

Risk Communication Between Companies and Local Stakeholders for Improving Accident Prevention and Emergency Response



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Abstract Hazardous industrial areas pose major accident risks. In recent years, two innovative approaches have been used for improving accident prevention and emergency response beyond conventional regulatory requirements: the Seveso and RMP models of local involvement in state regulation. Both promote information sharing and enable direct engagement between companies and local stakeholders, and therefore involve extensive risk-related communications. The authors examine the two approaches in detail by using case studies of their application to hazardous industrial sites in Norway and the US and identify obstacles to their implementation. Nevertheless, they conclude that the approaches advance corporate social responsibility and make risk governance more democratic, respectful, and responsive to the population sectors that are most vulnerable to major industrial accidents.

Keywords Hazardous industry · Risk governance · Risk regulation
Risk communication · Major industrial accidents · Emergency response
Safety regulation · Local stakeholders · Seveso Directive
Risk management plan rule

Introduction

Hazardous industrial activities pose risks of major accidents, as shown by occurrences at AZF-Toulouse (2001), BP-Texas City (2005), and Chevron–Richmond (2012). Those most likely to be injured or killed are workers, emergency responders, and neighboring residents. In addition, there is usually substantial damage to the environment and property.

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The regulatory toolbox for preventing such accidents includes prescriptive- and performance-based regulations on workplace safety and safety management (Hood et al. 2001; Aven and Renn 2010; Baldwin et al. 2012). It also includes rules that require risk information sharing between a hazardous enterprise and its host community in order to foster their constructive engagement in emergency preparedness, with the EU Seveso Directive (2016) and the US Risk Management Plan Rule (2016) as the leading examples. These approaches stimulate extensive risk communications and, in some cases in the US, have led to the negotiation of a “Good Neighbor Agreement” (Kenney 2004) between local stakeholders and companies that stipulates specific accident risk-reducing initiatives for company implementation.

In a FonCSI research project, the authors examined the Seveso Directive (SD) and the Risk Management Plan and Good Neighbor Agreement (RMP/GNA) approaches and developed several case studies. Our findings indicate that these approaches for informing and engaging communities and local stakeholders are at the forefront of progressive policies that promote corporate social responsibility for public safety. In theory, they promote transparency, information sharing, dialogue, and respect for community concerns and local knowledge. But their implementation encounters several obstacles due to institutional structure and regulatory practices of risk governance, and disputes about risk assessments, differing goals of local participants, and cultural contexts. We also gained insights about risk communication and the trust-building issues that need to be addressed for such communications to lead to acceptable outcomes. These are among the main features of this chapter.

Analytical Framework

Governance of major accident risks involves many types of social controls, including regulation, self-regulation, liability law, values and behavioral norms, and private decision-making by investors, insurers, and consumers (Baram and Lindøe 2014). Each type of social control is a dynamic subsystem that coexists with, but does not necessarily complement the other controls. Some are international in scope, such as the collective wisdom of experts in a particular knowledge domain who contribute to the development of standards and safety management systems.

The SD is a key part of such governance in the EU, as is the RMP in the US. Each requires a hazardous enterprise to disclose and share accident risk information with host communities and local stakeholders, and thereby creates a direct linkage for further communications between the enterprise and the local public. This fosters subsequent risk communications, dialogue, and can lead to voluntary initiatives for improving accident prevention and emergency response. Neither approach prevents regulators from enforcing safety rules and addressing residual risks.

Figure 1 depicts the main actors, their relationships, and pathways of risk communication.

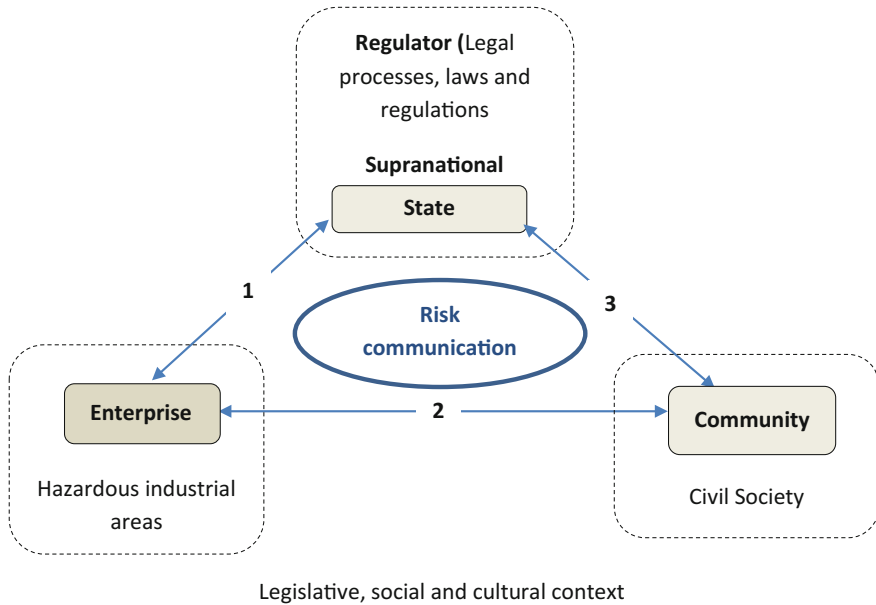


Fig. 1 Analytical framework

The state as regulator oversees and enforces the SD/RMP approach and can intervene with additional information when necessary (1, 3). The hazardous enterprise must share specific types of accident risk information with the state, the community, and local stakeholders (1, 2). The community and stakeholders have the right to provide local knowledge and other risk information to the enterprise and the state, and have dialogue with both (2, 3). What is special about the SD/RMP model is that it clearly establishes the important linkage (2) between enterprise and community or local stakeholders for risk communication, engagement, and dialogue that can lead to voluntary risk-reducing arrangements (OECD 2016). Thus, safety may be improved beyond the requirements of conventional regulations.

Finally, the analytical framework encompasses other social controls. Those that may be particularly influential in shaping the roles and communications of the actors under the SD and RMP regimes are listed in Fig. 2.

Mandates for Information Sharing and Dialogue

The Seveso Directive

Major industrial accidents have occurred worldwide. In Europe, the Seveso accident in 1976 prompted EU adoption of a Directive aimed at the prevention and control of

Characteristics	Examples
Enforceable Laws	Administrative Law Land Use Law & Permit Requirements for Siting and Operating Hazardous Facilities and Activities. Regulation of Workplace Risks & Safety Management Rules on Public and Worker Right to Know
Voluntary Policies	European Eco-Management and Audit Scheme Company Safety Management and Internal Controls ISO 14001 -a generic management system standard Global Reporting Initiative
Generally Accepted Guidances	International Risk Governance Council model ISO 26000 Guidance on Social Responsibility

Fig. 2 Influences on SD and RMP implementation

such accidents. The latest version of the Seveso Directive (SD) now applies to around 10,000 industrial establishments where dangerous substances are used or stored in large quantities, mainly in the chemicals, petrochemicals, storage, and metal refining sectors.

The SD obliges member states and affiliated countries like Norway to ensure that facility operators have a policy in place to prevent major accidents. Operators handling dangerous substances above certain thresholds must regularly inform the public likely to be affected by an accident, provide safety reports, and have a safety management system and an internal emergency plan. EU members and affiliates must ensure that emergency plans are in place for the surrounding areas and that mitigation actions are planned. Account must also be taken of these objectives in land-use planning.

There is a tiered approach to the level of controls: the larger the quantities of dangerous substances present within an establishment, the stricter the rules. Therefore, “upper-tier” establishments with larger quantities than “lower-tier” establishments are subject to tighter control.

The SD has been amended over the years, most recently as Seveso III in July 2012. The Directive has technical updates to take account of changes in EU chemicals classification, affirms that member states and affiliates must ensure that operators have a policy in place to prevent major accidents, and sets stricter standards for inspections of establishments to ensure more effective enforcement of safety rules. The SD also affirms the legitimacy of public stakeholder involvement in its expansive approach to risk governance, and is thereby complementary with laws such as Norway’s “working environment” law which establishes roles for the workforce in various aspects of workplace risk governance. Local stakeholders are

further empowered by amendments in the SD III that provide (1) better access for citizens to information about risks resulting from nearby companies, (2) requirements about behavior in the event of an accident, (3) more effective rules on participation by the public concerned, in land-use planning projects, and (4) access to justice for citizens who have not been granted appropriate access to information or participation. There will also be legitimate roles for public access to risk governance proceedings. Industrial parks and the risk of domino effects of incidents and accidents have been one of the areas addressed in the enforcement and implementation of Seveso inspection. A number of innovative strategies for proactive risk management have been employed by inspection authorities to encourage cooperation among the actors (Larsen et al. 2012).

The Risk Management Plan Rule and Negotiated Agreements

Several US laws and regulations require industrial disclosure of risk information to persons exposed to hazardous industrial activities (Baram 1990). The Worker Right to Know rule ensures that workers have access to information about the hazardous substances in their work settings. The Community Right to Know law provides that states and communities have access to company reports on the types, volumes, storage, and emissions of the hazardous substances at their facilities. And the Risk Management Plan rule (RMP) was subsequently enacted and requires some 15,000 companies using specified types and quantities of chemicals, and who thereby pose risks of major accidents, to provide the Environmental Protection Agency (EPA), states, and host communities with a report containing an accident history, worst-case and alternative release scenarios and their estimated consequences, a program for preventing accident risks, an emergency response program, and a plan for implementing the programs.

At the time the RMP was enacted, Congress and EPA envisioned that the reported information would enable dialogue between communities and companies that would lead to improved emergency response capabilities and voluntary risk-reducing initiatives by the companies. However, fear of terrorist incidents and their manifestation on September 11, 2001 caused high-level officials and EPA to restrict open public access to some of the RMP information, especially with regard to analyses of the offsite consequences of the accidental release scenarios (Beierle 2003). Nevertheless, RMPs, some with scenario consequence information, are usually provided to a host community's Local Emergency Planning Committee (LEPC) and made available to the public at some 50 federal reading rooms across the country (Risk Management Plan Rule 2016). In addition, the RMP rule has encouraged LEPCs in major industrial area to work closely with companies on improving and coordinating emergency response plans, take an active role in reviewing RMPs and securing further gap-filling information, and help community officials and local stakeholders engage in dialogues with companies about risk-reducing measures (Walter 1998).

These informational developments have also activated groups of local stakeholders and community leaders to press companies to make operational changes that reduce accident risks and improve emergency response capabilities. In a number of communities, dialogues with industry have occurred and led to negotiation of “Good Neighbor Agreements” (GNAs) with companies (Kenney 2004; Baram 2016). The negotiation process typically involves addressing a cluster of concerns over proven and perceived risks and impacts, unlike traditional risk regulation that requires a separate agency-managed proceeding for each risk or impact. It often involves demands for company internal information that exceed what is required in regulatory proceedings, and draws the attention of the media and public support. Agreements with risk-reducing and emergency response commitments have been negotiated with many types of companies, including global majors with US facilities such as Shell, Rhone-Poulenc, and Chevron.

Overall, studies of GNAs show that many company commitments were implemented, especially commitments which focused on preventing the recurrence of a prior injurious event and improving emergency response services. Perhaps, the most notable achievements of many GNAs are informational and involve company commitments to allow and pay for independent health and safety audits of the company’s operations, to act upon audit recommendations for improvements, and to accept public involvement in the audit process and public review of relevant documentation.

Case Studies

Three case studies are briefly summarized here by characterizing the industries and local communities (*cf.* Relation 2 in Fig. 1). All the cases involve production, storage and transport of gas, and oil and chemical products where leakage, loss of control, and other foreseeable circumstances could lead to explosion, fire, and harmful discharges resulting in loss of lives, injuries and severe health consequences among workers, emergency responders, and local residents. These hazardous activities are in or close to urban areas with housing, public areas, and vital public infrastructure such as transport. Figure 3 gives some characteristics of the cases.

Risavika, Sola Municipality

The Hazardous Industry

As a regional, national, and international logistics hub Risavika covers 400,000 m², with 120 enterprises and about 7000 workplaces (DSB 2015b), the harbor has been developed since the 1950s, and it includes seven quays with three different owners

Case:	Norway: Seveso Directive		US: RMP-rule
	Risavika, Sola municipality	South Port, Oslo	Chevron, Richmond
Activity	LNG-production, storage of goods, harbor and passenger terminal.	Storage and transport of chemicals, gas and oil products	Production and storage of oil products
Industrial structure	One LNG producer and a diversity of 120 companies.	35 major and minor companies	Chevron as the only major actor
Governmental actors	LNG-producer and harbor with public ownership. State level regulators.	Ports and industrial areas with public ownership. State level regulators.	City of Richmond, Contra Costa County, California, & national regulators.

Fig. 3 Characteristics of the cases

operating 25 ships day and night. The production in the area is divided between three main activities: industrial production (30%), storage and transport (25%), and service providers (20%). Some major companies within the petroleum sectors are located in the area: ConocoPhillips, Baker Hughes, Schlumberger, Halliburton, and Norwegian Shell. In 2005, the Lyse Group, owned by 16 municipalities in Rogaland County, planned to establish an LNG plant in Risavika with a production of 300,000 ton of LNG per year. The gas is temporarily stored in a 30,000-m³ tank before being transported by road or sea. For a more environmentally friendly fuel source, Norway and EU policies require a shift from diesel oil to LNG for maritime transport. In line with the new policy, new passenger ferries powered by LNG have been developed. Due to their travel scheme, they have to be loaded with liquid gas while passengers are embarking.

Surrounding Community and Risk Communication

North of the industrial area, there is a dense housing area, kindergarten, schools, churches, and public playing areas. Further away, a local center with shops and service facilities are located. In 2006, protests and complaints were raised against the plan of locating the LNG plant in the area. In the public consultation, process citizens requested more specific analyses of possible impacts and risks. Formal complaints were addressed to the County Governor and state agencies, notably the Directorate for Civil Protection (DSB 2015b), which is responsible for the fire and explosion legislation and for coordinating the enforcement of the Seveso Directive, as the plant would clearly be subject to these regulations. The public debate in the

press between these key actors opened a public space for risk communication and mobilized more stakeholders in the local community (Vinnem 2010). Lyse engaged experts and organized public consultations in which focus group meetings were held, including residents living close to Risavika, enterprises located in the area, emergency services, and other experts on risk appraisal and evaluation (Drottz-Sjöberg 2008). Criticisms spanned the whole spectrum of conditions, decision-making processes, and perceived risks. In particular, the quality of the initial risk assessments was questioned in terms of assumptions and scope, and the availability of information and the involvement of stakeholders in the process were severely criticized. Further, they reviewed the existing risk assessments and how the planned and implemented measures would reduce the risks to a presumably tolerable level (Vatn 2010). Series of meetings, consultations, complaints, and decisions took place involving a number of actors, from local citizen groups to responsible ministries and even the EFTA Surveillance Authority (ESA).

When ferries were planned to be loaded with LNG at the terminal building, a new round of public controversy took place. Regulation for fueling LNG to passenger ferries falls between onshore and maritime rules. LNG is transported by trucks 1600 km through Southern Norway and Sweden to the ferry's destination port in Denmark. A new regulation developed especially for Risavika came into force in December 2013.

The South Port, Oslo

The activities in the South Port, just 3 km from central Oslo, began at the end of the 1930s (DSB 2015a). Since then, the scope of activities has gradually increased. The port is arguably Norway's most important logistics and transport hub, with well-established residential areas to the south, and a large residential area is in progress to the north. In the late 1990s, it was decided to develop the waterfront to increase public access to the harbor areas. The so-called Fjord City Project is the largest urban development project in Oslo and includes residential areas, enterprises and workplaces, hotels, restaurants, cafeterias, parks, and promenades.

The Hazardous Industry

Today, the South Port comprises all or most of the industrial activities in the Oslo harbor area. The port is the largest container port in Norway and the largest terminal for the storage and distribution of petroleum products, including all jet fuel for Oslo Airport. About 40% of the national consumption of road traffic fuel goes through the port. The area comprises some 35 firms with port-related activities. Encompassing a large number of enterprises with varying degrees of interdependence and requirements for coordination, South Port became an area with increased risk. Many risk-prone activities are concentrated in a small area, in particular, the transport and

storage of petroleum products. There is a possibility of domino effects. In sum, this can result in lack of oversight and consistent management, and insufficient clarification of interfaces and responsibilities. During the last 15 year, a variety of incidents and accidents have taken place in the area: explosion in the underground storage of oil, collision between train and tank truck, overfilling of diesel oil when unloading from ship, three workers killed, and major damage when a set of railway wagons rolled uncontrolled into the harbor (DSB 2015a, pp. 84–85).

Surrounding Community and Risk Communication

The South Port is located close to districts in Oslo with a population of approximately 100,000.

Due to the development in downtown, the population expects to increase with 4–5000 residential units and approximately 20,000 workplaces. The Port of Oslo administers the harbor area on contract relations based on a “shopping mall model” and their own role as “landlord”. In terms of safety, this implies that tenants are kept at arm’s length, with each enterprise responsible for its own safety and risk management. As a consequence, a systematic dialogue among stakeholders on risk issues regarding neighboring populations or the development of “Fjord City” and the South Port has taken place before DSB raised the issue in their report. The worst-case scenarios, described in the report, include an ignited leak of gasoline and an oil fire with gas driving toward downtown Oslo. The case was reported in headlines in one Oslo-based newspaper, but no further media coverage or public debate followed. As a follow-up to the report, and as an element in increasing emergency preparedness related to incidents at the South Port, a full-scale exercise among responsible actors and emergency agencies was initiated in 2015 (DSB 2016).

Chevron, Richmond

Richmond, nearby San Francisco, is home to one of the biggest oil refineries in the United States. Now owned by Chevron Corporation, the refinery was built in 1902 in a “tiny railroad settlement”. As the refinery and port facilities grew, so did the town, which now has over 100,000 residents. Chevron has long been the largest employer as well as one of the biggest polluters. Its troubled history includes fires, explosions, spills, and other accidental releases of toxic chemicals, significant leaking (“fugitive emissions”) of air pollutants, unsightly premises, unwillingness to engage with local stakeholders, and attempts to finance and influence political developments (Chevron Wikipedia 2016; Mattera 2016).

Richmond is a diverse community with different factions competing for political primacy. After the refinery was identified as the San Francisco Bay Area’s largest polluter in 1982, Richmond residents began “Environmental Justice” activism. In

the mid-1980s, the National Toxics Campaign sent an organizer who helped create a local stakeholder group, the West County Toxics Coalition (WCTC) in North Richmond, a chronically impoverished area. WCTC activities have continued and focus on holding Chevron accountable for its accidents and pollution impacts. Another national organization, Communities for a Better Environment (CBE), also set up a local branch in Richmond and published an influential study of environmental justice issues (Kenney 2004).

In July 1993, a safety valve ruptured on a railroad car located on Chevron property. The valve leaked aerosolized sulfuric acid into nearby communities over a range of fifteen miles, causing 24,000 local residents to seek medical treatment. In the following year, Chevron and the community signed a Memorandum of Understanding (MOU) in which Chevron committed to taking action on several concerns including plant-wide replacement of valves, fence-line monitoring of specified air pollutants for data that would lead to further controls, waste cleanup and aesthetic improvements, areas for recreation, and funding for several community needs (Macey and Susskind 2003).

Nevertheless, accidents and emissions of pollutants that threatened public health and safety continued and actually worsened over the following years. In 2007, the EPA reported that Chevron had produced over 900,000 lb of toxic waste and that the Refinery was in “high priority violation” of EPA standards. Then, in 2012, a major fire took place at the refinery. After a leak was observed in a corroded carbon steel pipe containing hydrocarbon process fluid and several repair attempts failed, the decision was made to shutdown the refinery. But prior to shutdown, “hot work” repairs on the corroded pipe caused an explosive release of a vapor cloud that immediately ignited, causing a fire that sent a large plume of pollutants across the Richmond area. Nearby residents were instructed to take shelter with their windows and doors closed. 15,000 people from the surrounding community subsequently sought medical attention for respiratory complications due to the fire (Chemical Safety Board 2013a).

Residents claiming they are “disproportionately impacted” joined a multi-organizational protest March that gained international publicity. Community groups have brought several lawsuits against Chevron and the City of Richmond also went to court to seek orders that would bring about a new safety culture at the refinery. Several state and federal agencies and the national Chemical Safety Board (CSB) investigated the accident and presented findings at public meetings.

CSB reports identified technical, organizational, emergency response, and safety culture deficiencies at the refinery and inadequacies in the relevant industry codes. They also noted that the failed pipe should have been replaced earlier with an inherently safer corrosion-resistant alloy that the leak should have led to shutdown of operations before repair was attempted, and that reluctance among employees to use their “Stop Work Authority” and substandard equipment maintenance were evidence of a deficient safety culture (Chemical Safety Board 2015). The final report was presented at a public meeting in Richmond on January 15, 2015. Chevron refused to attend but responded in a letter in which they accepted most of the CSB findings and recommendations but disagreed with other findings as an inaccurate depiction of its process safety culture.

Public Engagement and Risk Communication

In this section, we will look at characteristics and findings from, respectively, the Norwegian and US cases with the aim of exploring public engagement in assessing, interpreting, and responding toward hazard accompanying industries within the communities.

Learning from the Norwegian Cases

The two Norwegian cases can be described both with similar and different characteristics. The similarities are *structural* with locations nearby urban areas, public ownership, a major seaport, and a complex diversity of companies with a variety of hazardous activities. The differences are *processual* and *communicative*, showing how state agencies and local actors respond, respectively, reactive and proactive in assessing and communicating risk issues. By using our analytical framework, three factors seem to be of relevance for the outcomes: First, limitations of the regulator in preventing and handling critical incidents and accidents creating domino effects affecting surrounding communities and environment; second, the conflicting roles with public ownership and third, the contextual and cultural basis for engagement within “local risk society” (Lindøe and Kringen 2015).

First, in Norway the state-managed approach to regulatory tasks is distributed horizontally as well as vertically among several ministries and national regulatory agencies. County governors at the regional level and local authorities including municipal planners give permission for locating hazardous industries. Emergency responses including fire services are organized at the municipal level. National port regulations specify the economic independence of the ports, and the ISPS Code imposes port security requirements.¹ The Seveso Directive and other safety regulations are in place for the storage, handling, and transport of dangerous substances. The two cases highlight a major weakness within the regulatory framework, as shown in Fig. 1. Most safety regulations are implemented either by the state directly or delegated to county or municipality (1) are directed toward an individual enterprise. They do not call for an overall or holistic risk governance process when several enterprises or activities are sited in close proximity to each other. As a consequence, no holistic risk assessment regarding vessel traffic activity has been provided either by the Port of Oslo or Risavika, or by national coastal authorities. Although the county governor coordinates governmental regulation of municipalities,

¹The International Ship and Port Facility Security Code (ISPS Code) is a comprehensive set of measures to enhance the security of ships and port facilities, developed in response to the perceived threats to ships and port facilities in the wake of the 9/11 attacks in the United States. The ISPS Code is implemented through Chap. XI-2 Special measures to enhance maritime security in the International Convention for the Safety of Life at Sea (SOLAS), 1974.

administration of the regulations is fragmented, and the regulations are less suited for addressing the composite risks that are encountered in industrial parks and ports. In Risavika, the locations of the LNG plant and the ferry terminal were largely handled as separate issues and the aggregated accident risks were insufficiently evaluated. However, the SD III has potential value because it addresses the clustering of hazardous enterprises and domino effects by requiring member states to identify groups of enterprises where the danger of a major accident is increased because of their location, activities, and the proximity of dangerous substances. In such cases, the exchange of information and cooperation among the enterprises is required and the coordinating mechanisms are anchored in enforcement of the SD, and to some extent in Norwegian HSE regulations.

Second, the public ownership of the harbor and industrial areas introduces multiple and partly conflicting goals, likely creating role conflicts for key stakeholders, particularly at the local level. Ports are often part of municipal developmental schemes that involve tradeoffs between benefits and risks, and socioeconomic considerations may tend to overshadow risk concerns, as in the South Port case. Public involvement and ownership should normally ensure democratic and trustworthy control mechanisms. The information on which public actors must base their decisions relies largely on risk studies from companies that have been developed by their contracted experts. These raises concern about the objectivity of risk assessments and risk communication. Such processes can lead to public mistrust as seen in Risavika. When the public is unable to deal with theoretical risk estimates related to their “real world”, or with disagreement among risk experts, mistrust may escalate and risk communication became a vicious circle. In Risavika, conflicts afflicted “the social contract” between the owner of the LNG plant and the municipality on one side and stakeholder groups and individuals within the local communities on the other side. The most contentious issues were the quality and relevance of the risk assessments, and the decision process for locating the LNG plant. The case illustrates the ambivalent and contested power of knowledge in proceedings where experts differ over risk assessments and frustrate the public’s quest for certainty.

Questions raised in the community were “Is the location correctly selected, and can we live with this industry close to our door?”. While a risk expert from the local university brought the risk issue onto the public agenda with strong criticism of the enterprise and the municipality, he was opposed by other experts (Vatn 2010). The heated public debate that followed appeared to be a reaction to uncertainties regarding the risk of possible events and to the mixed roles and interests of stakeholders in the project.

Third, different social climates in the two cases may have influenced perceptions of risk among stakeholders and civil society. In this respect, the two regions differ. Risavika is in the county of Rogaland, which also includes Stavanger, an exceptional area because it is the “Oil and Gas Region” of Norway. Industries, professionals, and media have over the years fostered a strong public awareness and attention to risk with extensive media coverage of incidents and accidents. This region also has considerable clusters of experts in safety research, education, and

consulting. These factors may have contributed to the public engagement, media debates, and interventions among local citizens. The Oslo region lacks most of these features and is mainly focused on developmental benefits rather than on risks. A worst-case scenario indicates that an accident caused by a major leak of petroleum from a tanker in South Port and ignition and the spread of smoke and gas would endanger the whole area toward downtown Oslo including housing, public areas, and the iconic Opera building. Although a greater worst-case risk is posed in South Port than in Risavika, there has only been one newspaper article and no public engagement or debate followed.

Learning from the Chevron–Richmond Case

Chevron's Richmond refinery is subject to a multitude of safety and environmental regulations that are enforced by federal and state (California) agencies. It must also secure several permits from county, regional, and community (Richmond) units of government that set operational requirements. This regulatory framework includes the RMP rule and is supplemented by other components of risk governance (CCHS 2016).

Nevertheless, refinery operations have caused hundreds of accidents, spills, and other harmful events over several decades, with many attributed to regulatory violations. As a result, Chevron is continuously defending against enforcement actions and lawsuits, and has paid tens of millions of dollars in penalties and damage awards (Mattera 2016). Our research, which included the review of extensive reports (Macey and Susskind, Kenney, etc.) and other documentation and numerous interviews in Richmond, leads to the conclusion that the company, in aggressively implementing its business plans, subordinates regulatory compliance and avoids engaging with the public and taking other voluntary actions except when it needs a permit to continue or expand operations.

In the modern era of industrial safety, the Richmond refinery ranks as a worst case. As such, it provides an opportunity to understand the circumstances that undermine the effectiveness of the RMP rule and enable the continuation of its accident-causing operations. The undermining circumstances arise mainly from (1) the high socioeconomic value of the refinery and the low economic condition of the community, and (2) national security policies and the failure of the oversight agency, EPA, and the company to provide the factual information and analyses needed for effective risk communication and dialogue.

Federal and state regulators, knowing that the refinery's operations are of considerable importance to the national and state economies, dutifully take enforcement actions to punish noncompliance but tailor them to avoid impacting operations to the extent that their societal value would be impaired. Absent the threat of severe sanctions, this highly profitable company absorbs the penalties and other monetary loss consequences of their accidents and violations as costs of doing business,

continues to subordinate regulatory compliance, and sees little need to engage in risk communications and dialogue with local stakeholders.

Similarly, local officials with permit granting authority know that refinery operations are essential to the Richmond economy (e.g., jobs, tax revenues, and local suppliers). They also know that despite many factions in the city with different objectives and conflicts between them, there is an underlying position shared by most if not all in Richmond, namely to keep the company in Richmond and not drive it elsewhere. As a result, permit requirements are carefully crafted to address issues by means that are acceptable to Chevron. Company promises to provide jobs and job training, and contribute funds for social services and other community betterments have also influenced community decision-making. The company has also made political contributions to change community leadership.

In addition, the potential value of the RMP rule for promoting meaningful, risk communications, engagement, and dialogue between the company and local stakeholders has not been realized. One reason is that national security policies have constricted information sharing, making it more difficult for local stakeholders to access critical information about a particular facility's accident hazards, safety management program, and offsite consequences, as noted earlier (Beierle 2003).

Another reason is that RMP implementation by the EPA has been weak. As reported by the Chemical Safety Board (CSB), EPA has not required accident risk reduction nor required that the company demonstrate that its safety systems are functioning, and the EPA regional office lacks sufficient resources to fully inspect and audit the numerous high hazard facilities within the area. The CSB concludes that the RMP program as applied by EPA to refinery operations has not resulted in Chevron's development and documentation of sufficient factual information and analyses needed for control of major accident hazards and risks (Chemical Safety Board Regulatory Report 2013b). Thus, EPA, as well as Chevron, has deprived local stakeholders of the factual information and detailed studies needed for effective risk communication and dialogue.

Finally, it is instructive to consider the case in which Chevron secured the permits it needed to change and expand refinery operations in order to meet new federal requirements for an environmentally friendly reformulated gasoline (Kenney 2004; Macey and Susskind 2003). Permit approvals were granted in 1994 by the City Council and a regional regulator despite Chevron's performance record, the occurrence of a spill and a major accident at the refinery during the permit application process, and deep mistrust and hostility among Richmond residents. In addition, a Mitigation Task Force comprised of three environmental organizations and Chevron negotiated a GNA that contained additional company commitments.

Some of the Chevron commitments expressed in the permits and the GNA involved reduction of emissions of toxic chemicals, replacement of leaking valves, and cleanup of contaminated and unsightly premises. But many others involved its funding of community social and health services, recreational facilities, and other community betterments. This patchwork approach, sweetened by company

donations, did not provide a foundation for continuing engagement, communications, and dialogue, nor did it contribute to building a safety culture at Chevron. As a result, the company continues to incur accidents, polluting occurrences, and community hostility.

Conclusion

Our point of departure has been conflicts that arise when companies with hazardous activity cause local concerns about risks, impacts, and their consequences for the safety of workers, public health, and the environment. The analysis has identified different approaches and “modeling” of the risk governance process and the company–community relationship. The Norwegian cases with industrial areas and harbors represent a “regulatory model” that is administered by the state, involving many regulatory agencies and addressing the interest and concerns of stakeholders within the national legal framework as well as the European Seveso Directive. The US case with a huge refinery operation similarly involves national regulation, including the RMP rule, and also involves regional and local permit granting authority. It leaves the door open for company and community (or citizen groups) to voluntarily negotiate an agreement on specific steps to be taken to resolve residual risks and community concerns. It also enables negotiation of company donations for improving the community’s social programs. Each model has special features, contextual circumstances, and implications which differ from the familiar features of traditional regulatory and permitting procedures.

As presented in the analytical framework (Fig. 1), the SD and RMP components of state regulation should be viewed as complementary policies for information sharing and promoting engagement and dialogue between a company and its community, including the workforce and local stakeholders. They also enhance transparency of proceedings and respect for community concerns and local knowledge (Lindøe 2017).

Our assessment has shown that obstacles to implementation can arise. They include the following:

- Insufficient coordination of the regulatory framework causing a fragmented approach to risk,
- Technical complexity and stakeholder confusion arising from competing experts,
- Competing or conflicting interests of multiple stakeholders,
- Concerns about security that restrict the flow of risk information and communications,
- Prioritization of economic and developmental interests that subordinates local concerns about health and safety,
- Lack of factual detail in the company information provided.

Nevertheless, the societal benefits being gained, despite these troubles, justify robust implementation of the SD and RMP approaches. They move corporate social responsibility from theory to practice and establish a pathway for discourse between company and community. They confirm the legitimacy of local stakeholders for participation in risk decision-making on hazardous industrial operations and thereby enable a more sensitive and holistic approach to risk issues by regulators and companies. Overall, they contribute to making risk governance more democratic, respectful, and responsive to the population sectors that are most vulnerable to major industrial accidents.

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