeration would preserve all corpses until forensic teams had the time and resources to systematically identify each individual.

Conclusion

Summary

Understanding that MFEs are unpredictable and inevitable, Canada must seek to improve its decision-making and policy recommendations in an effort to overcome obstacles during MFE events. In light of the frequency with which MFEs such as the 2001 9/11 Twin Tower attacks, 2004 Indian Ocean earthquake, and the 2010 Haiti earthquake occur, it is imperative that Canada and other countries are prepared and well-positioned to deal with such events. As such, governments and international organizations need to maintain open channels of communication regarding MFMs, and also collaborate regularly in order to adapt and improve MFM plans. As seen with the 2001 9/11 Twin Tower attacks, the Thailand tsunami, and the Haiti earthquake, globalization has created an environment in which it is increasingly common that several countries are implicated during large MFEs. Depending on the country in which the MFE in question occurred, there are often problems of medical and legal congruity, and also problems relating to communication, the cause of death, and the timely return of the deceased. These differences can result in dramatic delays, incorrect analysis, and even destruction of victim remains. As seen in the MFE in Thailand, linguistic and cultural differences also have a significant influence on MFM processes, effecting legal, medical, and victim-identification efforts.

In an effort to separate various compounding problems experienced during MFEs, I have applied the theoretical framework and decision-making model of the New Haven School of International Law to the 2010 Haiti earthquake, the 2001 9/11 Twin Tower attacks, and the 2004 Thailand tsunami. Furthermore, I have dissected each MFE into the

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five developmental stages of the New Haven School's policy creation process. First, I delineated the main problem. Second, I identified conflicting claims and controversies. Third, I have analyzed past trends and decisions. Fourth, I have projected future trends. Fifth and finally, I have offered recommendations for each event (Smith, 2013). Through evaluation of these MFMPs, as well as forensic science techniques and intergovernmental relations, there is a clear need for ongoing innovative discussions regarding all types of MFM across the globe to better assist in times of international disaster. It is important to remember that in some cases, international aid need not be inherently "humanitarian" in nature to be effective. In the case of the 2010 earthquake in Haiti, efforts related to the recovery and identification of deceased should have come second to the evaluation and stabilization of existing local infrastructure. Without the repair of airports and roads, it was exceptionally difficult to reach victims. This delayed access to rescue workers, resulting in additional deaths. Ensuring that affected countries have immediate access to basic infrastructural needs such as electricity and transportation will increase the chance that those who die abroad will be efficiently and correctly identified.

When considering the 2001 9/11 Twin Towers attacks, the implementation of an increased perimeter for both primary and secondary zones extending beyond the furthest known displacement of evidence may have reduced the number of subsequent investigations. Given the scale of the disaster and the number of variables, it would have been reasonable to extend the second zone into a tertiary zone in an effort to include material that fell beyond the estimated zones. Similarly, following the 2004 Thailand tsunami, efforts to begin identifying the victims overshadowed the need for the immediate deployment of refrigeration services. Additional refrigeration services would have increased the likeli-

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hood of effective individual identification through the preservation of soft tissue and would have preserved corpses until forensic teams had the time and resources to systematically identify each individual. The goal of applying the New Haven School to these MFEs was to apply a mapping tool to each event, which will, in turn, minimize the risk of overlooking critical components of the events while maximizing critical analysis of the events and decisions made (Reisman et al., 2007). Additionally, the New Haven School decision-making model provided a highly adaptable framework in which all MFEs can be analyzed in a systemic manner. In conclusion, academic scholars, public servants, and government officials need to dedicate time and resources to the continual evaluation and analysis of ongoing global MFEs and MFM responses in order to maintain relevant and efficient MFMPs and policies that address the numerous risks associated with death abroad. Most importantly, those involved in the MFMP process need to remain open-minded, adaptable, and able to quickly pivot in a new direction throughout the entire MFM process. There is no “one-size-fits-all” MFMP that will be effective in all MFEs due to the complexity of these events and where they occur. Therefore, we can use knowledge about previous MFEs but it is imperative we are willing to course correct and deviate from previous experiences in order to effectively adapt and address the issues at hand.

Reflection

This thesis is limited in scope to the three case studies I analyzed using the New Haven School of International Law. Although I selected each case study with the aim of

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diversity based on geographic location and event type, there are many other types of MFEs that need to be explored. Both the type of MFE and the geographic location have a large impact on the way in which MFMPs proceed. Had the 2004 Thailand tsunami occurred in Vancouver, Canada, the response would likely have been different from the response in Thailand. Similarly, if the Twin Tower Attacks had occurred in Syria, the response would have been drastically different. All this to say that MFEs are like Rubiks cubes: despite solving one side of the cube, the others can remain misaligned. Furthermore, the slightest adjustment or manipulation can result in a completely different picture. For these reasons, MFMP can always improve, but will never be perfected. I hope that this thesis motivates further research into other types of MFEs in different countries.

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