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**Analysis of the Risk Regulation Regime in Canada for Controlling
Major Incidents Involving Dangerous Chemicals
(Executive Summary Only)**

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IMPORTANT NOTES FOR THE READER:

1. This document is an executive summary of the full paper. It is being shared for the purposes of discussion at the CIP Initiative Workshop on February 14, 2014. The full paper is currently being reviewed by colleagues. We will make the full paper available on the Dalhousie CIP Initiative website (www.cip.management.dal.ca) after we review their comments and incorporate the necessary changes.
2. This is a draft. Please do not cite without the permission of the corresponding author.

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While we are grateful for the support from these sources, the authors alone are responsible for any errors or omissions.

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List of Acronyms

BM	Behaviour Modification
CBRNE	Chemical, Biological, Radiological, Nuclear and Explosive
CCPA	Canadian Chemical Producers' Association
CEPA	<i>Canadian Environmental Protection Act, 1999</i>
CIAC	Chemical Industry Association of Canada
CFATS	Chemical Facility Anti-Terrorism Standards
CI	Critical infrastructure
CIP	Critical infrastructure protection
CRTI	CBRNE Research and Technology Initiative
CTPAT	Customs-Trade Partnership Against Terrorism
DCI	Dangerous chemical interview
DHS	United States Department of Homeland Security
E2	CEPA Environmental Emergency Regulations
IG	Information gathering
IGH	Interest group hypothesis
MIACC	Major Industrial Accident Council of Canada
MFH	Market failure hypothesis
ORH	Opinion-responsive hypothesis
PSC	Public Safety Canada
RAP	Rational actor paradigm
RC	Responsible Care
SS	Standard setting
SMEs	Small-and-medium enterprises
TISN	Trusted Information Sharing Network
WaterISAC	Water Information Sharing and Analysis Center

1.0 Executive Summary

This draft paper reports on the preliminary results of a research project designed to identify how Canada regulates risks associated with low probability / high consequence events involving dangerous chemicals, and the contextual factors that influence this risk regulation.

1.1 Methodology

We employ the Hood, Rothstein and Baldwin (2001) meso-level risk regulation regime framework to frame our analysis. Between 2011 and 2013, we conducted 18 semi-structured interviews, which included regulators, owners, operators and managers, respectively. Interview subjects came from four types of organizations: water utilities, which use chemicals for treatment purposes; emergency management offices and fire departments, which are responsible for responding to chemical disasters; chemical industry associations; and government regulatory agencies. Most interview subjects work for Canadian organizations, although we also interviewed specialists from Australia, the UK and the U.S. to provide some comparative perspective. The interview tool and process were approved by Dalhousie University's Research Ethics Board. We also conducted a review of the academic and grey literature and a media analysis of 24 post-9/11 critical infrastructure (CI) events, four of which primarily affected the dangerous chemical sector. For a more detailed description of our methodology, please see Appendix B.

1.2 Limitations

As with all social science work, our research must be considered in light of certain methodological limitations. Our findings reflect the knowledge and perceptions of a small group of highly-qualified interview participants at a specific moment in time. Our interpretation of this data reflects the analytical model (the Hood *et al.* framework) that we employed to draw observations from the interview transcripts. Our objective is not to

provide an exhaustive account of chemical safety and security regulation in Canada, but rather to contribute to a deeper understanding of specific issues with respect to major incident risk perception and management. Above all, our analysis suggests that further research in the area of chemical risks and risk governance – a broad and complex subject – is warranted.

1.3 What We Found

A defining characteristic of chemical regulation in Canada, and a key theme of this paper, is that the regime for controlling major incident risks is in fact an amalgamation of federal, provincial, municipal and private mechanisms. It is more accurate to speak of multiple, loosely related regulatory systems than of a single, cohesive, national approach to regulating chemical safety and security risks. Acknowledging the diverse and at times haphazard nature of the regime is an important first step in understanding its dynamics and identifying areas of potential improvement.

The chemical sector is heavily regulated. Facilities that use, manufacture or store chemical substances are subject to numerous regulatory requirements related to safety and security, including in the areas of occupational health and safety, emissions, waste disposal and so on. In many respects, these standards resemble the traditional model of prescriptive, top-down government regulation. A second key finding of our research, however, is that in the context of *major incidents*, the Canadian regime is balanced towards an approach that values flexibility, particularity (rather than rigid standardization, or ‘one-size-fits-all’) and collaboration between critical infrastructure operators and government regulators. Thus, when we refer in the following paper to the absence of government standards, we mean the absence of what Neil Gunningham calls “direct regulation” (1998: 548); we do not mean to imply that the regulatory space is empty or that governments and industry are unconcerned with controlling major incident risks.

Our findings are organized according to the structure of the Hood *et al.* framework. This model considers the *content* and the *context* of a risk regulation regime. The former concept – content – builds on the cybernetic theory of control to examine the management of a specific policy area. It asserts that the three dimensions of control –

information gathering, standard setting and behaviour modification – must be present in order for the entire system to be under control. The latter concept – context – refers to three factors that typically shape regime content: the technical nature of the risk (market failure hypothesis), the public’s and media’s opinions about the risk (opinion-responsive hypothesis) and the way power and influence are concentrated (interest group hypothesis).

1.3.1 Regime Content

Information Gathering

Information gathering represents the largest component and primary focus of the regime, encompassing a wide range of monitoring, research and information-sharing mechanisms. There is an emphasis on formal multi-jurisdictional and public-private structures, but informal and discrete information sharing also occurs on the basis of trusted personal relationships. Interview participants reported largely positive and effective relationships when sharing information *within* their organizations – within industry associations, government agencies and CI operators and law enforcement, respectively. Participants disagreed, however, on the quality, relevance and regularity of information sharing *between* CI operators and government agencies responsible for CI protection, which may be a product of conflicting expectations with respect to how, why and with whom information may be disseminated.

Sectors differed in their opinions of how things might be improved. Water utilities and fire fighters, for example, called for the creation of information-sharing platforms on which CI operators could freely exchange information and best practices with one another, while chemical industry participants preferred that context-specific information be provided by government on demand and in industry-preferred format. The former attitude suggests a preference for flat organizational structures and communitarian decision-making, whereas the latter reflects a desire for limited government intervention and corporate autonomy with respect to risk regulation. The responses provided by government regulators, which emphasize the importance of rules and structure in the context of information sharing, suggest a bureaucratic orientation.

Standard Setting

Overall, the regulatory space for dangerous chemicals is characterized by low levels of policy aggression, meaning standards have limited ambition with respect to behavioural change and are intended to be minimally disruptive (Hood *et al.*, 2001). On balance, standards are set through a combination of technocratic processes and bargaining among stakeholders. This is particularly true in the case of the chemical industry, where the regime's standard setting component reflects a collaborative, consensus-based relationship between government and the private sector. Industry-promulgated standards, such as Responsible Care, are prevalent, and the development of new standards by government generally involves extensive consultations with representative industry associations. In permitting facilities a degree of freedom to implement practices tailored to their unique circumstances, the regime is generally responsive to private sector interests which can assist with commercial innovation and growth. Water utility operators, however, reported limited interaction with government agencies responsible for CIP and, consequently, that they tend to rely on best practices and standards developed by US or international organizations. The emergency responders we interviewed similarly called for greater clarity and guidance with respect to standards for storing dangerous chemicals (although they reported satisfaction with standards for *responding* to chemical incidents). Regulators consistently expressed satisfaction with the standard setting component of the regime. Overall, we found that the relative absence of stringent, government-imposed standards enables flexibility and reflects a high-reliability approach towards safety and security, in which processes and structures are designed to be adaptable, responsive, redundant and dispersed. Yet at the same time, this orientation potentially permits inconsistency across the regime, facilitating lax or ineffective safety and security practices among CI operators who choose not to prioritize safety and security. Where regulations do exist (for example, the Environmental Emergency (E2) Regulations of the *Canadian Environmental Protection Act, 1999* (CEPA 1999)), attitudes vary with respect to their effectiveness and stringency.

Behaviour Modification

Behaviour modification appears to be the smallest component of the regime. The academic and grey literature suggests that the resources dedicated to enforcement may be low in absolute terms. This was also the perception among our water utility, emergency management and industry interview subjects. Enforcement and compliance appears to be a particular problem in the case of SMEs who are less organized (and often do not subscribe to self-regulation initiatives), possess fewer resources and expertise and, compared to large organizations (multinational chemical companies, for example), struggle to achieve compliance. Interview participants were generally in agreement that industry associations are typically successful in securing compliance with industry self-regulation initiatives through verification audits and other means. There is, however, less consensus on this point in the academic literature. Again, differences in style, or organizational culture between sectors, appear to influence perspectives on behaviour modification. Water utilities and fire fighters tended to support greater government intervention while industry participants preferred collaborative enforcement mechanisms, in which government supports industry self-regulation efforts. None of our participants called for the diminishment of efforts to influence the behaviour of high-risk facilities; at issue was the style and scope of the processes to be used.

1.3.2 Regime Context

Market Failure Hypothesis

The market for chemicals is variegated, complex and dynamic, both in terms of firm structures and products. While there are significant difference between multi-nationals and SMEs, the sector as a whole is largely competitive, and product and process innovations are key sources of profit. Chemical products and firms vary in terms of their significance to CI. Some are easily substitutable; others are not; some represent high-consequence single points of failure; others have multiple redundancies; some chemicals can be weaponized and others cannot.

MFH has limited explanatory power in the context of dangerous chemicals. On the one hand, the market seems to be reasonably stable and efficient; catastrophic events are extremely rare. On the other hand, such events cause considerable social and economic damage to communities. Reliable risk models are difficult to develop. Several factors, including varying information costs, information asymmetries, high opt-out costs, moral hazard problems, negative externalities, problematic insurance requirements and limited tort-law processes, point to a context that perpetuates vulnerabilities. A government risk regulation regime underpinned by a market failure logic would anticipate that the government would intervene to correct these failures; while the regime certainly includes government-imposed regulations, our interviews and literature review suggest a preference for and tendency towards industry self-regulation on matters of safety in particular, at least since the Bhopal incident in the 1980s.

Opinion-Responsive Hypothesis

The psychology of risk literature and our media analysis highlight several reasons why CI operators who use, manufacture and store dangerous chemicals are sensitive to media coverage. The public has a fascination with and strong aversion to low probability / high consequence events. The aversion the public feels towards these events is reinforced in chemical events in particular due to public distrust of multi-national corporations, the perceived artificiality of chemicals (a process seemingly contrary to nature), the availability heuristic (previous chemical disasters are easily recalled, such as Exxon Valdez, BP Oil Spill in the Gulf of Mexico), the perceived lack of control over chemical risks (particularly in the case of chemical facilities in urban centres, such as the Propane Sunrise explosion and West Texas Fertilizer disaster) and the (often oversimplified) demand for accountability in the wake of disasters caused by human error. The Opinion-Responsive Hypothesis (ORH) highlights how industry outreach efforts may be understood as a stratagem to shape public opinion rather than as a product of increased demands for transparency. At the same time, the ORH helps to explain the tendency by government to explore (if not act on) regulatory changes in the immediate

aftermath of major incidents. At a minimum, low probability / high consequence events usually disrupt the normal control mechanisms and create an opportunity for change.

Interest Group Hypothesis

In the context of dangerous chemicals, our interview data and literature review point to two main sources of influence on the regime: the US federal government and large industry via their industry associations. By directing our attention to the interplay of interest groups, this hypothesis helps explain several regime features: first, it illustrates how the market power, expertise and technical capacity of large chemical companies makes them well-positioned to contribute to the development and implementation of regime standards; second, it shows how a desire to maintain access to the US market for Canadian chemical products incentivizes adherence to voluntary US standards; and third, it highlights how American security priorities may influence the perceived acceptability of market-based regulation of chemical risks.

With respect to US priorities, the implication of this argument is that we should see stricter, more cohesive regimes in sectors where Congress feels it is necessary and exerts more influence on the sector. Since 9/11, American efforts to legislate stricter regulations for chemical security have failed repeatedly. Until prescriptive standards and rigorous behaviour modification efforts are made a prominent feature of the US chemicals regime, they will likely remain modest within the Canadian regime as well.