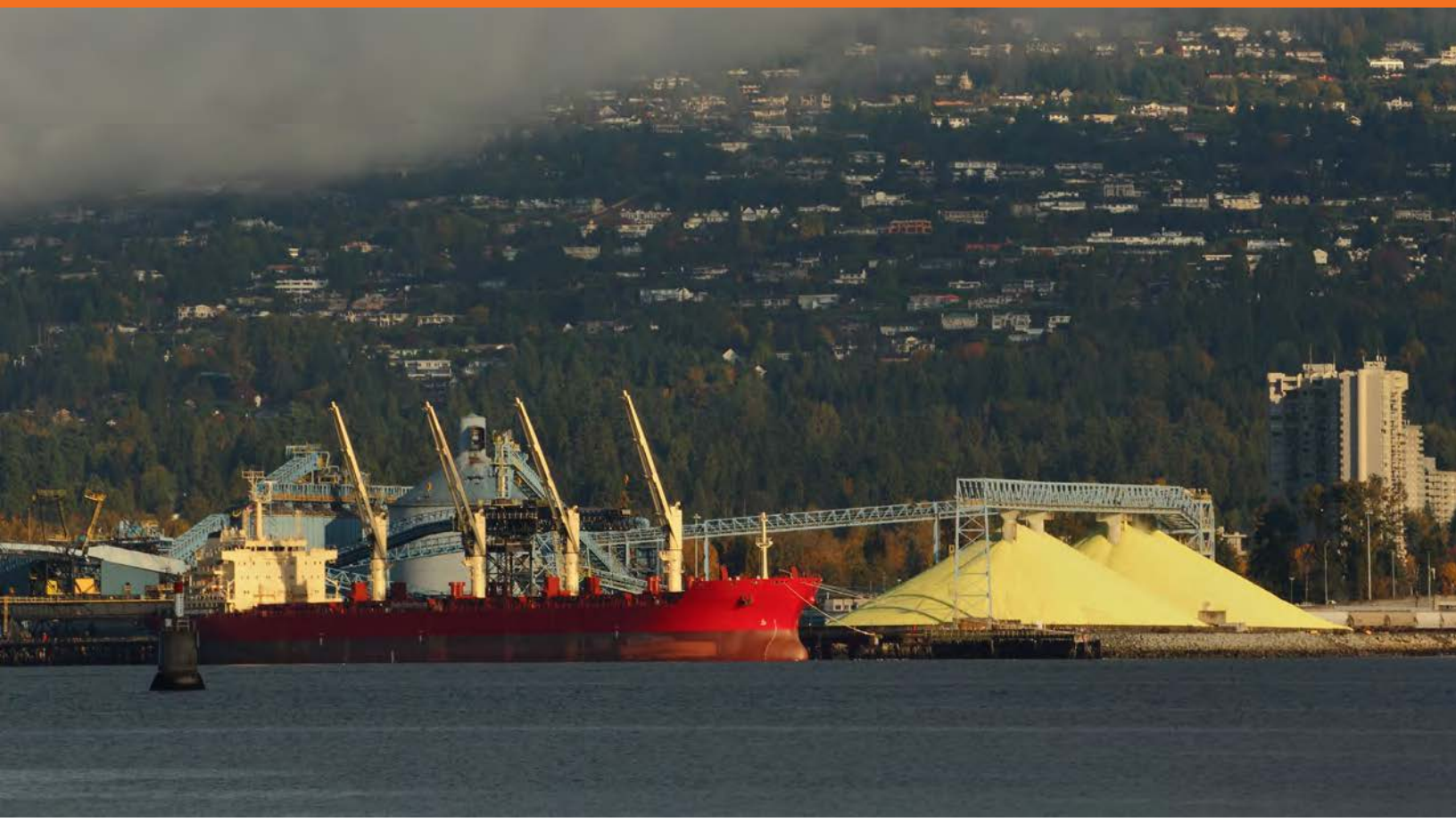
CHAPTER 2 HAZARDOUS AND NOXIOUS SUBSTANCES



Introduction

Hazardous and Noxious Substances in Canada

Hazardous and noxious substances (HNS) are moved in and out of Canadian ports every day. The International Maritime Organization defines HNS as "any substance other than oil which, if introduced into the marine environment, is likely to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea."[14] HNS encompasses thousands of products that are transported by ship around the world.

The marine transportation of HNS generally poses very little threat; hundreds of products are safely transported, either as bulk liquids or solids in specialized vessels or packaged and carried among general cargo on container vessels every day. A risk assessment commissioned by Transport Canada also found that the risk posed by select bulk HNS movements in Canadian waters was relatively low. Notwithstanding this result, and the fact that Canadian and

[14] *Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances*, 2000. International Maritime Organization, 2000.

international statistics generally point to a low historical frequency of HNS incidents, the potential impacts of a release, should one occur, could be harmful to human health (particularly in populated areas) and the environment.

HNS Risk Assessment

In addition to other sources of information that informed our review, the results of a risk assessment of select bulk HNS movements in Canada was considered, within the context of its limitations. Although data availability limited the scope of the study to the transportation of select bulk HNS, the risk assessment found that the risk of ship-source releases of these substances, carried in bulk in Canadian waters, is relatively low. This conclusion is influenced largely by the low volumes and number of transits of HNS substances. The results are summarized in Appendix A-2.

The need for some preparedness in Canada for HNS releases in the marine environment was first identified several decades ago. In 1990, the Public Review Panel on Tanker Safety and Marine Spills Response Capability (Brander-Smith Panel) made a number of recommendations regarding the safe transportation of both oil and chemicals in Canadian waters. These included recommendations on training and certification of personnel handling chemicals, stringent standards for design, equipment and operations related to chemical substances, the creation of a national response team specializing in chemical spills, and the development of a national chemical spill response framework as well as chemical contingency plans.

In the decades that followed the publication of the Brander-Smith Panel's report, a number of attempts were made to establish a Canadian HNS preparedness and response program. However, these attempts have not been brought to a satisfactory conclusion. In the mid-1990s, Canada's Ship-source Oil Spill Preparedness and Response Regime was implemented and, thereafter, the Canadian Coast Guard began working on a Marine Chemical Emergency Response system for HNS releases. In 2004, developing and implementing an HNS program became Transport Canada's responsibility. Transport Canada identified the development and implementation of an HNS regime as a high priority in its *Sustainable Development Strategy (2007-2009)*, its *Report on Plans and Priorities 2009-2010* and its *Marine Safety Strategic Plan 2008-2015*. Despite the acknowledged need for an HNS program in Canada, such a framework has yet to be established.

The recommendations we make later in this chapter lay out the first steps in establishing a ship-source HNS incident preparedness and response program. The recommended measures are not intended to be the end point of preparedness and response in Canada, but rather the base necessary to further build industry and government capacity as risks evolve.

However, before moving to our recommendations, it is important to take note of the existing international and domestic requirements that are currently in place to reduce the risks of ship-source HNS releases, as well as the provisions for liability and compensation in the event of a release.

International Framework for Hazardous and Noxious Substances

Prevention

The suite of Canadian legislation and regulations that govern vessel safety, including construction standards, crew certification, inspections, navigation, vessel traffic management and pilotage, have all helped prevent major HNS incidents in Canada. Some of these domestic instruments have incorporated, or are complemented by, international codes and conventions, which address either navigation safety generally, such as the *International Convention for the Safety of Life at Sea* (SOLAS), or HNS specifically.

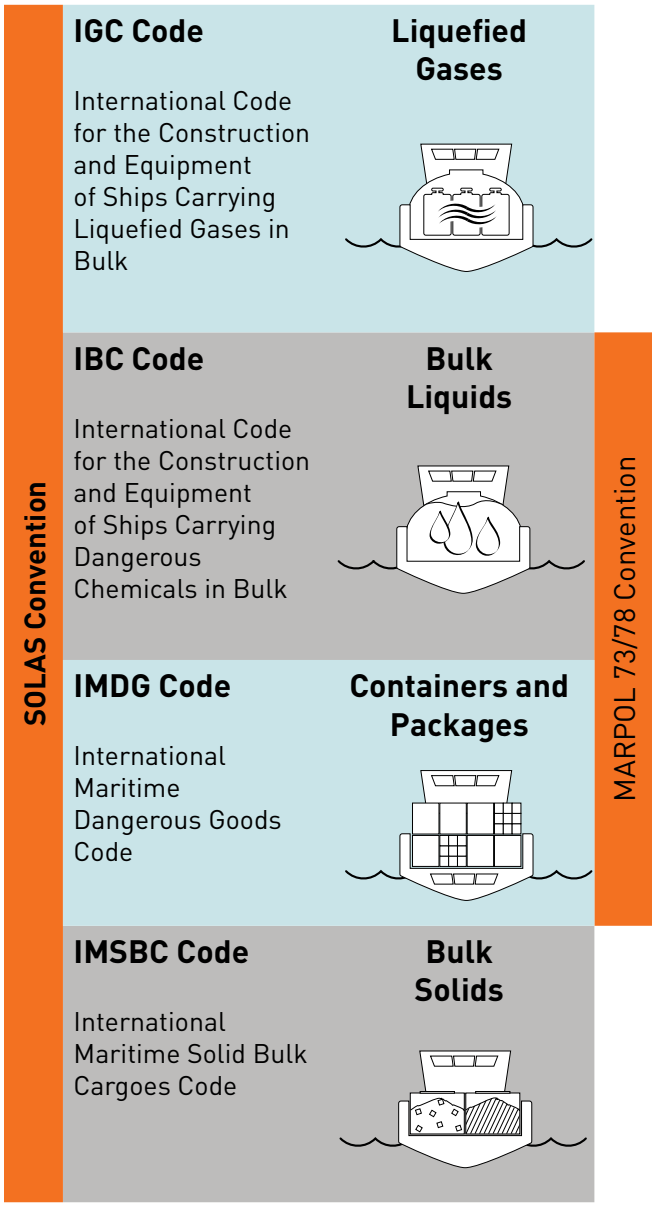
For example, the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk* (IBC Code) and the *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (IGC Code) lay out requirements for the design, construction and operation of vessels carrying certain types of HNS and specify minimum equipment to be carried on board. The *International Maritime Dangerous Goods Code* (IMDG Code) provides an international standard for packaging, containerization, and stowage, with a specific focus on the segregation of incompatible substances.

We conclude that Canada is well-served by international and domestic spill prevention measures for HNS.

Preparedness and Response

There are some measures targeted at HNS incident preparedness and response. An Annex to the IMDG Code, the *Emergency Response Procedures for Ships Carrying Dangerous Goods*, provides guidance to enable masters and crew to respond to shipboard fires and spills involving packaged (not bulk) dangerous substances, materials or articles, or marine pollutants, without external assistance. It is intended to aid shipowners, ship operators and other parties with developing emergency response procedures to be integrated into a ship's contingency plan. The possible dangers associated with carrying bulk cargoes such as HNS are also highlighted in the *International Maritime Solid Bulk Cargoes Code* (IMSBC Code), along with precautionary measures.

Figure 2.1 - International Standards for Carrying Cargo



In addition, Annex II of the *International Convention for the Prevention of Pollution from Ships* (MARPOL) establishes measures for the control of pollution by noxious liquid substances in bulk. It requires all vessels 150 GT or more that carry noxious liquid substances to have an approved Shipboard Marine Pollution Emergency Plan for these substances. This plan can be combined with the Shipboard Oil Pollution Emergency Plan, if the vessel is also required to have one (i.e., if the vessel is an oil tanker or a vessel 400 GT and above). However, these plans do not provide the level of detail that would be required to organize an effective response to a major HNS release.

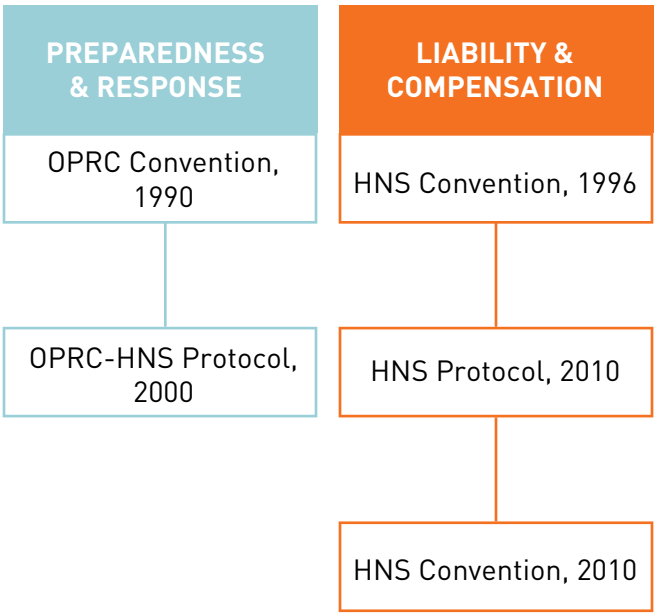
The lack of a formalized and coherent approach to HNS preparedness and response internationally has led the International Maritime Organization to renew its efforts on this, resulting in the development of the *Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000* (OPRC-HNS Protocol). The OPRC-HNS Protocol is an addition to the *International Convention on Oil Pollution Preparedness, Response and Co-operation* (OPRC Convention) and follows its main principles. The OPRC-HNS Protocol seeks to ensure that ships carrying HNS, as well as HNS handling facilities involved in handling operations to or from a ship, are subject to national preparedness and response programs similar to those already in existence for oil incidents.

The key elements of the Protocol include: requirements regarding pollution incident emergency plans for prescribed vessels, HNS handling facilities, and seaports; a national contingency plan and exercise program that includes HNS; a minimum level of prepositioned equipment; and arrangements to help coordinate and facilitate the response to an HNS incident, including international cooperation.

While Canada has not yet ratified the OPRC-HNS Protocol, some 33 countries are signatories, including Australia, Denmark, France, Germany, Japan, Norway, and Sweden.

The lack of a formal preparedness and response program for HNS incidents in Canada needs to be addressed. There are strong expectations, amongst both the Canadian public and internationally, that Canada will develop and implement a preparedness and response framework for ship-source HNS releases, especially in light of the development of the OPRC-HNS Protocol. As will be outlined in our recommendations, we feel that the OPRC-HNS Protocol and its elements provide a good baseline for the development of a preparedness and response program in Canada.

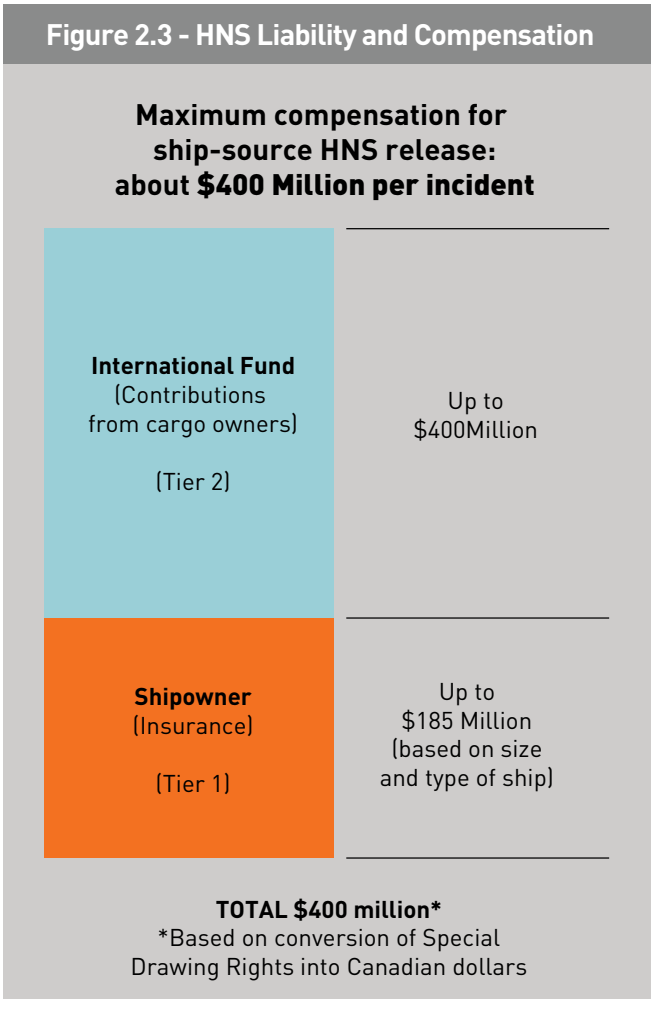
Figure 2.2 - International Regime for HNS Preparedness & Response and Liability & Compensation



Liability and Compensation

An international system for liability and compensation related to marine HNS transportation is also being implemented. The *International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea* (2010 HNS Convention) is based on the model that covers pollution damage caused by spills of persistent oil from tankers. Once in force, the 2010 HNS Convention will establish a two-tier system for compensation to be paid to claimants in the event of ship-source accidents at sea involving HNS.[15]

Figure 2.3 - HNS Liability and Compensation



Shipowners would be strictly liable under the first tier in accordance with the limits of liability set out in the 2010 HNS Convention. This liability would be covered by compulsory insurance. In those cases where the insurance does not cover an incident, or is insufficient to satisfy the claims, compensation would be paid from a second tier comprised of an international fund, made up of contributions from the receivers of HNS. Contributions will be calculated according to the amount of HNS received in each Member State in the preceding calendar year.

Where damage is caused by HNS in bulk, the shipowner would normally be able to limit its financial liability to an amount between 10 million and 100 million Special Drawing Rights (SDR) of the International Monetary Fund (approximately $16 million to $160 million), depending on the gross tonnage of the ship. Where damage is caused by packaged HNS, the maximum liability for the shipowner is slightly higher, up to 115 million SDR (approximately $185 million). The HNS Fund would provide an additional tier of compensation up to a maximum of 250 million SDR (approximately $400 million), including any amount paid by the shipowner and its insurer.

The 2010 HNS Convention covers damage in the territory or territorial sea of a State party to the Convention. It also covers pollution damage in the exclusive economic zone, or equivalent area, of a Member State, as well as damage (other than pollution damage) outside the territorial sea of any State caused by HNS carried on board ships registered in the flag of the Member State. The following types of damage will be covered:

- Loss of life or personal injury on board or outside the ship carrying the HNS;
- Loss of, or damage to, property outside the ship;
- Economic losses resulting from contamination, (e.g., in the fishing, mariculture and tourism sectors);

[15] It should be noted that the definition of HNS in the OPRC-HNS Protocol differs from the definition of an HNS under the HNS Convention, as the latter includes non-persistent oils for which there was previously no international compensation regime (although Canada's Ship-source Oil Pollution Fund covers both persistent and non-persistent oils).

- Costs of preventive measures; and
- Costs of reasonable measures of reinstatement of the environment.

The 2010 HNS Convention will not apply to oil pollution damage from tankers, as defined in the *International Convention on Civil Liability for Oil Pollution Damage*, *1992,* nor to loss or damage as covered by the *International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001*. Loss or damage caused by radioactive materials is also excluded.

Canada is taking the steps necessary to join the 2010 HNS Convention through proposed amendments to the *Marine Liability Act,* which, at the time of writing this report, were before Parliament. The Convention would come into force 18 months after 12 countries have signaled their intent to join. We conclude that Canada will be adequately served by its participation in the international 2010 HNS Convention and see no evidence that Canada would require a supplementary domestic fund.

Anatomy of a Response to Hazardous and Noxious Substances Incidents at Sea

Although every incident is unique, we note that there are important differences in how incidents involving HNS releases tend to unfold in comparison to those involving oil spills. As context for our recommendations, we note it is important to understand the basics of a ship-source HNS release.

In the context of oil spills, 'response' is often synonymous with mechanical removal of the oil from the marine environment. This is particularly true in the Canadian context, where alternative response techniques (e.g., use of dispersants, in-situ burning) are not currently permitted for use by responders due to legislative impediments. However 'response' and 'removal' are not synonymous in the context of HNS incidents. Out of the thousands of HNS transported by ship, either in bulk or in some means of containment, very few can physically be removed once they are introduced into the marine environment. The response to an HNS incident is often very different from that of an oil spill, primarily because these substances vary greatly by physical and chemical composition, fate, and behaviour. HNS have varying degrees of toxicity, water incompatibility, and flammability.

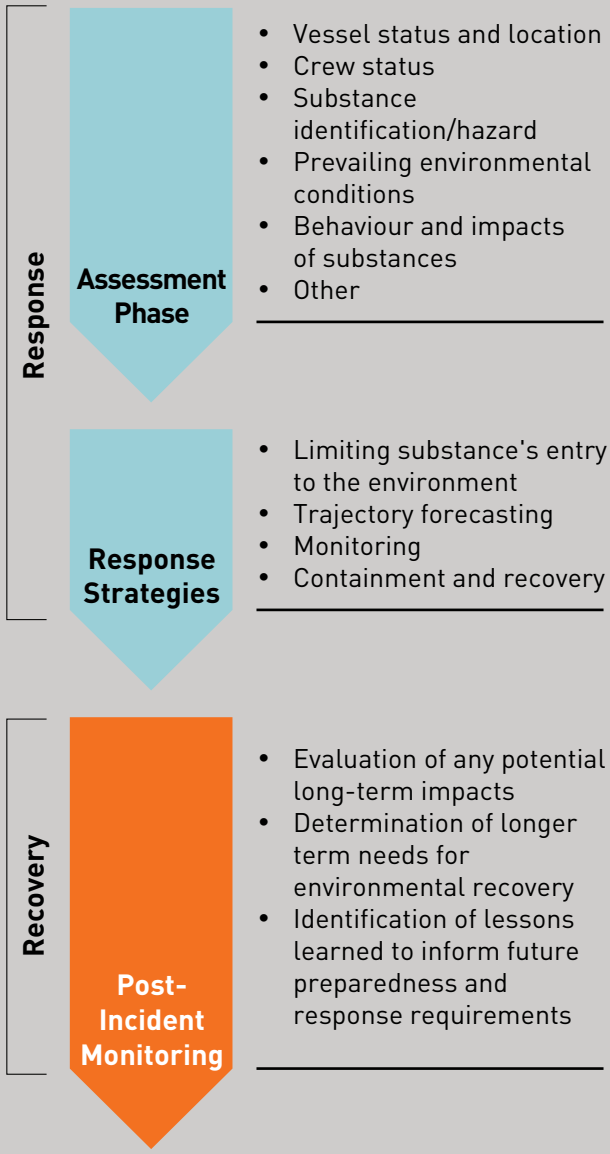
Initial Assessment

Arguably the most important phase of an HNS incident response is the timely and rapid initial assessment upon which subsequent response strategies will be based. During this preliminary phase, responders identify the variables crucial to a successful and safely executed response. These variables can include factors such as:

- Crew status;
- Vessel status and location;
- Prevailing environmental conditions;
- The hazardous properties of the substance(s) released into the environment;
- The substance(s) predicted behaviour in, and impacts on, the marine environment;
- Potential impacts on urban centres in the vicinity; and
- The appropriate level of personal protective equipment that is necessary to ensure responders' safety.

This phase is crucial, as the chosen response strategy will vary greatly depending on a number of factors, including: whether the substance released tends to evaporate, dissolve, float or sink; and, if more than one product is released, how those products interact together, as well as with any fuel that may have been spilled in the same incident.

Figure 2.4 - Anatomy of a Response to an HNS Incident at Sea



Response Strategies

Limiting Entry into the Environment

Depending on the results of the assessment phase, the next step during a response is to prevent or limit the substance's entry into the environment. This could involve lightering cargo from the vessel or transferring cargo within the vessel, which are the primary methods for preventing further release into the environment. If a substance is spilled on deck, containment is another option to prevent spillage into the water. This can involve using sorbents, booms and other materials. If the substance released has produced toxic vapours, the vessel can be manoeuvred to position the accommodations upwind to protect the crew from inhalation hazards.

Forecasting Spill Trajectories

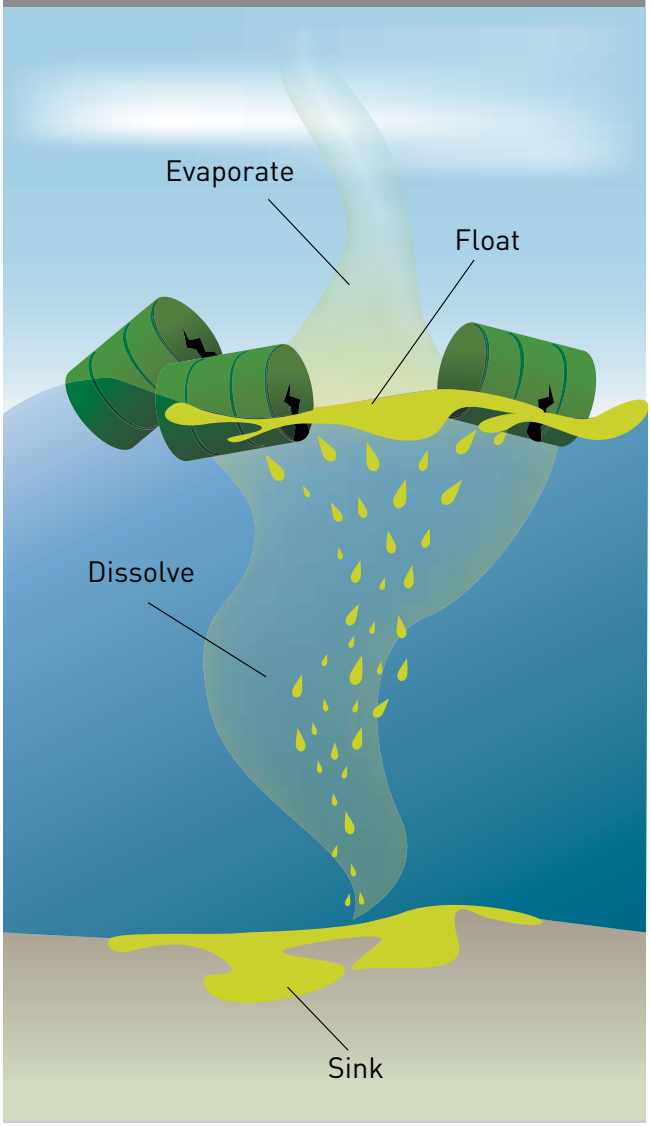
One of the main response strategies for HNS is to forecast the trajectory of substances that are released. This activity enables responders to identify the potential path of the substance and any sensitive resources that could be affected. Once the trajectory is known, responders can implement appropriate protection measures, such as the evacuation of a populated area in the case of a toxic plume. Trajectory forecasting can be done for evaporators, floaters and dissolvers. These forecasts are typically generated by sophisticated computer models that are available commercially or developed in-house by government agencies who have invested in such technologies.

Monitoring

In many instances, depending on the nature of the substance and its projected behaviour, real time atmospheric and water column monitoring may be the only feasible tools to inform a broader response strategy, or may be the only response action required. Monitoring consists of analyzing the substance's toxicity and concentration in the immediate vicinity of the spill, which is necessary to ensure the safety of crew, responders and any residents in nearby areas. The monitoring process can be facilitated by specialized detectors that monitor air quality, by taking water and sediment samples, or by simple visual observation (if, for example, a 'floater' substance is coloured and easy to see).

This response method is typical for evaporating and dissolving HNS, some of which can be extremely volatile, and/or may generate a toxic vapour cloud upon release.

Figure 2.5 - HNS Behaviours at Sea



Containment and Recovery

For HNS that float on the water surface and/or sink to the seabed, the optimal strategy may be containment and recovery. Where it is possible to remove the pollutants that could sink to the seabed, or at least a portion of them, this is preferable because these types of substances have the potential to contaminate the seabed and to persist in the sediment. This response strategy utilizes similar technological tools as an oil spill response, including booms, skimmers, absorbents, hoses, and storage tanks—but only if such equipment is compatible in the context of an HNS release.

Containerized Cargo

An incident involving containerized transportation of HNS will often result in damaged containers, or containers being lost at sea. Response to a damaged container on board a ship will typically involve crew members unless they require external assistance. The initial action would be to plug or contain a leak from a container until the ship reaches a port where the damaged container could safely be removed from the vessel. Operations can be more complex when containers fall overboard. In this case, the assessment would need to identify the substances in the container(s), the hazards from these substances, and the expected behaviour and trajectory of the container (e.g., whether it will float or sink). Floating containers can be recovered using nets or cranes, or by being towed to a safe location.

Response to sunken containers will be more complex as they will need to be located using sonar and eventually recovered using divers, cranes or remotely operated submersible vehicles. In both cases, once containers are recovered, their hazardous or noxious contents will need to be contained or recovered under the supervision of specialized hazardous materials teams.

The major challenge presented by incidents involving containerized HNS cargo is that many different types of hazardous substances are transported side by side on the vessel. Given that interactions between certain substances can result in a highly volatile and/or toxic reaction, the presence of hundreds of different HNS may present a severe hazard not only to potential responders, but also to any surrounding populations. The assessment phase is again crucial when it comes to these types of incidents. Responders must obtain a detailed picture of what HNS are on board and how they may react.

Environmental Considerations

In addition to health and safety concerns, environmental considerations are critical to every decision made during a response. Because HNS and their effects on the environment have been studied less than the effects of petroleum products, monitoring programs implemented during a response are one of the best ways to assess the potential and actual damage of a spill to the surrounding environment and determine the most effective response strategies. In addition, knowledge about the hazard level of a substance can aid responders by providing the rationale for the substance's removal and/or by helping them determine which areas and ecosystems will be most impacted by the release of the HNS.

Post-incident Monitoring

When all that can reasonably be done as part of the response phase is completed, the recovery phase commences. Post-incident monitoring is conducted to evaluate long-term impacts, track the longer term needs for environmental recovery, and ensure that preparedness and response approaches continue to evolve based on lessons learned from past experiences to reduce the environmental, human health, and socio-economic impacts of HNS incidents.

A Canadian Hazardous and Noxious Substances Program

The recommendations that follow lay out a measured approach to enhancing Canada's preparedness for and response to ship-source HNS releases. While there are various prevention measures in place, and a number of government programs can be leveraged, we are cognizant that a preparedness and response program for HNS would be built from the ground up. There are few models established internationally upon which to model a national HNS program. It will take time and new resources to build capacity in Canada. It will necessitate building linkages between the marine industry (with its expertise in emergency response on water), chemical producers (with their expertise in product behaviour), and the land-based hazardous materials response community (with its expertise in the response to these types of incidents). For the most part, these linkages do not exist formally today.

Our approach reflects our view that the shipping industry and the producers of HNS share joint responsibility for the risks they create, and that they should therefore each play a role in preparedness and response. While shipowners should have plans in place that identify the response resources they would call upon to respond to an HNS release, the HNS producer industry should be proactive in vetting the level of preparedness available in the responder community.

Our proposed approach for HNS shares similarities with the current Emergency Response Assistance Plan program under the *Transportation of Dangerous Goods Act* and its regulations. This program currently requires industry to have Transport Canada-approved response plans before importing or transporting certain dangerous goods (i.e., those dangerous goods of a certain quantity or concentration). The plans must also outline what is to be done to respond to an actual or anticipated release of the dangerous good.

Unlike oil, there are many different types of HNS products being shipped (well into the thousands). The diverse behavioural properties of each substance create preparedness and response complexities not seen for oil. Using a certified Response Organization model (as is the arrangement for oil spill response south of 60) is not considered to be a viable approach. The preferred model, from our perspective, is to increase requirements for the ship and facility owners to identify, in a plan, the suite of potential response options, tactics and equipment that could be employed from multiple providers depending on the incident and products involved. We also find that, given the complexity of the technical aspects of HNS response, shipowners should appoint a shore-based coordinator to provide advice on or coordinate the response, and liaise with government officials.

In our first report, we recommended that spill planning should be based on risks specific to a geographic area rather than an inflexible one-size-fits-all approach. This perspective led us to outline an Area Response Planning model, where the key players leading or overseeing a potential response are responsible for determining the specific risks of a particular geographic area (e.g., type of product being transported, in what volumes, navigational risks, environmental sensitivities, etc.) and engaging all the necessary players who hold key planning information and/or may have a supporting role in the response.

Transportation of Dangerous Goods Program

Canada currently legislates the transportation of dangerous goods by all modes of transport within Canada. Dangerous goods is a broad classification comprising products and substances such as explosives, gases, flammable liquids and solids, oxidizing substances and organic peroxides, poisonous and infectious substances, nuclear substances as well as other substances posing a threat to people and the environment, as defined by Canada's *Transportation of Dangerous Goods Act, 1992*. Most dangerous goods would be considered HNS under the definition provided by the International Maritime Organization.

The Transportation of Dangerous Goods Directorate within Transport Canada is responsible for the development and the enforcement of regulations for the safe transportation of dangerous goods in Canada. Regulations establish standards and requirements for the containment of dangerous goods, as well as the training of personnel handling such products and substances. Regulations also require any person either offering certain dangerous goods for transport or importing them to have an Emergency Response Assistance Plan that is approved by Transport Canada. The plan describes the actions to be taken in the event of an incident involving dangerous goods in order to ensure that adequate resources and equipment are available to respond efficiently and in a timely manner. Transport Canada also conducts regular inspections of facilities where dangerous goods are handled.

The Transportation of Dangerous Goods Directorate also operates the Canadian Transport Emergency Centre (referred to as CANUTEC), which provides information on dangerous goods. CANUTEC can assist in the event of an incident involving dangerous goods by providing advice to emergency responders.

In reading our proposals for HNS, there may be some confusion as to whether we are abandoning our proposed Area Response Planning model. This is not the case. The process we are recommending is the same: it is both risk-based and geographically-based, and it involves all necessary public and private players holding key planning information and/or having a supporting role in the response. What is different, as a function of the nature of HNS, is the level of detail of the plans that result from that planning process, as well as the level of involvement of various segments of industry. In the case of the oil industry south of 60, shipowners are supported in the planning function by their relationships with certified Response Organizations, which are tied to defined areas of response and can plan—down to a tactical level—for possible response scenarios. Given the variety of HNS being shipped and their diverse behavioural properties, planning in the case of HNS lends itself towards building a menu of response capabilities that may be called upon as needed for the specific characteristics of an HNS incident. Thus, the outputs of HNS planning would be:

- Vessel plans and HNS handling facility plans, identifying the varied suite of response options that may be required and where those capabilities can be accessed.

- Regional plans, led by the Canadian Coast Guard, that support and complement industry's plans for the response to HNS releases.

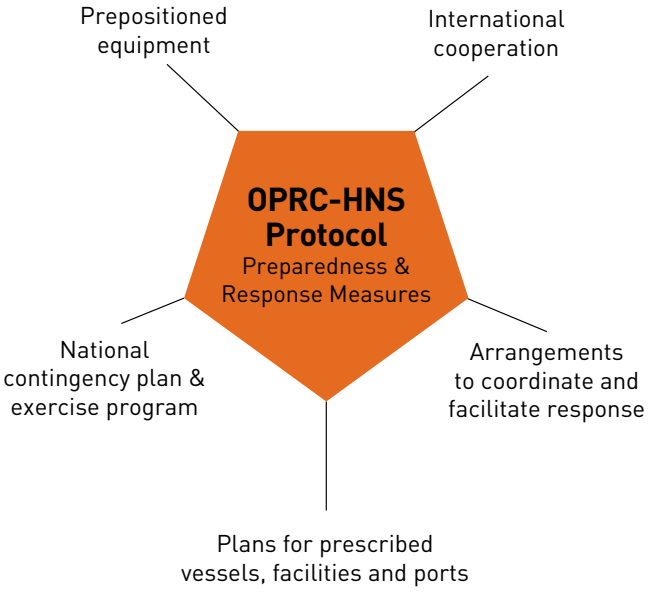
The Role of the Canadian Coast Guard in HNS Incidents

Under the *Canada Shipping Act, 2001*, in the event of a ship-source pollution incident, the Canadian Coast Guard is responsible for monitoring the response and using its authorities and powers to ensure the response is appropriate. This is equally applicable for both ship-source oil spills and for ship-source releases of HNS.

Just as industry, over time, will need to build its preparedness and response capacity to fulfill its plan requirements, so too will the government departments and agencies that oversee and support the proposed program. The Canadian Coast Guard's mandate to ensure appropriate responses to marine pollution incidents applies equally to HNS releases as it does to oil spills. It will require incremental new funding to build its knowledge, expertise and capacity to carry out this mandate, as well as to integrate HNS considerations into regional plans. Transport Canada will require incremental resources to properly oversee the new regulated requirements of the program, and Environment Canada and Fisheries and Oceans Canada require sustained funding to build their capacity to provide the scientific advice needed to support response operations. Furthermore, the nature of HNS integrates a new set of federal participants. Health Canada and the Public Health Agency of Canada will play a role in incidents where there are potential public health impacts. Their activities can include providing: scientific advice and risk assessment for public health consequence management; surge capacity for analytical laboratory support to measure levels of

known contaminants; surge capacity for medical countermeasures, supplies and personnel in support of local medical authorities; and public health advisories, alerts and warnings. They can also assist in addressing the recovery component by providing support, where appropriate, for long-term public health consequences. In addition, Public Safety Canada can coordinate federally and intergovernmentally with provincial and territorial governments.

Finally, we emphasize that the proposals and recommendations that follow do not establish the end point of HNS preparedness and response in Canada. These are initial steps to build capacity and move the yardstick, so to speak, of preparedness and response for HNS in Canada. As a better understanding of HNS shipping risks in Canada develops, the approach we propose can be scaled to adjust to those risks, and as they evolve, the Government should regularly reassess the adequacy of preparedness and response capacity.



Canada's Accession to the OPRC-HNS Protocol

As discussed earlier, the OPRC-HNS Protocol is an addition to the OPRC Convention, and follows its main principles. The OPRC-HNS Protocol aims to ensure that there are preparedness and response measures in place around the world to protect against pollution from ships carrying HNS. These measures are similar to those already in place for ship-source oil spills, and include:

- Pollution incident emergency plans for prescribed vessels, HNS handling facilities, and seaports, as deemed appropriate;
- A national contingency plan and exercise program that includes HNS;
- A minimum level of prepositioned equipment;
- Arrangements, including communication procedures and coordination mechanisms, to help coordinate and facilitate the response to an HNS incident; as well as
- International cooperation with respect to all aspects of HNS preparedness and response.

To date, Canada has not signed on to the OPRC-HNS Protocol.

The OPRC-HNS Protocol provides a basic framework for the development of a national program for HNS preparedness and response. Canada's national program for HNS preparedness and response should, in our view, be built around the elements of the OPRC-HNS Protocol. Canada should take the necessary steps, many of which are outlined in subsequent recommendations, to accede to the OPRC-HNS Protocol.

RECOMMENDATION 2-1:

Canada should take the necessary steps to accede to the OPRC-HNS Protocol, including developing a national HNS preparedness and response program.

Preparedness and Response for Vessels and Facilities

As is the case for oil spills, the primary responsibility for preparing for and responding to ship-source HNS releases rests with the potential polluter. As a result, vessels carrying HNS and facilities involved in the handling of HNS between facilities and ships should have the appropriate plans in place to respond to HNS releases.

Under the international conventions, there are provisions that require vessels of 150 GT and above carrying bulk liquid HNS to have a Shipboard Marine Pollution Emergency Plan on board. These plans must include a procedure to report both spills and incidents that could lead to a spill, to the nearest coastal country as well as up-to-date 'points of contact' lists for organizations that would be contacted in case of a spill. The plans must also give clear guidelines to the ship's personnel on how to control discharges.

Although useful, these current plans provide far less detail and the identified capacity is well below that defined for oil spill preparedness in Canada. Further, HNS is carried in Canadian waters in many forms, not just liquid bulk, and we consider that shipowners should also be prepared to respond to incidents involving solid bulk HNS that may be carried in dry bulk carriers and on barges, as well as HNS that is carried in smaller packages, often within containers on board large cargo vessels. The latter may benefit from guidance provided through the International Maritime Organization's *Emergency Response Procedures for Ships Carrying Dangerous Goods*. However, the remaining vessels (i.e., those carrying solid bulk HNS) are currently only required to have a plan to deal with a spill of the fuel used to propel the vessel.

Although the risks related to HNS releases in Canada overall are relatively low, given the potential impacts that HNS can pose to human health and the environment, the Government of Canada should expand the requirement for shipboard emergency plans to include all vessels of a prescribed size and class, involved in carrying HNS. The size and class of vessels that would be required to have these plans should be determined in consultation with industry. However, it is our view that the requirements should cover not just bulk liquid carriers, but also dry bulk carriers, barges and container ships.

In addition, there are several elements not currently included in the Shipboard Marine Pollution Emergency Plans required for bulk liquid carriers that we consider should apply to all

vessels transporting HNS to help ensure an appropriate response to an incident, should one occur. We propose that ships transporting HNS be required to have a Shipboard HNS Response Plan that includes the following elements:

- The identification of a shore-based response coordinator appointed by the shipowner, who would possess the competencies, knowledge and experience to:
  - Advise, or coordinate the response on behalf of the shipowner in the event of an HNS incident.
  - Serve as a liaison between the Government of Canada and the shipowner to facilitate the timely transfer of critical information, such as the cargo manifest and stowage plans.
- The identification of response resources which, in the event of an HNS incident that cannot be managed by the resources available on board the ship, could be used to respond, including the services that municipalities may be able to bring to bear while the ship is in port. These resources could either be provided by the shipowner or through a contract with an emergency response contractor.
- A mandatory training plan for the crew.
- An exercise program that includes regular exercising of the emergency procedures, ideally including the crew and other necessary parties, such as the shore-based response coordinator and local first responders.
- On-board equipment so that vessels can deal with small incidents that are contained within the vessel.

- A record, maintained aboard the vessel, of any pollution incidents.
- The review of the plan at regular intervals and after any event where the plan is initiated. All changes made to the plan as a result of these reviews should be tracked.
- A description of the incident management system that would be used in the event of an HNS incident.
- A strategy for the disposal of wastes associated with an HNS release.

These elements would help build much stronger capacity in the marine transportation industry, as well as the emergency response industry, to be able to address HNS incidents in Canadian waters.

Refining the Legal Definition of HNS for Canadian Regulations

The international definition of HNS included in the OPRC-HNS Protocol is very general. It can be interpreted to include thousands of substances ranging from dangerous chemicals such as sulphuric acid to relatively benign materials such as iron ore. It also includes both bulk HNS and packaged HNS carried in cargo containers. When implementing our recommendations and developing the required legislation and regulations, the Government of Canada will likely require a more precise definition of HNS. We firmly believe that this definition needs to be developed via a thorough consultation process with both industry and the public. While we do not provide a definition for HNS in this report, we conclude that any legal definition should include both bulk and packaged HNS and should be broad enough to include any substance that could cause harm to people or the environment.

RECOMMENDATION 2-2:

Transport Canada, in consultation with industry, should require vessels of a prescribed size, type and class that carry HNS, either in bulk or packaged forms, to have a Shipboard HNS Response Plan. This plan should include all of the requirements currently outlined under MARPOL Annexes II and III, as well as additional requirements, such as: a shore-based response coordinator; identification of response resources; preparedness activities, such as training and exercises; on-board equipment; a waste disposal strategy; record keeping; and an incident management system to be used during a response.

As outlined in the OPRC-HNS Protocol, facilities involved in moving HNS to and from ships should also have HNS Response Plans. The *Canada Shipping Act, 2001* already outlines the requirements for oil handling facilities to have emergency plans. Similarly, such requirements should exist for HNS handling facilities, including those that handle bulk and packaged HNS. Elements of the HNS handling facility plans could include:

- The policies that the operator of the facility will follow in the event of an HNS incident;
- A description of the activities that will be carried out in the event of an HNS incident;
- A list of resources, including the types and quantity of equipment for use on scene during a response to an HNS incident at the facility;
- Contact information for third party responders;
- Details of the training and exercise program for staff of the facility; and
- Health and safety protocols.

Transport Canada will need to develop classes of HNS handling facilities, as it has done for oil handling facilities. Classes could be defined based on risk factors such as the type of operation (container handling terminals, bulk liquid, and solid HNS handling facilities) and volume and type of HNS handled.

In developing these new requirements, Transport Canada should work closely with Environment Canada. Environment Canada's existing *Environmental Emergency Regulations* under the *Canadian Environmental Protection Act, 1999*, promote proper environmental emergency planning for Canadian facilities that use or store select hazardous substances. The regulations also apply to specified substances located at terminals/facilities at ports and to the loading and unloading of specified substances at terminals/facilities in Canada.[16]

RECOMMENDATION 2-3:

Transport Canada should require HNS handling facilities of prescribed classes (to be determined through consultation with industry) to develop HNS Response Plans to ensure adequate response to pollution incidents that could occur during the handling of HNS between a vessel and a facility.

By mandating these HNS Response Plans for HNS handling facilities, Canada would meet the OPRC-HNS Protocol's requirement for facilities to have plans. It would also be of great benefit for HNS handling facilities to involve municipalities in the development of their HNS Response Plans.

Oversight and Accreditation

We recognize that Transport Canada has extensive experience in developing oversight programs aimed at ensuring compliance with both international transportation law and Canadian transportation legislation and regulations. This experience includes several oversight programs in the area of marine safety related to control of domestic and foreign vessels, marine personnel qualification and certification and protection, control of marine infrastructure, and maritime domain awareness and protection. While the oversight program for oil spill preparedness and response that we recommended in our first report is well-suited for the oil regime south of 60, which is highly regulated and in which response capability is certified, we envision the oversight program for HNS preparedness and response being modelled in a different manner.

We believe an oversight program that would be most appropriate for HNS is one that would follow more closely the models and expertise that are already in place for the road and rail sectors, with regard to Transport Canada's oversight of the transportation of dangerous goods. Under the Transportation of Dangerous Goods Program, Transport Canada oversees compliance with the requirement to have an Emergency Response Assistance Plan. Transport Canada reviews the Emergency Response Assistance Plans to ensure applicable requirements are met and to determine the overall quality of the plan. While there are key differences between the regulatory regimes for the transportation of dangerous goods and those being proposed here for the marine transportation of HNS, we feel that a similar regulatory approach, one that focuses on the plans of the ship and facility owners (rather than a certification process such as the one in place for the Response Organizations for oil spills

[16] Environment Canada's *Environmental Emergency Regulations* (E2 Regulations) outline the HNS that, under various conditions such as contact and/or inhalation, can become toxic to humans. These substances are generally referred to as 'E2' substances, and include those that were used in the risk assessment we considered for this report, such as benzene, ethylene, propylene, and ammonium nitrate. Toxicity to humans and chemical behaviour (such as potential to explode) are the two main factors by which the substances are categorized.

south of 60), will provide a substantial increase in the level of preparedness and capacity to respond to HNS incidents in Canada.

At a minimum, Transport Canada would need to review plans to ensure that a ship or facility owner has developed a plan that meets the required criteria. For example: does the shipowner's plan identify a shore-based coordinator as well as response resources? Are provisions made for training and exercises? The assessment of the overall quality of the plans would need to determine if they are appropriate to the specific owner (i.e., shipowner or facility owner) and if the response resources identified in those plans are suited to the task. As with any new regulatory system, a measured approach will help promote capacity over time.

RECOMMENDATION 2-4:

Transport Canada should develop an appropriate oversight program to ensure compliance with the new requirements regarding HNS Response Plans for ships and facilities for ship-source HNS incidents.

Although oversight of regulated activities is properly a government responsibility, we believe that the effectiveness of this function can be augmented significantly through new industry verification or accreditation programs. Canadian and international companies that produce HNS have critical technical knowledge about the nature, behaviour, and impacts of their products, as well as the response tactics that are the most effective. They therefore have an important role to play in making sure their knowledge feeds into and offers another level of assurance regarding preparedness.

In studying what industry has done in terms of preparedness for incidents involving dangerous goods, we were particularly impressed with the proactive stance taken by the Chemistry Industry Association of Canada over the past several years. The Association has long been a proponent of 'Responsible Care' and its members are required to choose the safest mode, route and carrier possible to move their products. As part of Responsible Care, the Chemistry Industry Association of Canada conducts independent verifications of its member companies and their transportation partners every three years. The Association leads 'verification teams' composed of industry experts, public advocates and representatives chosen by local communities. All verification reports, including identified areas for improvement and requirements for corrective action, are published on the Chemistry Industry Association of Canada's website.

In more recent years, the Association has developed a Transportation Emergency Assistance Program (TEAP or TEAP III as its latest version is known). Under the program, all Association members must meet two standards, which together seek:

- To establish minimum requirements for each member company's Transportation Emergency Response Plan.

- To ensure that companies confirm that their transportation emergency response provider is capable of responding to their specific commodities and means of containment.

This is just one example of a model (albeit a land transportation model for now) that could be encouraged at the intersection of the HNS production and marine transportation sectors.

RECOMMENDATION 2-5:

Transport Canada should encourage domestic industry associations to strengthen verification and accreditation programs for their members involved in the marine transportation of and response to ship-source incidents involving HNS.

A National Contingency Plan

Article 4 of the OPRC-HNS Protocol requires signatories to establish a national system for responding swiftly and promptly to pollution incidents, which would include, at a minimum a national contingency plan. The Canadian Coast Guard has a *Marine Spills Contingency Plan*, in which the *National Chapter* applies to marine pollution incidents occurring in Canadian waters. In addition, Transport Canada has the *Environmental Prevention and Response National Preparedness Plan,* which details the preparedness capacity of the marine spill response regime. However, both of these plans principally outline the organizations' respective roles and responsibilities for a ship-source oil spill incident, and do not specifically address governance of an HNS incident.

To ensure that all interested parties (all levels of government, industry, ports, the public, etc.) are aware of roles and responsibilities for preparing for and responding to an HNS incident, this information should be outlined in an overarching national contingency plan—either as part of the existing *Marine Spills Contingency Plan*, or as a standalone plan for HNS. This would be a high level plan for incidents of national significance, and would not replace operational plans by industry. The national plan should include details on governance, roles and responsibilities, training and exercise requirements for the Canadian Coast Guard, resources, cost recovery and financial measures, and response capacities that can be contracted in the event that the Canadian Coast Guard becomes the On-scene Commander (i.e., when the polluter is unknown, unwilling or unable to respond). Given the particularities of HNS events and depending on the nature of the emergency, other federal government organizations such as Environment Canada, the Public Health Agency of Canada and Health Canada should also be designated as either primary departments or supporting departments, under the purview of the Federal Emergency Response Plan. As the coordinating department for the Federal Emergency Response Plan, and with its links to provincial emergency management organizations, Public Safety Canada should work closely with the Canadian Coast Guard, Transport Canada, provinces and territories to support planning and readiness activities.

RECOMMENDATION 2-6:

The Canadian Coast Guard, in collaboration with Transport Canada, Environment Canada, Public Health Agency of Canada, Health Canada and Public Safety Canada, should lead the development of a national contingency plan for ship-source releases of HNS that are of national significance.

Regional Planning

In line with our first report, we are of the view that planning for ship-source releases of HNS needs to take into account the differences that exist between regions in Canada in regard to vessel traffic, movements of HNS, as well as environmental and socio-economic factors.

The Area Response Planning model detailed in our first report, and more particularly planning for oil spills, lends itself to a *scenario-based* approach. Tactical plans can be developed that outline how oil spills will be addressed with booms, skimmers and alternate response techniques under a limited set of possible scenarios. On the other hand, the varied types of HNS being shipped and their diverse behavioural properties create additional complexities—the potential release scenarios for HNS are virtually endless. The preferred model is to build contingency scenarios that cover a suite of response options, tactics and equipment that can be called upon, like a menu, during the initial assessment of and response to an HNS release.

The Canadian Coast Guard should lead regional planning, which would be an adapted version of the Area Response Planning process outlined in our first report. In the context of HNS, the objective would be to understand the general marine movements of HNS within a region, and who would be involved in a response, including representatives from industry, private sector responders, local first responders, and federal monitors. This approach is, in our view, commensurate with the risk involved in HNS incidents as well as the nature of HNS incidents.

The regional plans would detail how the combined resources from various jurisdictions (federal, provincial, territorial, municipal, industry, etc.) may be activated and brought together in a timely manner to respond to a ship-source HNS incident. This would include the identification of the roles and responsibilities of local stakeholders, such as law enforcement, public health services, fire services, hazardous materials team, and the manner in which they would be integrated in the response. This could also include a list of similar organizations in the United States, with which there may be mutual aid arrangements for emergencies.

For regional planning to be effective, it is critical that local stakeholders be provided the opportunity to be involved in the planning process. We encourage the Canadian Coast Guard to build on and apply the established networks, knowledge and resources developed from the Area Response Planning process (for oil spill preparedness and response) to the HNS planning process. Given the role that local responders and government agencies may have to play in the areas of public health and safety, the Canadian Coast Guard should actively seek the collaboration of local stakeholders, such as ports, communities, local public health services, fire services, environmental agencies, police departments (for evacuations and establishing safety perimeter lines), and other levels of government in the regional planning. Close linkages with Public Safety Canada should also be used to integrate planning efforts with provinces, territories, and their emergency management organizations. These partners' contributions to ship-source HNS releases should be reflected in the regional plans.

RECOMMENDATION 2-7:

The Canadian Coast Guard should lead regional planning for ship-source releases of HNS, in collaboration with Transport Canada. The Canadian Coast Guard should invite other relevant stakeholders and communities to participate in the regional planning process, and should make the regional plans available to the public.

Canadian Coast Guard Capabilities

Due in part to the low incidence of HNS spills in Canadian waters, the Canadian Coast Guard does not currently possess the expertise required to adequately fulfill its role as Federal Monitoring

Officer or On-scene Commander in the event of a major HNS release. Since the majority of the pollution incidents reported to the Canadian Coast Guard involve oil spills, the practical experience related to HNS incidents is difficult to obtain and maintain. Nonetheless, it is critical that the Canadian Coast Guard have sufficient knowledge of the intricacies and complexities of an HNS incident (e.g., public health and safety, roles of local emergency management services, general HNS response options and tactics, etc.). Building on this knowledge and experience will enable the Canadian Coast Guard to effectively carry out its Federal Monitoring Officer and On-scene Commander functions, ensuring an effective and timely pollution response. Furthermore, given the potential health hazards posed by HNS incidents, it is important for the Canadian Coast Guard, like the responders, to have the appropriate knowledge in order to protect themselves and the public while carrying out their duties.

RECOMMENDATION 2-8:

The Canadian Coast Guard should ensure that its officials have the appropriate training to develop new expertise and competencies required to carry out its Federal Monitoring Officer and On-scene Commander functions under the proposed HNS program.

Federal response capabilities required for responding to HNS incidents must be commensurate with the associated level of risk. Although the Canadian Coast Guard has some equipment and capability for oil spills, it does not possess similar tactical capabilities (equipment and technical expertise) for HNS. Given the significantly lower volume of HNS movements in Canadian waters, for cases where the polluter is unknown, unwilling or unable to respond, we consider that the appropriate mechanisms would be for the Canadian Coast Guard to convene an initial assessment team (potentially comprised of public and private sector experts) at the onset of an incident to provide a preliminary assessment of the situation. Following the initial assessment, the Canadian Coast Guard should then ensure that the capability for response is established. This can either be done by the Canadian Coast Guard executing its authorities to direct a responder to take action, or via the formal procurement of qualified contractors. As per the polluter pays principle, the Canadian Coast Guard should seek compensation for its expenses either directly from the polluter (when known), and/or from the international HNS Fund (when it is operational).

Environment Canada and Transport Canada[17] can provide some hazardous materials technical expertise during an incident; however, given the wide range of substances for which a response may be required, it is important that the Canadian Coast Guard identify those contractors capable of providing technical expertise and responding to releases of HNS in a marine environment. Much of this identification work should occur during the regional response planning process.

RECOMMENDATION 2-9:

The Canadian Coast Guard should ensure it has the flexibility to quickly contract with appropriate technical experts and responders in the event a polluter is unknown, unwilling or unable to respond to an HNS release.

A key player in incident management for environmentally significant events is the Environmental Emergencies Science Table, chaired by Environment Canada's National Environmental Emergencies Centre in Montreal.

[17] Such as the Canadian Transport Emergency Centre (also known as CANUTEC).

As indicated in our first report, the coordination and delivery of the Government's scientific and environmental advice would be enhanced by the on-site presence of an Environment Canada advisor during a response, when requested by the Canadian Coast Guard in its role as On-scene Commander or Federal Monitoring Officer. Furthermore, given the importance of ensuring public health and safety during an HNS release, we encourage the Science Table to engage the Public Health Agency of Canada, Health Canada and local public health agencies during an incident.

Building Linkages

The Area Response Planning approach we outlined in our first report bridges an important gap in ship-source oil spill preparedness by directly connecting the Response Organizations, the Canadian Coast Guard and Transport Canada throughout the planning and exercise process. Thus, in the event of a spill, the Canadian Coast Guard, as Federal Monitoring Officer, will have a much better appreciation of the Response Organizations' plans, capabilities, equipment, resources and available tactics. Essentially, the model increases readiness and response efficiencies.

In the context of preparedness for an HNS incident, we believe that such relationships and such insight into capabilities within industry are critically important to the Canadian Coast Guard's role as the Federal Monitoring Officer. However, we recognize that the suite of recommendations we have made to improve spill preparedness and response for HNS do not, on their own, provide the same opportunities for the Coast Guard to build these relationships and insights. For one, under our proposed improvements, there are no certified Response Organizations for HNS incidents to develop plans on behalf of industry. Rather, preparedness for HNS incidents will require ship and HNS facility owners to identify, in their respective spill response plans, the resources they would employ to respond to a spill.

Although Transport Canada would review these plans as part of its oversight program to ensure compliance with requirements, and responders may be accredited by industry, the response capability of these third party responders would not be certified by Transport Canada, as it is for Response Organizations.

However, we recognize the benefits of the Canadian Coast Guard understanding the types of resources ship and facility owners identify in their respective spill response plans. To this end, we encourage the Canadian Coast Guard and Transport Canada to develop a collaborative mechanism to ensure that the Canadian Coast Guard has access to the information on industry's plans that will benefit its roles as Federal Monitoring Officer and On-scene Commander.

This will also help ensure that the Canadian Coast Guard has a good sense of the capabilities within the responder community, ensuring that when it is required to (i.e., if the polluter is unable, unwilling or unknown), the Canadian Coast Guard can contract with competent and effective responders.

RECOMMENDATION 2-10:

Transport Canada and the Canadian Coast Guard should develop a collaborative mechanism to ensure that the Canadian Coast Guard has access to information about industry's plans for HNS incidents that will inform its roles as Federal Monitoring Officer and On-scene Commander.

National Exercise Program

To validate regional planning under the National Contingency Plan, elements of the plans, as well as senior officials' decision-making, should be exercised on a regular basis. This would reinforce an understanding of roles and responsibilities,

maintain effective relationships among all key players, and ensure the effectiveness of procedures, arrangements, resources and decision-making. The Canadian Coast Guard already has a national exercise program to exercise the skills and knowledge needed for the response to a marine pollution incident. However, with the new proposed requirements for HNS preparedness, the Canadian Coast Guard and several supporting departments and agencies have little capacity to fully integrate HNS into their plans and future exercises.

RECOMMENDATION 2-11:

The Canadian Coast Guard should develop and maintain a national exercise plan to regularly validate both the National Contingency Plan for HNS and region-specific planning and readiness for HNS.

Further to this, it is our view that there is immense value in the participation of Environment Canada and Fisheries and Oceans Canada experts in preparedness activities for HNS releases, such as regional planning and exercises. Without their valuable input, the preparedness process will be incomplete. However, throughout the first phase of our review, we heard evidence that the ability of these departments to fully participate in preparedness activities relative to the oil regime had declined over time. We can only surmise that their ability to engage in a new HNS program will be even more tenuous. In addition to the scientific input for preparedness, there is a critical need for timely scientific advice during an actual response. During an incident, the Canadian Coast Guard, acting as the Federal Monitoring Officer or On-scene Commander, may need:

- Health and safety information for first responders and potentially impacted populations;
- Fate and behaviour information (specific to the incident, which may involve more than one HNS substance, in various volumes and concentrations);
- Spill trajectory and dispersion modelling;
- Spill clean-up priorities and countermeasures;
- Meteorological, sea-state and ice forecasts and warnings;
- Air/water monitoring support;
- Location and sensitivity of wildlife and ecosystems;
- Advice on ecosystem recovery objectives; and
- Expertise on marine mammals, such as whales and seals, and their sensitivity to the particular hazardous and noxious substance(s) released.

During our engagement sessions, it became apparent that Environment Canada and Fisheries and Oceans Canada do not have the resources to provide this support during an HNS incident. It is important that the scientific expertise be available in all aspects of the HNS preparedness and response program, including research and development toward implementing supporting operational systems (e.g., chemical and physical properties of HNS products in varied receiving environments, accurate weather, ocean currents and ice information, and atmospheric and aquatic dispersion modelling). We therefore encourage the Government to make targeted investments to ensure that federal experts can participate at all stages of preparedness and response.

RECOMMENDATION 2-12:

Environment Canada and Fisheries and Oceans Canada should improve their ability to respond to HNS incidents and to participate in preparedness activities for HNS incidents, such as regional planning and exercises, to conduct research and development toward implementing supporting operational systems, as well as to provide scientific expertise and HNS modelling capabilities during an HNS incident in support of the response.

Continuous Improvement

While the recommendations set out in this chapter seek to formalize an HNS preparedness and response system in Canada, there is a need to consider what will be required beyond these fundamental steps to ensure that the system is improved upon both for the short term and long term. Given the existing knowledge and awareness gaps that exist with respect to marine movements of HNS in Canada, and preparedness and response requirements for an HNS release, the Government needs to continually monitor developments and seek to address these gaps. In particular, the Government will need to continue to collect data on the movements of bulk and containerized HNS, to research the fate, behaviour and effects of HNS, and to reassess the risk posed by releases of ship-source HNS to determine what additional requirements are needed.

Awareness and Engagement

As discussed earlier, there are a number of complexities related to an HNS incident, including potential impacts on public health and safety, the environment, and specific response tactics. We believe proactive communication with the public is essential to raise awareness on these issues, as well as to provide clarity on the actual versus perceived risks associated with incidents involving certain HNS. Events such as the tragedy in Lac Mégantic, Quebec, although not a marine incident, have elevated public concerns and raised questions about the overall safety of moving potentially dangerous products in close proximity to population centres.

In our first report, we provided a recommendation (Recommendation #34) which sought to foster public confidence in the Ship-source Oil Spill Preparedness and Response Regime. Given that we are proposing new requirements for the preparedness and response of ship-source HNS incidents, the Government of Canada needs to build public awareness of the context in which HNS are transported by ship, the potential risks of releases of certain products, and what capabilities are in place for responding to an incident.

As described earlier in this chapter, the Government of Canada commissioned a pan-Canadian spills risk assessment, which included a report on: *Phase 2, Part A: Spills of Select Hazardous and Noxious Substances (HNS) Transported in Bulk South of the 60th Parallel North*. As previously mentioned, the results of this assessment, as well as all future risk assessments should be made public to increase awareness about the actual risks associated with ship-source releases of select HNS, by providing

a current picture of the areas of relative risk in Canada. This type of information, if shared with the public, will further improve its understanding of the transportation of HNS and its related risks.

In line with our recommendation from our Phase I review, as well as the regional planning functions outlined in Recommendation 2-7 in this report, interested parties, including provinces, territories, municipalities, local communities, and Aboriginal organizations, should be appropriately and meaningfully engaged in the planning for ship-source HNS incidents. Awareness needs to be built on fundamental principles of the proposed HNS system and its overall structure, including roles and responsibilities. In addition, once Canada joins the HNS Convention, which provides for a liability and compensation regime for ship-source incidents involving HNS, this should be part of the information that is provided as part of public awareness.

National Framework for Ship-source Spills

In our first report, we recommended that the Government develop and publish a National Framework for Ship-source Oil Spills (Recommendation #36). The purpose of this framework is to clarify and make available to the public essential facts on the system in place in Canada to prepare for and respond to spills from ships.

In the context of our second review, we would like to reiterate our recommendation, but amend it to include all spills from ships, including oil and HNS, whether they occur south or north of 60.

This knowledge-building is in the public's and the Government's best interest, to ensure that existing or new requirements for HNS incident preparedness and response are well understood and to foster confidence in the system.

Given the importance of protecting public health and safety during an HNS incident, we additionally note that communications during a response is critical to effective incident management. We encourage the Canadian Coast Guard in its role as Federal Monitoring Officer or On-scene Commander to ensure that pertinent information is being disseminated in a timely manner to all parties involved in the response, including local public health and safety authorities. This would equip these authorities with the information needed to inform the public and alleviate concerns.

RECOMMENDATION 2-13:

With a view to raising public awareness and fostering public confidence in the existing system and any new requirements for preparedness and response for HNS incidents, Transport Canada and the Canadian Coast Guard should conduct regular outreach to the public to communicate the level of risk that Canada faces. Transport Canada and other relevant federal departments and agencies should also explain how the system functions, including its prevention, preparedness, response, and liability and compensation components.

Improving Data for Preparedness and Response

Timely access to accurate and comprehensive information on the movement of HNS in Canadian waters is vital when planning for a potential HNS incident. For example, information on the properties and fate and behaviour of the substances being moved regularly in an area will inform decision-makers and responders on the hazards that could be posed by those substances entering the marine environment.

However, over the course of our review, it became apparent that data on the movement of HNS is not being collected by the Government of Canada. Statistics Canada, through the Marine Origin-Destination Survey, did collect information on all substances moved in Canadian ports until spring 2012 when the survey was cancelled. However, while information on HNS moved in bulk was well documented by the survey, information on packaged or containerized HNS movements was and is not maintained in a manner that is conducive to performing analyses. Often, the information on HNS transported in containers is simply listed as "general cargo." This broad classification provides no value in the context of preparing for or responding to an HNS spill, or developing policies to ensure the Government has appropriate rules in place. This major gap has limited our understanding of the risk associated with container traffic and will be a major challenge when preparing for potential incidents that involve packaged HNS.

We were also interested to learn that the Commissioner of the Environment and Sustainable Development noted this as a major problem in its 2010 Fall Report to Parliament. The report stated that, "officials from Transport Canada informed us that one of the challenges they face in establishing a regime is that the data on the type and quantity of hazardous and noxious substances transported by ship is not at a level of detail appropriate for the Department's needs."[18] The Commissioner of the Environment and Sustainable Development recommended that, "In order to facilitate the development of a hazardous and noxious substances regime in Canada, Transport Canada should take the necessary steps to ensure that it has adequate data on the type and quantity of hazardous and noxious substances transported by ship in Canada."

[18] *2010 Fall Report of the Commissioner of the Environment and Sustainable Development, Chapter 1: Oil Spills from Ships*, Commissioner of the Environment and Sustainable Development, 2010.

Unfortunately, the necessary steps to create a system that would provide this information have yet to be taken. Transport Canada has started a process to replace the Marine Origin-Destination Survey, but this work is still in the development stage and, as currently planned, would not supply all of the information required for HNS preparedness and response. The Government of Canada should therefore work quickly to remedy this situation and put in place a comprehensive database that tracks the movement of HNS, in bulk and in packaged form, throughout Canadian waters.

At a minimum, the database should include information on vessel transits, detailed HNS cargoes by vessel, total volumes imported and exported, as well as the port of origin or destination of the cargoes. This information should be used by the Government of Canada to help update and review the HNS program.

RECOMMENDATION 2-14:

For the purposes of developing government policies and for preparing for HNS incidents, Transport Canada should work with the Canadian Coast Guard to gather data on the movements of HNS in Canadian waters, including both bulk and containerized shipments. This database should incorporate information from all applicable sources.

While data on the movement of HNS will be useful in preparing for a potential incident, other information is required to aid in the response. Information on a vessel's cargo and the location of specific substances within a vessel is critical for decision-makers and responders during an HNS incident. The type, quantity and even location of HNS on board a vessel can all have impacts on how the response is managed, and ultimately, on the success of the response.

Several high profile international incidents involving container vessels in recent years have highlighted the need for more work to be done so that cargo manifests and loading plans can be immediately transmitted to the relevant authorities in the event of an incident. This information should be rapidly accessible. Decision-makers, both in government and in industry, need this information immediately so that they can make informed decisions during the response. The United Kingdom has started to work on a system and the Government of Canada should learn from its efforts when developing this new system for sharing information between producers and responders.

RECOMMENDATION 2-15:

Transport Canada should work with the Canadian Coast Guard, other relevant government departments and agencies, and industry to improve the process for sharing cargo manifests and stowage plans in a timely manner in the event of an HNS incident.

Research Gaps and Priorities

As we noted in our first report, Environment Canada and Fisheries and Oceans Canada have a variety of scientific authorities and operational capabilities that support preparedness and response efforts with regard to ship-source oil spills. While this remains true for HNS releases, the nature of HNS creates an added dimension for human health that implicates the Public Health Agency of Canada and Health Canada.

Research and Development on Oil Products and Spill Responses

Building on scientific research already announced in March 2013 for non-conventional petroleum products, recent announcements by the Government to further strengthen Canada's tanker safety system identified a number of new activities with respect to research and development. Namely, the Government will:

- Conduct leading-edge research on new oil products and their behaviour if spilled in Canadian waters, to help determine the window of opportunity for response;
- Undertake research on the effectiveness of a range of response measures and tools to support real-time sampling and monitoring during an incident by responders;
- Conduct research on pre-treatment of oil at source; and
- Deliver a new funding program to encourage research and development of new/enhanced mechanical response techniques.

Aligned with our current recommendation of also improving the understanding of properties of HNS (Recommendation 2-16), these initiatives will position the Government to inform emergency planners and spill responders, and develop better modelling capabilities.

For HNS incident preparedness, both Environment Canada and Fisheries and Oceans Canada have important scientific advisory roles to play in providing information that is essential for effective planning for HNS incidents. Accurate weather, ice and ocean current conditions are essential to ensure safe navigation, minimize risk, and provide an efficient and effective response should a ship-source spill occur. Information on the fate and behaviour of HNS substances moving in Canadian waters (whether in bulk or in packaged/containerized form) will be critical for regional planning and for future risk assessments. While some of this information already exists, it has not been reviewed and made easily accessible in the same way as fate and behaviour information on oil products. Environment Canada and Fisheries and Oceans Canada should consolidate and review any existing information on the fate and behaviour of HNS carried in Canadian waters and identify any potential gaps in their knowledge. We suggest starting with the 25 substances identified in the 2014 HNS Risk Assessment (refer to Appendix A.2). Once a process is in place to gather the appropriate level of data for containerized HNS, which could take a number of years, priorities should be assessed to determine which additional substances to include—both from bulk and containerized movements.

In addition, there is work to be done to understand the biological effects of HNS when they enter the marine environment, including the atmosphere, and how these effects may impact human health and the environment. This information will inform response priorities and approaches.

In order to fill any gaps in knowledge of relevance to Canadian HNS shipping, Environment Canada and Fisheries and Oceans Canada should seek to perform additional research and development toward implementing operational systems so that responders have access to the information they will need during a response. As research projects can be costly and require specialized expertise, we recommend that the Government of Canada look to establish partnerships with industry, and Canadian and international research institutions, where possible. For example, France's Centre of Documentation, Research and Experimentation on Accidental Water Pollution (also known as CEDRE), the United Kingdom's National Chemical Emergencies Centre, and Norway's SINTEF would be well-positioned to partner with Canadian agencies to share knowledge and resources. Related discussions are already underway between Transport Canada and CEDRE, and this initiative should continue to be pursued. These joint projects should also be used to leverage the knowledge and expertise that already exists on HNS around the world. The priorities for these research projects should be established through a consultative process that involves government, industry, and other stakeholders as appropriate. By pursuing active international scientific collaboration, all parties can ensure that their response to any potential HNS incident is appropriate, timely, and effective.

RECOMMENDATION 2-16:

Environment Canada and Fisheries and Oceans Canada should collaborate broadly to improve their understanding of the fate, behaviour, and effects of the HNS currently transported in Canadian waters, starting with the substances studied in the 2014 HNS Risk Assessment.

Future Risk Assessments

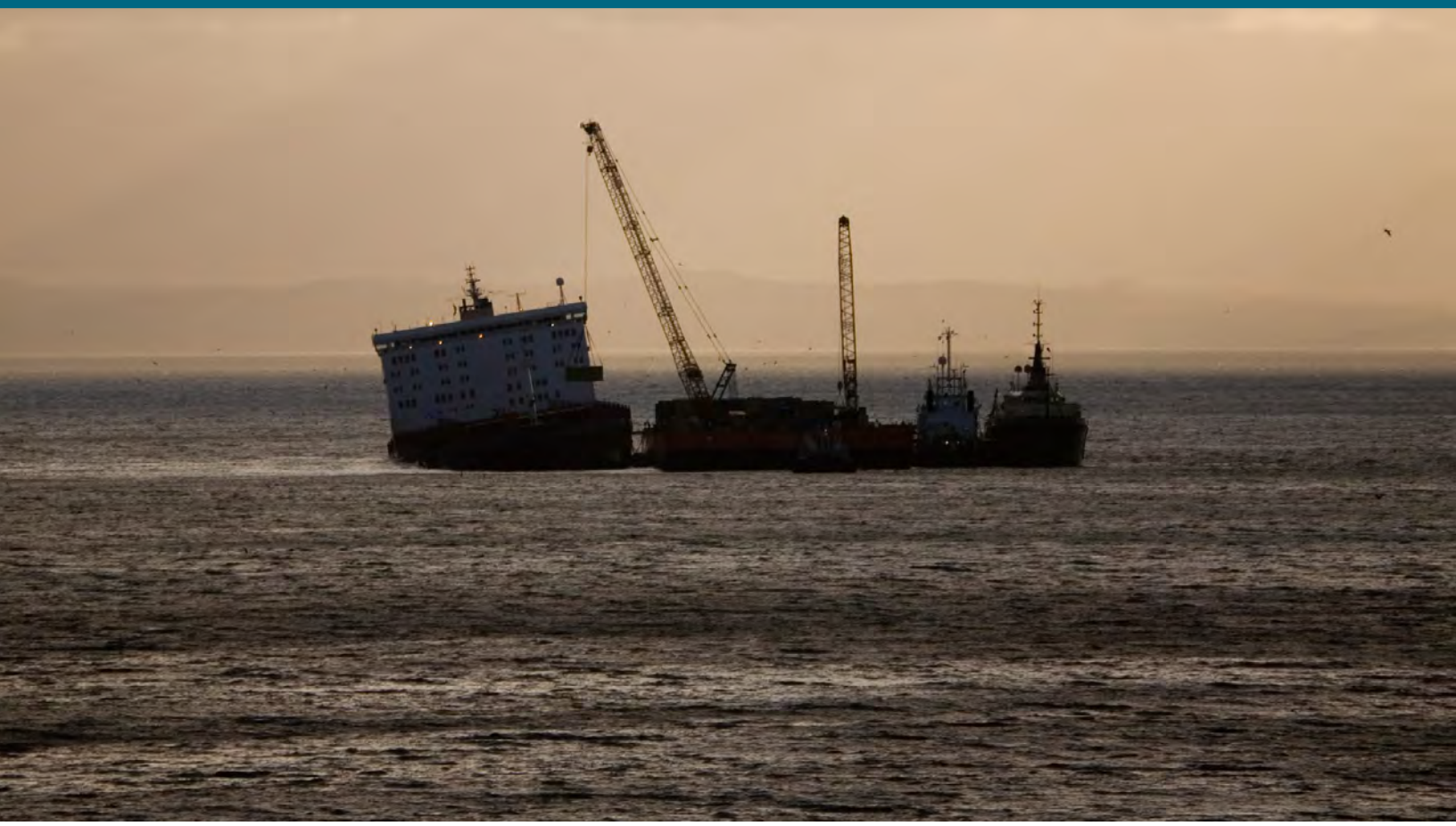
As described in Appendix A.2, the Government of Canada commissioned a pan-Canadian spills risk assessment, which included a report on: *Phase 2, Part A: Spills of Select Hazardous and Noxious Substances (HNS) Transported in Bulk South of the 60th Parallel North*.

We suggest that the results of HNS risk assessments be reviewed and updated on a regular basis by Transport Canada, in collaboration with the Canadian Coast Guard and Environment Canada. In addition, subsequent reviews should look not only at the risks associated with the releases of select substances transported in bulk, but also of those transported in packaged form once the data becomes available. The results of the 2014 HNS risk assessment, as well as all future updates, should be made available to the public to increase awareness of the risks associated with ship-source releases of HNS.

RECOMMENDATION 2-17:

Transport Canada should regularly review and update the national risk assessment for HNS being transported in Canadian waters, and make these results public.

CHAPTER 3 MARINE CASUALTY MANAGEMENT



Emergencies at sea, such as vessel groundings, engine failures, loss of propulsion or steering, and on-board fires are familiar occurrences to many mariners. With standard procedures and training, most of these events are handled on board with few impacts to the crew, the vessel itself or the environment. On rare occasions, a broader and sustained response effort is required to rapidly mitigate the situation to prevent escalation into a catastrophic event, like a major collision, a sinking, or a spill.

This chapter reflects the culmination of our research, consultations and deliberations throughout both Phases I and II of our review. Our two reports focus primarily on improvements to ensure Canada is prepared for and able to respond to spills or to react quickly when there are clear and imminent risks of a spill. In contrast, this section of our second report seeks to address situations where the risk of pollution is a matter of debate among various implicated parties. Such events need to be managed quickly and decisively to prevent escalation into a catastrophic event, including a marine pollution incident.

Managing a marine casualty in Canada is a complex endeavour. It can involve multiple federal, provincial/territorial, and municipal authorities. Depending on the situation, different expertise may be required quickly to avert a catastrophic event and support the mitigation

efforts (e.g., tugs, firefighters, cranes, pumps and barges, welders, etc.). The sheer number of authorities involved and the different powers that may be brought to bear in a marine casualty can make decision-making very complex, challenging, and, at times, slow—all of which increase the risk of spills. In some instances, the distribution of powers and authorities can lead to 'decision-making by committee' as the authorities involved debate over the best course of action and who has the jurisdiction or power to make key decisions. As has occurred during some unfortunate marine incidents in the past, this approach may not ensure the timeliness of decisions that is required to ensure the best possible outcome.

After the February 1996 grounding of the oil tanker *MV Sea Empress* (a single-hulled oil tanker) off the coast of Wales, which resulted in 72,000 m^3 of crude oil being released, the government of the United Kingdom appointed Lord Donaldson to conduct a review of the incident. The review concluded that the decision-making by committee, which occurred during the response, was highly ineffective. The review urged the government to take a stronger role in managing future marine casualties and recommended that a single decision-maker be appointed who has the power to make and enforce decisions on behalf of the United Kingdom government, in the public interest. As a result of this review, the United Kingdom created the position of the Secretary of State's Representative for Maritime Salvage and Intervention (also referred to as 'SOSREP') within the United Kingdom's Maritime and Coastguard Agency.

We share Lord Donaldson's view that timely decision-making, in the public interest, is one of the most important factors in protecting people and the environment from the effects of a marine casualty. Compare the fate of the *MV Sea Empress* to that of the *MSC Napoli*, a container vessel in the English Channel that was seriously damaged during a storm in 2007 while en route from Belgium to Portugal. The vessel was to be towed to Portland Harbour in England for repairs. En route, the vessel's condition deteriorated and the decision was made to beach the vessel in southern England, where it was quickly lightered and only minor pollution resulted. This decision was made quickly because all of the powers required to direct this action resided in one person, the Secretary of State's Representative for Maritime Salvage and Intervention. In this case, the Secretary of State's Representative acted quickly because any delay could have resulted in the vessel breaking apart in the English Channel and potentially polluting the whole region for years.[19]

Australia, with a jurisdictional landscape comparable to that of Canada (i.e., a federal model of government, with powers divided between the national government and various sub-national governments), has adopted a similar marine casualty management model by way of a Maritime Emergency Response Commander (also known as the MERCOM), within the Australian Maritime Safety Authority. This position was the result of lengthy negotiations between the Australian Commonwealth and its territorial and state governments. The Maritime Emergency Response Commander can intervene in incidents within federal waters and, under certain circumstances, in state or territorial waters (i.e., those waters within three nautical miles of the coast). The Maritime Emergency Response Commander is able to act to address the incident in question, but in doing so, will consider the reasonable views and stated positions of the relevant state(s), Northern Territory and other relevant stakeholders. It is recognized that these entities represent economic, environmental, community and social interests that could be impacted by the Maritime Emergency Response Commander's decisions.[20] Australia has found that, overall, a predetermined mutual understanding between all levels of government,

[19] *MSC Napoli Incident: Maritime and Coastguard Agency's Response*, Maritime and Coastguard Agency, 2008.

[20] *National Plan for Maritime Environmental Emergencies*, Australian Maritime Safety Authority, 2014.