

**Faculty of Humanities, Social Science and Education  
Department of Sociology, Political Science and Community Planning**

# **Oil spill emergency response in the Barents Sea**

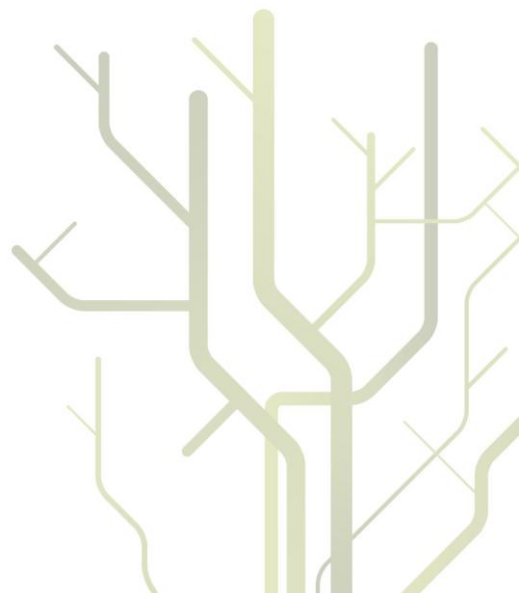
**Issues of interorganizational coordination**



**Maria Sydnes**

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*To my parents*



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Tromsø, December 2011

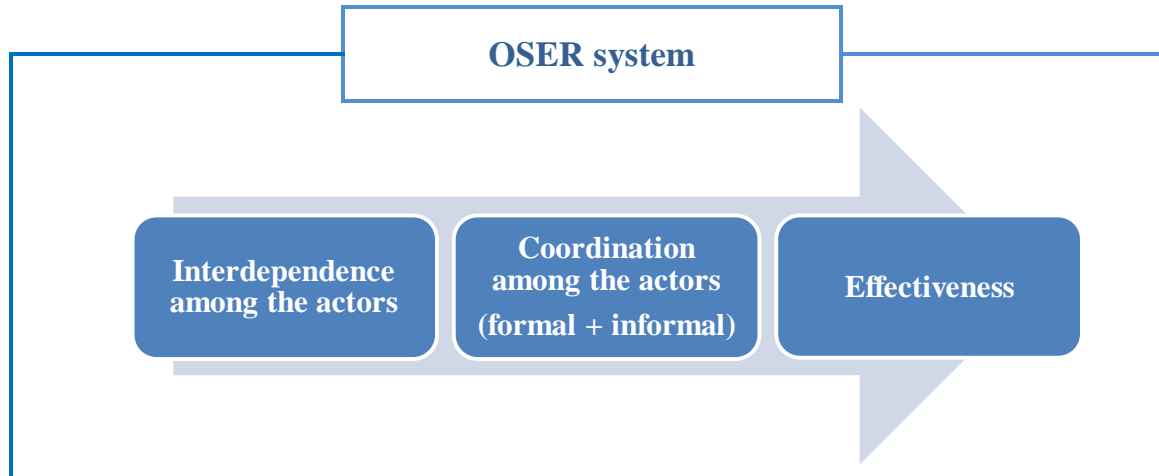
Maria Sydnes

## Summary

As long as oil spills are a reality (International Maritime Organization, 2005, p. 3; Davidson et al., 2008; Kirby and Law, 2010) oil spill emergency response (OSER) remains an important policy and research topic. OSER is a complex and dynamic cross-disciplinary activity that unfolds in a continuously evolving and at times highly uncertain environment. The greater the scale of the oil spill, the larger the number of actors involved. The effectiveness of an OSER system is a function of the ability of these actors to work together to ensure that containment, clean-up and disposal activities are conducted. The need for interaction among multiple organizations entails unique organizational problems of interorganizational coordination.

Interorganizational coordination in OSER systems is the focal point of this study. I have formulated the following research questions: (1) *what are the basic characteristics and determinants of the organizational structure of an OSER system?* (2) *how do formal and informal mechanisms of interorganizational coordination provide for the effective functioning of an OSER system?* (2a) *what is the relationship between formal and informal coordination mechanisms?* (3) *how do the patterns of interdependence among organizations in OSER systems affect interorganizational coordination?* The ultimate aim has been to study interorganizational coordination in oil spill response in order to shed light on whether and how it provides for the effective functioning of an OSER system.

The analysis is based on three variables, as shown in Figure 1. OSER systems are approached as organizational structures where numerous organizations interact on the basis of interdependencies related to the nature of OSER activities. Interdependence may facilitate or inhibit interorganizational coordination, depending on the circumstances. Coordination in turn affects the effectiveness of a system. Coordination functions as an intermediate variable: on the one hand, it is affected by interdependence; on the other, it influences the effectiveness of an OSER system. I see coordination as the simultaneous interplay of formal and informal mechanisms, i.e. as a compound variable. Therefore the focus is not on the individual effects of interdependence on formal or informal mechanisms.



**Figure 1. Variables in the study**

The thesis consists of two parts. Part I addresses the research project as a whole. Here I present the main research questions and discuss the theoretical and methodological approaches employed in the empirical investigation. Further, I present the main findings and discuss the conclusions. Part II contains the four research articles accepted for publication or published in various scholarly journals. I have written four articles, three as co-author. The articles are based on empirical data gathered in the course of studies of the OSER systems in Norway and the Murmansk region of Northwest Russia and a study of the bilateral Norwegian–Russian cooperation on joint oil spill response in the Barents Sea.

I chose to focus on Norway and Northwest Russia because of the increased risks of acute oil pollution in the Barents Sea. This is due to the rapid growth and projected increase of oil transport; and to anticipated offshore petroleum developments in the Norwegian and the Russian Arctic (AMAP, 2007; Arctic Council, 2009; Bambulyak & Frantzen, 2005; 2007; 2009; Eide et al., 2007; Kirby and Law, 2010; Ramboll Barents, 2010). What makes this especially important is that responding to oil spills under severe Arctic conditions is exceptionally difficult, and irreparable damage may be done to the vulnerable marine and coastal environment (Arctic Council, 2009; Eide et al., 2007; Ramboll Barents, 2010).

The studies in these research articles are all qualitative and are based on a case-study design. The data derive from interviews and textual documents. Academic knowledge on oil spill preparedness in Norway and Russia and on the bilateral cooperation between the two countries is limited. Therefore, my studies can stand as an initial research attempt to



investigate these topics. For this reason, much of the research effort has involved the empirical investigations. As the four articles share a common theme, and a similar analytical approach has been used, some overlaps are inevitable. In particular, articles I and II are partly based on the same empirical material, while articles II and III rely on a shared analytical approach. It should also be noted that the presentation of the material varies, due to differences in the formal requirements of the journals. This, however, has not affected their substantive content. Each of the articles represents a separate contribution to my investigation of the main research topic: oil spill emergency preparedness in the Barents Sea.

Article I was meant to fill in the knowledge gap regarding organizational aspects of OSER in Northwest Russia. The article outlines the formal organizational structure of the Russian OSER system and examines the formal relationship between the federal and the regional authorities and the subsystems of the OSER system in the Murmansk region of Northwest Russia. My main objective was to define the roles and functions of the major public and private actors and their relations in the OSER system. The findings of this article indicate that the national OSER policy and system in Russia has not been fully developed; it lacks a clearly formulated state policy and a single governing authority, has no unified structure, and is constrained by insufficient resources.

Article II explores interorganizational coordination in the OSER system in the Murmansk region of Russia. The OSER system is discussed as a structure based on interorganizational interdependencies which may both facilitate cooperative behaviour and induce competition. The findings indicate that the formal and informal mechanisms are in fact complementary. The formal coordination defines the roles and functions of the interacting organizations, establishing the operative coordination procedures and patterns of interaction on a daily basis. The informal coordination facilitates the effective functioning of the formal procedures and compensates for its gaps and shortcomings. Interdependence among the actors within the systems is based on a shared commonality of purpose. However, the commercialization of OSER services as a result of federal policy has led to competitive relationships, in particular among response providers.

Article III examines the Norwegian OSER system. The Norwegian OSER system is based on a unitary state policy where agreement on purpose and principles is shared among the participating organizations. The principle of collaboration where everyone contributes to the

common objective is an essential element of the culture of the OSER system. Formal coordination constitutes the core of the interorganizational coordination in the system. The informal mechanisms are synergetic in that they facilitate the effective functioning of the formal mechanisms of coordination. There is a continuous striving to strengthen the formal procedures by socializing the actors into the 'duty system' – the chain of command and control. Interdependence among the participants is based on a strong sense of common purpose, which promotes cooperative behaviour and strengthens interorganizational coordination.

Article IV is a case study of the bilateral Norwegian–Russian cooperation on joint oil spill response. The study examines the development and institutionalization of this bilateral regime, discussing the facilitators and inhibitors of cooperation and analysing its effectiveness in terms of outputs, outcomes and impacts. The findings indicate that the Norwegian–Russian cooperation on oil spill response functions as an effective bilateral regime.

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# Part I



‘At the very core of the practice of emergency management is the concept of coordination’ (Drabek, 2007, p. 217).

‘Response to a major pollution emergency is like standing up, overnight, a multi-million dollar corporation with three (or more) partners (Unified Command) ... The tremendous variety of entities (agencies, companies, organizations, individuals, etc.) that are partners, customers, suppliers and stakeholders in the business of emergency response have always posed huge challenges for emergency responders’ (Kuchin and Hereth, 1999, p. 2).

## **1. Introduction**

### ***1.1. Background and problem***

Accidental marine pollution is a subject of major international concern (Garnacho et al., 2010). In particular, oil transport at sea remains one of the major sources of risk (Ornitz and Champ, 2002; Håvold, 2010; Perry, 2009). Despite the substantial decrease in the number of large spills from tankers during recent decades due to implementation of new stricter regulations and better management practices (International Tanker Owners Pollution Federation, 2011), ship accidents are still a major input of oil pollution in the marine environments (GESAMP, 2007). Further preventive inputs are required (Eide et al., 2007). Oil transportation will continue to increase (International Energy Agency, 2010, p. 6), especially in the Arctic (ACIA, 2004; Arctic Council, 2009, p. 5), the area in focus in this project. Release of oil into the Arctic marine environment through accidental or illegal discharge from ships is an especially significant threat, so the highest priority should go to preventing oil spills, in order to protect the vulnerable Arctic environment (Arctic Council, 2009, pp. 5, 7).

Oil is a hazardous toxic substance. Major accidental oil spills in the marine environments may spread over vast territories, causing a wide range of negative impacts for the ecosystem (International Maritime Organization, 2005). Experience has shown that efficient oil spill

recovery at sea can be carried out during only approximately 60% of the year (Norwegian Coastal Administration, 2010a), and in most cases the amount of oil that can be contained close to the source is not more than 15% (Norwegian Coastal Administration, 2010a, p. 14).

In some environments, years may be required before the damage is fully repaired, and the impacts of large oil spills can last for decades (International Maritime Organization, 2005; Webler et al., 2010)<sup>1</sup>. The Arctic regions are areas of special concern with respect to oil spills due to the extreme weather conditions, vulnerable ecosystem, poor infrastructure and other specific challenges associated with responding to oil spills in cold environments (AMAP, 2007; Arctic Council, 2009; Patin, 2008). Methods for recovering spilled oil in an ice-covered Arctic environment are complicated and are currently limited (AMAP, 2007; Arctic Council, 2009). Environmentalists have warned, '[w]ere it to happen again today [in the Arctic], a spill the size of the 1989 *Exxon Valdez* disaster would likely prove equally as devastating' (WWF-US, 2009).

Oil spills are low probability but high consequence events (Harrald et al., 1990, pp. 15–16). In particular, large spills are potential disaster situations (Walker et al., 1994 p. 31–32). When a quick and massive response is required, no single organization has all the resources necessary to alleviate the effects of a disaster. A combined effort of multiple organizations is required. In any disaster, organizational integration becomes the most crucial dimension: '[w]hile in everyday affairs organizations implicitly are dependent on one another to meet routine problems, they are rarely called out in force to function effectively together as one unit. Yet this is precisely what is required in a disaster – the full mobilization and cooperation of interdependent organizations, which normally operate autonomously' (Form and Nosow, 1958, pp. 243–244, cited in Litwak and Hylton, 1962, p. 403).

This thesis argues that good organization and effective interorganizational coordination among the key actors are both key prerequisites and a major challenge for successful oil spill emergency response (OSER). Providing effective response to oil spills requires a functioning organizational structure that can allow all participating organizations to work together to achieve unity of effort (Ott et al., 1999; Stevens and Aurand, 2008). The effectiveness of this

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<sup>1</sup> The *Exxon Valdez* oil spill has made clear the scope of negative consequences of major spills and how persistent they can be. Twenty years after the spill the ecosystem has still not recovered and oil can still be found under rocks on the beaches of Prince William Sound (Guterman, 2009; Webler et al., 2010; WWF-US, 2009).



structure is a function of a combined and coordinated effort of multiple organizations (Coastal Response Research Center, 2006, p. 9; Stevens and Aurand, 2008; Tuler et al., 2007). Inability to achieve this may ultimately lead to failures in a response operation, as with the operation in connection with the grounding of the *Exxon Valdez* in Alaska on 24 March 1989 (Harrald et al., 1992, p. 199).

To define the organizational structure responsible for providing oil spill emergency response I have applied the term ‘OSER system’ in the study. This is a complex concept. On the one hand, it reflects on a *pollution response preparedness system* (Harrald, 1994, p. 203), which is an OSER system in a steady-state mode of operation. On the other hand, it reflects on the concept of an *emergency response management system* (RMS), which is an OSER system in an emergency mode of operation. An emergency response management system is an organizational subsystem created by a pollution response preparedness system in a state of incident and is defined as ‘the combination of organizational structure, management processes, individual roles, and operational strategy employed during an oil spill response’ (Walker et al., 1994, p. 15). In the articles presented here I have not differentiated between the two modes of operation. A general term, ‘OSER system’ has been applied, but the focus is on a pollution response preparedness system. The geographical focus on Norway and Northwest Russia makes it natural for the Norwegian and Russian OSER system to serve as the empirical context.

In line with the definition as a ‘social institution consisting of agreed upon principles, norms, rules, procedures and programs that govern the interaction of actors in specific issue areas’ (Levy et al., 1995, p. 274) I regard an individual OSER system as a regime. This allows me to consider an OSER system as an institution, which in turn provides an argument for using organization theory as the analytical framework for studying the Norwegian and Russian OSER systems.

By studying these systems, I wish to deal with the following research questions: (1) *what are the basic characteristics and determinants of the organizational structure of an OSER system?* (2) *how do formal and informal mechanisms of interorganizational coordination provide for the effective functioning of an OSER system?*; (2a) *what is the relationship between formal and informal coordination mechanisms?*; (3) *how do the patterns of*

*interdependence among organizations in OSER systems affect interorganizational coordination?*

## ***1.2. Research on oil spills***

In this study, *oil spill emergency response* is seen as an integrated part of emergency management (McLoughlin, 1985, p. 166) and defined as ‘[a]ny action undertaken to prevent, reduce, monitor or combat oil pollution’ (International Maritime Organization, 1995, p. 15). Studies of spill emergency response are part of the emergent social science literature on behaviour in disaster studies. This research tradition has evolved primarily in the United States and has concentrated on understanding and improving human responses to disaster events (Drabek, 1986). An initial effort to examine emergency response to disaster was made in 1920, when the Canadian Samuel Prince wrote the first doctoral dissertation on a disaster topic in social science (Drabek, 1986, p. 1). In his dissertation, he studied the convergence of people and supplies in response to the 1917 Halifax shipping explosion resulting from a collision between a French munitions vessel (the *Mont Blanc*) carrying trinitrotoluene and a Belgian relief ship near the docks of Halifax, Nova Scotia. This thesis had a massive impact on the investigation of the matter and laid the foundations for research on the collective behaviour in and organizational reactions to various types of mass emergencies in social science.

Research on oil pollution goes back to 1930s, but until the late 1980s, the primary focus was on the effects of oil spills on the environment and on various live species (Battelle Memorial Institute, 1967) and the technical aspects of oil spill response, not organizational issues (Harrald, 1994, p. 204). Review of the biennial Oil Spill Conference Proceedings articles published during the 1970s and 1980s shows a focus on technology and resources, with only limited attention to organizational issues (ibid.). With respect to oil pollution emergencies it was in particular the *Torrey Canyon* (1967) incident that moved the world community to recognize oil spills ‘as a specific regulatory issue’ (Walker et al., 1994, p. 23). The need for better structured knowledge and experience in the field was apparent (Battelle Memorial Institute, 1967).

With the establishment of the Disaster Research Center by sociologists at Ohio State University in 1963, organizational behaviour in disaster situations entered the study focus of the social sciences (Drabeck and McEntire, 2003, p. 98). Research within the field has spread to include all phases of disaster (preparedness, response, recovery, mitigation) and system levels (individual, group, organizational, community, society and international), where the latter reflects the increased structural complexity of human systems (Drabek, 2007). The need for disaster studies to look into ‘the patterns of ... interorganizational linkages, to indicate those factors which facilitate and those which hinder the overall development of interorganizational ties’ was indicated in the late 1970s (Taylor, 1978, p. 254). Since then, research has examined the problem of organizing for response (Rodríguez et al., 2007) and interorganizational coordination in particular (Drabek, 2007).

Within the disaster literature, research on emergent phenomena has been a central topic of discussion (Drabeck and McEntire, 2003). Established by Quarantelli (1966) and Dynes (1970 cited in Drabeck and McEntire, 2003, p. 98), who developed the well-known typology of emergent organizations, this debate was substantially expanded in the ensuing decades. There has been a special focus on contrasting two models that seek to explain emergent phenomena: command and control vs problem-solving structure. At the core of the debate is the criticism of the traditional command and control approach (Dynes and Quarantelli, 1976; Britton, 1989, p. 28; Harrald et al., 1992, p. 214; Walker et al., 1994, p. 42; Dynes, 1994; Neal and Phillips, 1995, p. 335; Weller, 1997).

The command and control mode is common in emergency management in general (Schneider, 1992), and in OSER management in particular (Walker et al., 1994, p. 25). Rooted in paramilitary approaches to handling crisis situations (Dynes, 1994), the command and control approach is based on ‘clearly defined objectives, division of labour, a formal structure, and a set of policies and procedures’ (Schneider, 1992, p. 138) and is therefore rigid and highly centralized (Britton, 1989; Dynes, 1994; Neal and Phillips, 1995, p. 327). As a rule, such a form of organization is more effective in stable, predictable environments (Neal and Phillips, 1995, p. 329). However, the environment of most emergencies, oil spills not least, is often chaotic and unpredictable, so a rigid and highly centralized form of management may prove ill-suited (Dynes and Quarantelli, 1976; Britton, 1989, p. 28; Harrald et al., 1992, p. 214; Walker et al., 1994, p. 42; Dynes, 1994; Neal and Phillips, 1995, p. 335; Weller, 1997). More flexible approaches (Walker et al., 1994) and forms of coordination (Dynes and Quarantelli,

1976) are often needed. As Walker et al. (1994) have argued, to be effective in a highly turbulent environment, an OSER system has to be dynamic and adaptive, capable of adjusting its size, complexity and functionality to meet the needs of the situation.

The emerging research field received greater impetus in the wake of the major incidents of the following years, which indicated new issues and challenges. The 1989 *Exxon Valdez* oil spill in Alaska is the disaster most frequently referred to, because it changed attitudes to oil spill planning and response within the USA and globally (Walker et al., 1994, p. 19; see also Harrald, et al., 1990; Harrald, 1994; Weller, 1997; Walker et al., 1994; Ornitz and Champ, 2002). Research began to look into how to improve the ability to organize oil spill response and establish an effective response management system. Among the subjects in need of further study, interorganizational coordination has been indicated (Coastal Response Research Center, 2006, p. 27).

This thesis contributes to the organizational, social studies of oil spill emergency response and therefore belongs to the field of hazard and disaster studies within the social sciences. My aim is to contribute to our understanding of organizational behaviour and the processes of interorganizational coordination in OSER systems. The four articles that make up the body of this dissertation do not study particular emergency situations. Although I look at how an emergency may affect OSER systems in terms of structural changes, the main focus is on the steady-state mode of operation of OSER systems (see Walker et al., 1994, p. 16). The multiplicity of actors and functions within OSER systems makes it impossible to include them all. Therefore, this study is limited to the analysis of the key actors and their mandates. It is not my objective to discuss the physical or technical aspects of OSER activities. The choice of literature has centred on work – conference papers and research articles in particular – dealing with the organizational aspects and effectiveness of OSER. In addition, I have analysed general literature on disaster management and emergency planning that is not specifically related to oil spill response, in order to understand the conceptual origins of the organizational arrangements used in responding to emergencies. This literature was especially relevant as regards the role of informal coordination mechanisms in OSER systems that (as this study will show) are commonly based on the command and control approach.

### ***1.3. Research purpose***

The purpose of this study is to contribute to organizational studies of oil spills. The subject of interorganizational coordination which brings together the organizational entities in oil spill response has been pointed out as a specific research need (Coastal Response Research Center, 2006, p. 27). In this study, I examine how interorganizational coordination affects the effective functioning of an OSER system. The intention is to see how interorganizational coordination is established through formal and informal mechanisms in the Norwegian and Russian OSER systems and whether these mechanisms act complementarily and create synergies, or are non-compatible and in competition with each other. I examine the nature of interdependence among organizations within the Norwegian and Russian OSER systems and between the two systems in order to identify the incentives this creates for organizational behaviour in terms of coordination. And finally, I seek to define the characteristics and determinants of organizational structure in OSER systems and see how the components of the structure are interconnected.

Empirically, this thesis contributes to knowledge on oil spill emergency preparedness in the Barents Sea, specifically in Norway and Northwest Russia. I look into the organizational aspects, patterns of interorganizational coordination and effectiveness of the Norwegian and Russian OSER systems.

In terms of theory, I test the applicability of the analytical approaches to interorganizational coordination to the investigation of coordination in OSER systems. On the basis of the findings presented in the articles, I offer some reflections in chapter 5 on the OSER systems discussed in the articles in terms of organizational theory. In order to do this, I apply Mintzberg's theory on structuring of organizations (Mintzberg, 1983). The analytical propositions for this discussion are introduced in section 2.2 and applied in chapter 5.

Some words are in order about the limitations in the study. Given the wide range of tasks performed by an OSER system, it would have been impossible to focus on all of them within the scope of one thesis. My research has been delimited to the study of organizational aspects of OSER. I have concentrated on the legal aspects of OSER since they define the system; contingency planning as a means of providing coordinated and combined responses to oil

pollution incidents; and operational response, which is related to what actually happens in a situation of acute oil pollution and to some extent control. This focus on a specific aspect of OSER means that I have not sought to provide a comprehensive picture of this activity in its entirety. As this thesis has in many ways been an initial research effort to investigate oil spill emergency preparedness in Norway and Russia, it can be seen as a first step for more complex investigations in the future.

Issues related to data collection are discussed in section 3.6.

#### ***1.4. Structure of the thesis***

The thesis consists of two parts that should be seen as one coherent document. In Part I, I begin by presenting the background and research purpose of the study, discussing the analytical framework and my choices of methodology. In chapter 2, I discuss how the research topic was approached analytically and outline the key elements of the framework applied in seeking answers to the research questions. After discussing the complexity of oil spill response, I present an OSER system as the unit of analysis for this the study. Then I go on to examine an OSER through the lenses of Mintzberg's analytical approach to understanding the structuring of organizations, and develop an abstract model of an OSER system using his structural model. I further discuss the analytical propositions concerning the analysis of interorganizational coordination, interdependence and effectiveness of OSER systems. These sections provide the basis for the main research questions and analytical implications for the study. In chapter 3, I explain the choices in methodology and the collection of empirical data, especially the use of interviews and textual analysis. Towards the end of chapter 3 I comment on the quality of the study. In chapter 4, I present and summarize the main findings, which are then discussed in chapter 5. The overall conclusions of the study are presented in chapter 6.

Part II consists of the four articles. Each provides in-depth analysis and discussion of the specific research questions that, taken together, contribute to answering the main research questions. The four articles are complementary, as they all deal with various aspects of the main research topic, oil spill emergency response in the Barents Sea.

The articles are as follows:

**Article I:** Ivanova, M., 2011. Oil spill emergency preparedness in the Russian Arctic: a study of the Murmansk region, *Polar Research*, 30, 7285, DOI: 10.3402/polar.v30i0.7285.

**Article II:** Ivanova, M. and Sydnes, A.K., 2010. Interorganizational coordination in oil spill emergency response: a case study of the Murmansk region of Northwest Russia, *Polar Geography*, 33 (3), pp. 139–164.

**Article III:** Sydnes, M. and Sydnes, A.K., 2011. Oil spill emergency response in Norway: coordinating interorganizational complexity, *Polar Geography*, 34 (4), pp. 299-329.

**Article IV:** Sydnes, M. and Sydnes, A.K. The Norwegian–Russian oil spill response regime in the Barents Sea: an untold story of success. In: E. Røsæg & A. Proelss, eds. *Safety in the North*. Studies in international law of the sea and maritime law series. Baden-Baden : Nomos (2012 forthcoming).





## 2. Framework

This chapter presents and argues the analytical framework within which I seek to answer the main research questions. I outline the key points of the framework and discuss their analytical implications for the analysis. To summarize my analytical approaches, I have made a figure that shows the logical correlation between the main concepts examined in the study (figure 1). The study is based on three variables. One dependent variable is the effectiveness of an OSER system that is a function of interorganizational coordination. Coordination among individual organizations in an OSER system is another dependent variable, as it is subject to interorganizational interdependence. Consequently, the independent variable in the study is interdependence among the individual organizations in an OSER system. I return to the main elements in chapter 5, where I discuss their interconnectedness in terms of the empirical findings.

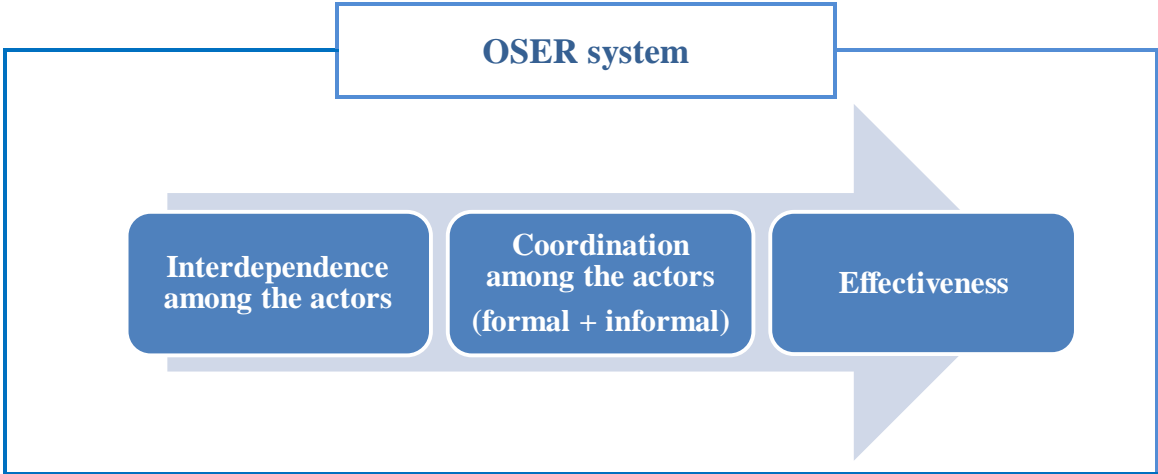


Figure 1. The variables in the study

I start this chapter by discussing the OSER system, the unit of analysis. In the articles, the OSER systems and their organizational aspects are treated primarily as empirical phenomena. To illustrate OSER systems and reflect on the empirical findings in terms of organization theory, I apply Mintzberg’s understanding of the structuring of organizations; in section 2.2, I create a model of an ‘ideal’ OSER system using Mintzberg’s organizational core elements (Mintzberg, 1983). The ‘ideal’ model provides a tool for illustrating and discussing the organizational structures of OSER systems. I return to the model in section 5.4. to deliberate on the structure of the Norwegian and Russian OSER system to generalize on the empirical

findings in terms of theory. Mintzberg's approach has a focus on intraorganizational processes, whereas I apply it in this study to examine interorganizational relations. This will entail certain limitations, as regards the discussion of coordination mechanisms in particular.

Interorganizational coordination and interdependence are examined in articles II and III. Both studies are based on analytical approaches to interorganizational coordination. In sections 2.3 and 2.4., I elaborate on the discussion of the analytical framework presented in the articles.

### ***2.1. OSER system as a unit of analysis: complexity of oil spill response***

Oil spill emergency response (OSER) is a complex and dynamic cross-disciplinary activity that unfolds under conditions of uncertainty and requires quick decisions and action (Ornitz and Champ, 2002; Tuler et al., 2007). Preparedness for oil spills is therefore challenging (Taylor, 2008, p. 7). The complexity of OSER activities is due to the wide range of functions and tasks that are involved to ensure a thorough and sound programme for responding to oil spills (see Table 1; Taylor, 2008, p. 7). My articles II and III identify a large number of organizations that may be needed in an emergency situation. This implies that OSER systems are multi-organizational and that the individual tasks and functions need to be integrated.

There is no single, agreed definition of OSER system in the literature, so the concept requires clarification. Here I take as my point of departure the nature of OSER as a special type of activity. As oil spills are accidents, OSER is conducted in two modes: *normal* mode (or steady state) for day-to-day operations, and *emergency* mode for response operations (Walker et al., 1994, p. 16).

In the steady-state mode, an OSER system acts as a pollution-response preparedness system (Harrald, 1994, p. 203). As OSER activities require multiple-party inputs (Weller, 1997, p. 734), such a preparedness system entails large-scale integrated organization. It is composed of multiple actors, with a range of mandates and functional tasks, who make decisions and work independently to serve the common objective. The actors' behaviour and performances affect each other and the system at large. Most OSER systems are based on cooperation among federal, state and local agencies. Commonly the national government takes a leading role in the organization of OSER, defining the policy, main principles and procedures for its

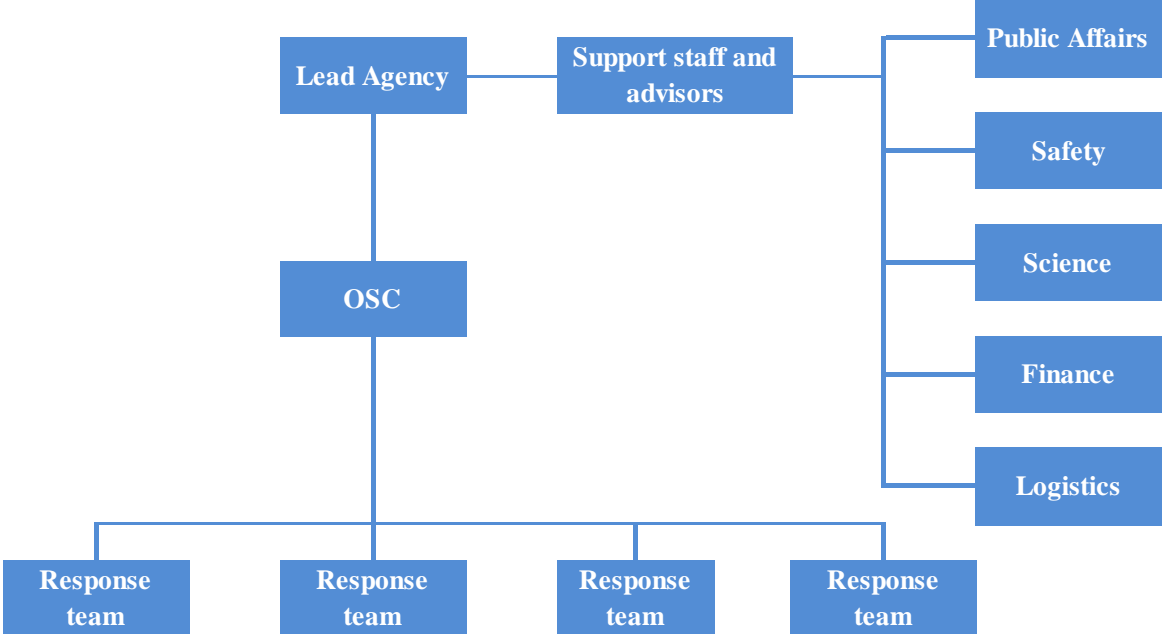
implementation and control (Walker et al., 1994, p. 52). The Norwegian and Russian OSER systems are such government-established systems. Each participant in the OSER system has a response role, performing a particular task (often only part of its broader mandate) as defined by its mandate. OSER systems often rely on a unified command and control mode of operation with established procedures and clearly defined hierarchy of authority, but with varying degrees of formality (Harrald, 1994, p. 207).

<p><b>Setting the stage</b></p> <ol style="list-style-type: none"> <li>1. Legislation and regulation</li> <li>2. Multi-national agreements</li> </ol> <p><b>Developing a plan</b></p> <ol style="list-style-type: none"> <li>3. Resources at risk</li> <li>4. Spill risk analysis</li> <li>5. Risk minimization</li> <li>6. Evaluation of response technologies</li> <li>7. Net environmental benefit analysis</li> <li>8. Expert information sources</li> <li>9. Contingency planning</li> </ol> <p><b>Organization and communications</b></p> <ol style="list-style-type: none"> <li>10. Response management systems</li> <li>11. Notification systems</li> <li>12. Communications</li> <li>13. Safety for responders and public</li> <li>14. Security</li> <li>15. Public information development and distribution</li> </ol>	<p><b>Operational response</b></p> <ol style="list-style-type: none"> <li>16. Source control, salvage, and firefighting</li> <li>17. Response technologies</li> <li>18. Waste management</li> <li>19. Wildlife recovery, care, and rehabilitation</li> </ol> <p><b>Response support</b></p> <ol style="list-style-type: none"> <li>20. Spill monitoring, tracking, and sampling</li> <li>21. Cleanup assessment</li> <li>22. Data management and access</li> <li>23. Logistics</li> <li>24. Finance, administration, and procurement</li> <li>25. Demobilization</li> </ol> <p><b>Developing and sustaining response capability and readiness</b></p> <ol style="list-style-type: none"> <li>26. Exercises</li> <li>27. Training</li> <li>28. Sustainability and improvement</li> </ol>
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**Table 1. Oil spill response planning and assessment categories and elements (Source: Taylor 2008, p. 7).**

‘The crucial function of preparedness [for an oil spill] is the creation of a response system capable of effectively responding to ... a relatively rare and complex event’ (Harrald, 1994, p. 204). In the emergency mode, an OSER system creates an organizational subsystem that responds to the specific event (Harrald, 1994). This subsystem is termed a response management system (RMS) and is defined as ‘the combination of organizational structure, management processes, individual roles, and operational strategy employed during an oil spill response’ (Walker et al., 1994, p. 15). The challenge in developing an effective RMS lies in finding the optimal way to bring together the entities of an OSER system, as they normally operate independently of one another (Walker et al., 1994, p. 16). A simplified example of

typical (local) response organization is presented in figure 2. The term ‘OSER system’ is used to establish some common fundamentals for organizational structures, roles and responsibilities of the organizations involved in OSER (Walker et al., 1994, p. 15).



**Figure 2. Typical local response organization (Source: International Maritime Organization, 1995, p. 9)**

OSER systems commonly enter emergency mode in turbulent and event-driven environments where they have to adapt continuously (Harrald, 1994, p. 205). In the case of a more extensive operation this system should be capable of incorporating itself into a larger (area or national) response organization that has been established according to similar structural principles (International Maritime Organization, 1995, p. 9).

Both pollution response preparedness systems and response management systems are complex organizational systems tailored to respond to a low-probability, high-consequence event (Harrald, 1994). This study does not aim to discuss the different modes of operation of OSER systems: no distinction will be made between an OSER system as a pollution response preparedness system or as an organizational subsystem created in an emergency situation. Therefore, I apply the term ‘OSER system’ as a general one. To tackle the complexity of the issues involved in analysing an OSER system and to achieve the research purposes, my study

requires a comprehensive analytical framework. This is presented and discussed in the coming sections.

## ***2.2. OSER system through the lenses of Mintzberg***

To handle the complexity of an OSER system, I have taken systems thinking as a point of departure in the analysis. Being a holistic approach, systems thinking allows for a comprehensive view of the unit of analysis (Checkland, 1981; Olsson and Sjöstedt, 2004). Traditionally this approach has been applied to the analysis of intraorganizational phenomena, whereas I apply it here in an interorganizational setting. Taking an OSER system as ‘a set of elements standing in interaction’ (Bertalanffy, 1956, p. 39) can provide a representation of an integrated structure composed of multiple interdependent and interacting organizations, whose individual performances affect the functioning of the system as a whole. This section introduces the approach of Mintzberg (1983) to provide a holistic view of OSER activity and create a basis for discussing OSER systems in terms of organizational theory. Here I begin by presenting some general points in Mintzberg’s analytical approach and then explain how it is applied in this study.

Mintzberg argues that the design of the structure of an organization that is ‘the sum total of the ways in which its labor is divided into distinct tasks and then its coordination is achieved among these tasks’ is the most important element in the effective functioning of organizations (Mintzberg, 1983, p. 2; p. v). He has synthesized the vast literature on organizational design in order to create a typology of organizational structure. This typology is based on five ‘ideal’ configurations and offers a framework helpful for understanding organizational structures in relation to the ideal types. Mintzberg’s model is based on the assumption that ‘formal and informal structures are intertwined and often indistinguishable’ aspects of organizational structure. Formal structures evolve in organization over time, often reflecting the changes that occur within the informal structures (Mintzberg, 1983, p. 9).

Mintzberg defines organizational structure as a combination of five basic components that provide a basic diagrammatic configuration of any organization (1983, pp. 9–19). The *strategic apex* is the organization top administration, with the chief executive officer and the other high-level managers together with their secretaries and assistants who bear overall

responsibility for organization. Their tasks involve organizing work process in terms of decision-making and development of organizational strategy, structuring the organization and resource allocation, controlling employee performance and solving conflict, as well as managing the relations of the organization with its environment. Ultimately, their primary job is to ensure the effective functioning of the organization (pp. 13–14).

At the other end of the organization lies the *operating core*, which includes all employees directly related to the production of services or products. Their primary functions are to secure the inputs, transform these into outputs, distribute the outputs, and provide direct support to the inputs, transformation, and output functions. The operating core is the part of the organization where its business value is produced (Mintzberg, 1983, pp. 12–13).

The strategic apex and the operating core are connected through the *middle line*, the chain of middle-line managers with formal authority. This chain runs from the senior managers to those who have direct authority over the operators, establishing the flow of direct supervision between the strategic apex and the operating core and ensuring that work is delegated according to the lines produced by the strategic apex. The larger the organization, the longer the middle line will be. The key function of middle-line managers is to manage the performance of those units they are responsible for. They maintain regular contacts with other managers, analysts, support staffers, and the outsiders whose work is interdependent of their own units. Their job is to provide regular performance feedback to the senior managers (Mintzberg, 1983, pp. 14–15).

The technostructure and the support staff are the two remaining important organizational core elements. The *technostructure* consists of analysts and experts who are not directly involved in the production process but who work to increase the effectiveness of organizational performance. They standardize the work of the operating flow by defining, planning, designing, changing it and training the people who do it. The technostructure operates at all levels of the organization to make the work of the others more effective (Mintzberg, 1983, pp. 15–16). The *support staff* is found at various levels throughout the hierarchy and includes groups of employees in the organization whose primary function is to provide support to the organization outside its operating workflow. Support staff includes, for example, the security and janitorial departments (pp. 16–19).

To ensure that all tasks performed by an organization are brought together, coordination mechanisms are required. Coordination among the core tasks is achieved by a mix of five mechanisms including mutual adjustment, direct supervision, and standardization (of work processes, outputs, and skills) (Mintzberg, 1983, pp. 3–9). The present study will not deal with all five coordination mechanisms. Following the propositions of the analytical approaches to interorganizational coordination discussed in sections 2.3 to 2.4 (see also Martinez and Jarillo, 1989, p. 490), I restrict the focus to formal and informal coordination. These two forms of interorganizational coordination are dealt with in detail in articles II and III. I return to these issues in chapter 5 where the final discussion of the findings is presented.

The power balance between the elements of the organization is defined by the degree of vertical and horizontal decentralization. Vertical decentralization implies a transfer of formal power down the chain of authority (Mintzberg, 1983, p. 99), for example from a federal to a regional or municipal agency. Horizontal decentralization indicates that power is shifted from a line manager to non-managers – staff managers, analysts, support specialists and operators (p. 105).

Organizational structures emerge from different organizational characteristics and are shaped by external circumstances. Each in its own way (five basic components, five mechanisms of coordination, and five types of decentralization) contains a set of factors that influence the emerging organizational structure. Each of the five key elements of organizational structure constantly pulls an organization in five different directions: the strategic apex pulls for centralization, technostructure for standardization, support staff for collaboration, operating core for professionalization, and the middle line for a ‘balkanization’ of organizational structure (Mintzberg, 1983, pp. 153–155). The ultimate interactions between these directions determine the structure of the organization, i. e. its configuration as a logically consistent clustering of its elements (p. 23). To be effective, the clustering must be established in harmony with both the internal organizational processes and the organizational situation (the environment) (p. 122).

Mintzberg identifies five main configurations of organizational structure: the simple structure, the machine bureaucracy, the professional bureaucracy, the divisionalized form, and the adhocracy (see table 2). Each configuration relies on a particular coordination mechanism; each tends to favour one of the core parts of the structure and uses one of the five particular

approaches to decentralize its structure. Trying to fit an individual organization into the framework of a single configuration would be a mistake. Experiencing all five of the pulls, real organizational structures rarely fit into a distinct structural model and usually represent hybrid structures (Mintzberg, 1983, p. 153).

Structural configuration	Prime coordinating mechanism	Key part of organization	Main design parameters	Situational factors
Simple Structure	direct supervision	strategic apex	centralization, organic structure	young, small; nonsophisticated technical system; simple, dynamic environment; possible extreme hostility or strong power needs of top manager; not fashionable
Machine Bureaucracy	standardization of work processes	technostructure	Behaviour formalization, vertical and horizontal job specialization, usually functional grouping, large operating-unit size, vertical centralization and limited horizontal decentralization, action planning	old, large; regulating, nonautomated technical system; simple, stable environment; external control; not fashionable
Professional Bureaucracy	standardization of skills	operating core	training, horizontal job specialization, vertical and horizontal decentralization	complex, stable environment; nonregulating, nonsophisticated technical system; fashionable
Divisionalized Form	standardization of outputs	middle line	market grouping, performance control system, limited vertical decentralization	diversified markets (particularly products or services); old, large; power needs of middle managers; fashionable
Adhocracy	mutual adjustment	support staff (in the Administrative Adhocracy); together with the operating core in the Operating Adhocracy)	liaison devices, organic structure, selective decentralization, horizontal job specialization, training, functional and market grouping concurrently	complex, dynamic, (sometimes disparate) environment; young (especially Operating Adhocracy); sophisticated and often automated technical system (in the Administrative Adhocracy); fashionable

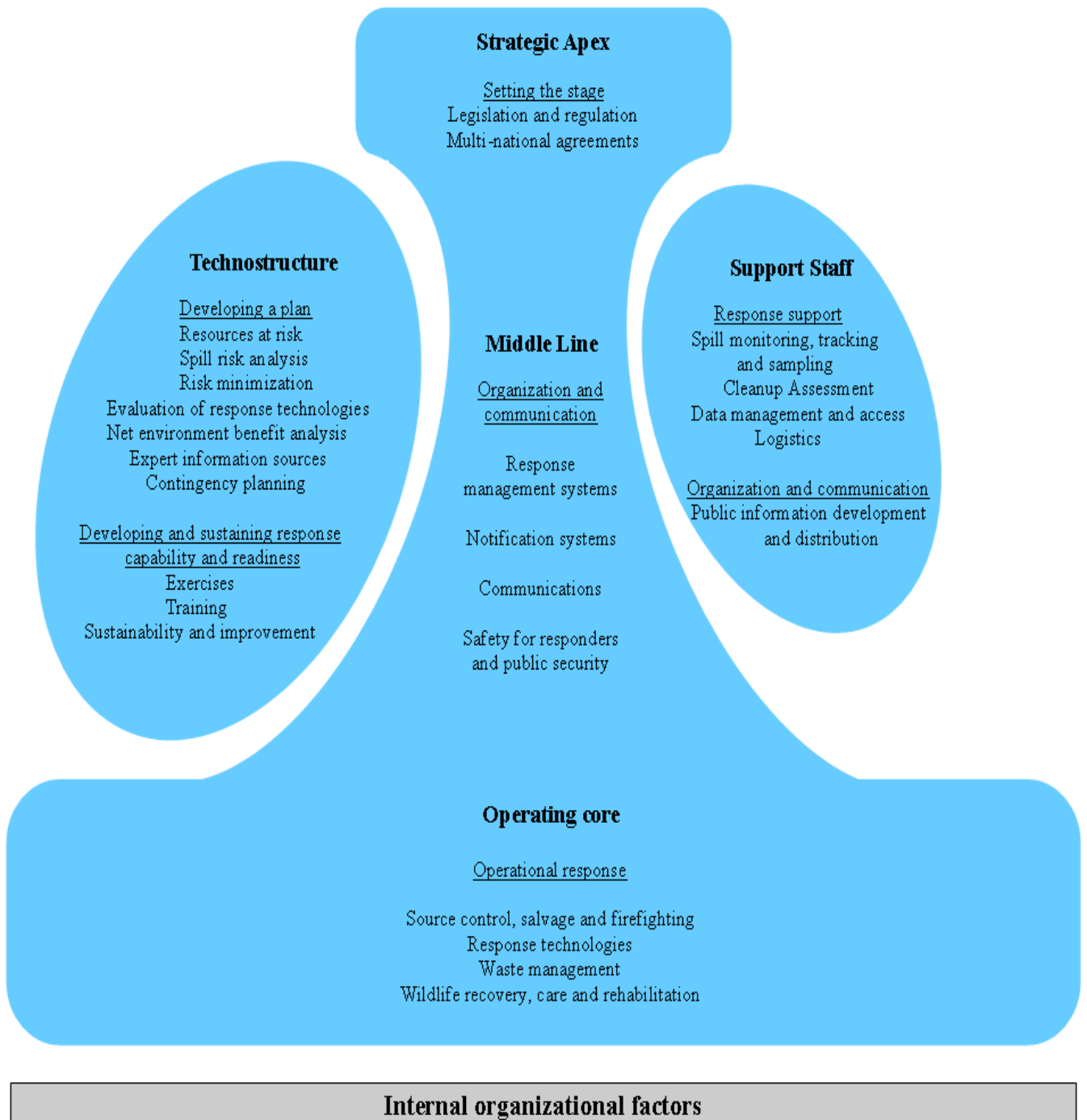
**Table 2. Five main configurations of organizational structure (Mintzberg, 1983)**



To develop an model of an abstract OSER system, I have plotted the key tasks that must be accomplished to ensure successful oil spill preparedness and response (Taylor et al., 2008) into a structural model based on Mintzberg (1983, pp. 11, 18) (Figure 3). The resulting model reflects an OSER system in the steady-state mode. It shows that all the key elements can be distinguished within the structure of an OSER system. However, we should note that the categories which are part of the key structural elements in the ideal model are not absolute. They may diverge in different OSER systems depending on structure of the system in question. Coordination among the system participants is usually standardized, achieved both through a set of agreed formal procedures (formal organizational structure itself, standardization of work processes and outputs through contingency plans, agreements, meetings and standardization of skills through for example exercises and training) and informal practices that have been developed.

Although an OSER system is an emergency response organization, it is designed to work within a bureaucratic framework that is rather rigid due to the continuous striving for standardization. The uniqueness of an OSER system lies in the fact that its structure is twofold and therefore extremely contingent. The configuration of the model may vary depending on the mode of operation of the system and the complexity of the incident in question. In the steady-state mode, its precise structure may be rather difficult to define. While its core is stable, the periphery is diffuse. This is because the activities of some organizations are only partially related to OSER and may or may not be involved in its daily activities. Actor mobilization is totally dependent on the nature of the emergency to be handled. An OSER system is primarily a bureaucratic organization with a clear line of authority. Its structure is centralized along a vertical dimension, with formal power concentrated in the upper reaches of the hierarchy. The degree of vertical decentralization will depend on the complexity of the incident. Most oil spills are small and can be dealt with by the polluter or the regional (municipal) authorities, but state and federal resources are available to ensure adequate reactions to larger or more complex spills.

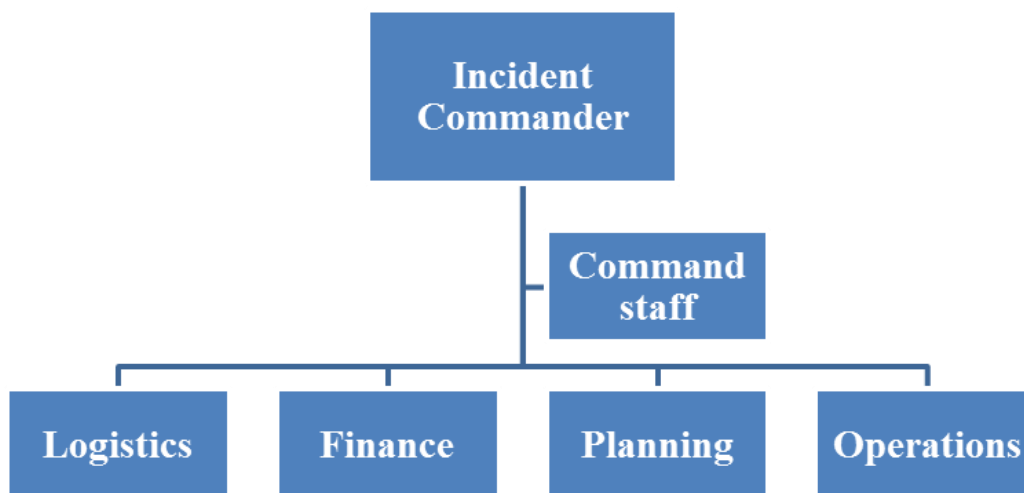
**External political and economic factors at the national and international level**



**Figure 3. Configuration of an OSER system based on the key structural components**

The structural configuration of the system in the emergency mode is a function of the nature of the oil spill (Walker et al., 1994, p. 27). The larger the spill, the greater will be the number of the participating organizations and levels of authority involved, and the more complex will the organizational structure become. There is no universally accepted model of an OSER

system in the emergency mode. Every oil spill is unique: and the complexity of the tasks and the number of the participants involved will depend on the demands of each particular emergency situation (Harrald, 1994; Walker et al., 1994, p. 30). The Incident Command System (ICS)<sup>2</sup> is a type of organizational structure an OSER system may adopt in the emergency mode (Figure 4). The basic characteristic of ICS structure is that it is widely applicable. Initially developed for fighting forest fires, the structure has been adapted for use in various types of emergency operations resulting from both natural and technological accidents, including oil spill response (Walker et al., 1994, p. 25). ICS is based on a command and control approach and is structured to facilitate activities in five major functional areas: command, operations, planning, finance, and logistics. Its adaptable nature and ability to integrate multiple resources quickly into a joint and effective goal-oriented team are main advantages of the ICS structure (Walker et al., 1994, p. 26).



**Figure 4. The five principle components of the Incident Command System (ICS) (Roland and Cameron, 1991 cited in Walker et al., 1994, p. 26)**

Because an OSER system operates both in the steady state and the emergency mode, its structure is hybrid. Visual evaluation of the ideal model (i.e. an OSER system's structure in the steady state) closely approaches the machine bureaucracy configuration (Mintzberg, 1983, p. 163). As defined by Mintzberg, the design parameters of the machine bureaucracy draw on 'highly specialized, routine operating tasks; very formalized procedures in the operating core; a proliferation of rules, regulations, and formalized communication throughout the

<sup>2</sup> For a detailed discussion of the Incident Command System structure see for example Walker et al., 1994.

organization; large-sized units at the operating level; reliance on the functional basis for grouping tasks; relatively centralized power for decision making; and an elaborate administrative structure with a sharp distinction between line and staff' (p. 164). Machine bureaucracy relies on the standardization of its operating work processes for coordination (p. 163), so technostructure, with its focus on standardizing, is the core part of the organization.

Among the machine bureaucracies, *contingency bureaucracy* is a type of structure relevant for this study. A fire department is an example proposed by Mintzberg (1983, p. 175), whereas I refer to an OSER system in the steady-state mode. Contingency bureaucracies 'exist not to provide routine services, but to stand ready in the event of the need for nonroutine ones. But because these services are critical, the organizations must plan elaborate procedures to respond quickly and efficiently to every contingent event that can be anticipated. Their operators then spend their time practicing these procedures and waiting around for an event to occur, hopefully one of the contingencies anticipated' (Mintzberg, 1983, p. 175). What pulls an OSER system towards a machine bureaucratic structure is the special need to formalize its procedures in the steady state to ensure that these will be carried out to the letter when a state of emergency arises (ibid.). The environment for the machine bureaucracy is simple and stable: most of its contingencies are predictable because they have occurred before. This can help to explain why extensive formalization of procedures is common in OSER systems. Any unexpected contingency will draw the structure towards an organic form (ibid.).

I do not provide an ideal model for an OSER system in the emergency mode. However from figure 4 we may conclude that the structure of an OSER system in the emergency mode tends to a simple configuration (Mintzberg, 1983, pp. 157–158). Among simple structures we can distinguish the crisis organization that I relate to the configuration of an OSER system in the emergency mode. Such a crisis organization, explains Mintzberg, 'appears when extreme hostility forces an organization to centralize, no matter what its usual structure' (p. 160). The need for fast, coordinated response is what pulls an OSER system towards a simplification of structure and a reduction in bureaucratic procedures in the emergency situation.

The strategic apex becomes the key part of the organization (i.e. the incident commander in figure 4) while the power of the other core elements in the simple structure is temporarily set aside. During oil spill emergencies, analysts and experts from the technostructure often remain on the periphery of the OSER system, entering the scene only after the clean-up

operation has been accomplished. A dynamic environment permits the simple structure to be organic, especially as regards its operating core (Mintzberg, 1983, p. 158). This contradicts the concept of the ICS structure, which was originally conceived as a closed type of system, based on a command and control approach. However, it should be noted that the ICS structure depicted in figure 4 is very basic. In practice, it will vary from a more open to a more closed type of organizational system depending, *inter alia*, on the institutional framework and organizational culture (Walker et al., 1994, p. 73).

Mintzberg (1983, p. 122) argues that ‘successful organization designs its structure to match its situation’. Therefore, effective interorganizational response in a crisis situation is dependent upon using appropriate organizational models. However, every oil spill is unique, and large spills can create highly complex situations with extreme uncertainty. An effectively functioning OSER system must be highly adaptable, capable of modifying and adjusting rapidly and continuously during a crisis event (Walker et al., 1994). In chapter 5, I apply the ideal model to illustrate the configuration of the Norwegian and Russian OSER systems and to reflect on whether and how these configurations are affected in an emergency situation.

The theoretical propositions discussed above have various analytical implications for this study. An OSER system is to be approached as a complex multi-organizational structure. The analysis has to consider the unique nature of an OSER system – its duality and the extreme contingency of its structure. The effectiveness of an OSER system depends on the ability of multiple actors to coordinate their mutual efforts in order to achieve common goals. From the discussion presented above I have formulated the first research question: *What are the basic characteristics and determinants of the organizational structure of an OSER system?*

### ***2.3. Interorganizational coordination***

Coordination as a form of organizational behaviour is a concept central to organizational studies (Alexander, 1995; Oliver, 1990, p. 241; Jennings, 1994, p. 53) and can be both an intra- and an interorganizational phenomenon. In order to reflect the complexity and dynamics of oil spill emergency response, coordination will be defined in this study as ‘both a process – the act of coordinating – and a goal: the bringing together of diverse elements into a

harmonious relationship in support of common objective' (Seidman and Gilmour, 1986, p. 224).

Coordination should be distinguished from other related phenomena (Dijkzeul, 1997, p. 64). As regards the present study, the distinction between coordination and cooperation (the latter term occurs in articles II, III and IV without definition) should be explained. I understand cooperation as 'deliberate relations between otherwise autonomous organizations for the joint accomplishment of individual operating goals' (Schermerhorn, 1975, p. 847). Just as coordination, cooperation takes place when 'two actors work for a common cause' for a particular reason (Dijkzeul, 1997, p. 64). Both cooperation and coordination are part of the process of policy integration and are based on organizational interdependence (Meijers and Stead, 2004, p. 5). However, coordination requires more interaction, accessibility and compatibility of resources, which both follow from and lead to greater interdependence. It entails a higher degree of formalization of institutional arrangements, involves more resources, presents a greater threat to stakeholder autonomy and is more comprehensive and demanding in terms of time, space and actors (Meijers and Stead, 2004, p. 5).

Interorganizational coordination is considered a strategic problem in interorganizational analysis (Litwak and Hylton, 1962, p. 399), and achieving effective coordination has been compared to 'the twentieth century equivalent of the medieval search for the philosopher's stone' (Seidman and Gilmour, 1986, p. 219). It becomes particularly challenging in multi-organizational environments like the OSER systems examined in this study (Coastal Response Research Center, 2006, p. 9; Stevens and Aurand, 2008; Tuler et al., 2007). In multi-organizational OSER systems where individual tasks are performed by independent organizations, interorganizational coordination is needed to enable all parties to work together towards a common goal. It is crucial for the effective functioning of the system: indeed, organizational failures in coordination may ultimately mean overall failure for an OSER operation (Tuler et al., 2007, p. 34). However, the organizations that are to coordinate may not necessarily be compatible. They may have conflicting functional responsibilities, diverse organizational cultures, may rely on different criteria in decision making, and have different geographical locations (Harrald, 1994, pp. 211–212). In an emergency situation, achieving coordination becomes even more challenging, since 'not only more but new organizations have to be coordinated with' (Quarantelli, 1986, p. 15). The need to integrate diverse organizations thus adds to the complexity of OSER activity.

To work together in complex and turbulent environments, organizations frequently develop formal or informal relationships (Moynihan, 2005 and LaPorte, 1996 cited in Kapucu, 2009, p. 2). As formal and informal aspects are intertwined parts of the organizational process (Selznick, 1948, p. 27; Minzberg, 1983, p. 9), I examine both the *formal* mechanisms of interorganizational coordination in the OSER systems studied here (organizational structure, law and regularization, and standardization of organizational processes through formal agreements, contingency plans, and training exercises) and the *informal* ones (lateral relationships, personal communication and organizational culture). (See table 3; also Hall et al., 1977, p. 459; Martinez and Jarillo, 1989, pp. 490–491.) However, the objective of this study is not to examine organizational culture as such. Further, I do not restrict the discussion to the analysis of particular forms of formal and informal coordination, but have aimed at identifying all means of coordination involved in the Norwegian and Russian OSER systems. We return to table 3 in chapter 5 in discussing the main finding regarding various forms of coordination the OSER systems.

Mechanisms of coordination		
Formal		Informal
Mandated	Standardized-voluntary	Voluntary
Mandated	Non-mandated (voluntary)	
Forms of coordination		

**Table 3. Mechanisms and forms of organizational coordination in the OSER system (based on Hall et al., 1977 and Martinez and Jarillo, 1989).**

Studying the formal aspects of organization implies examining organizations functionally in respect to their roles (Selznick, 1948, p. 26). In the present work, considerable effort has been made to define the formal aspects of the national OSER systems, modes of interorganizational coordination, and the joint Norwegian–Russian oil spill response regime. The formal structures provide the formal norms of behaviour and therefore determine organizational

action, as well as constraining how tasks are carried out (Christensen et al., 2007, p. 27). Formal mechanisms, and hierarchies in particular, are widely regarded as the most effective means of coordination (Mintzberg, 1983, p. 66; Challis et al., 1988, p. xi; Martinez and Jarillo, 1989; Peters, 1998, p. 49; Thomas, 2003, p. 21). Oil spill emergencies have traditionally been dealt with by military units, otherwise known for their highly hierarchical, formalized structures (Dynes, 1994). The formal coordination mechanisms define the structure, roles and functions of the interacting organizations. They establish the operative coordination procedures through joint exercises and patterns of interaction in an emergency situation, for example through contingency plans and emergency groups.

Just as the formal organizational structure is not an adequate reflection of the totality of empirical organizational reality (Selznick, 1948, p. 25), interorganizational coordination is more than a purely formal process. Formal procedures primarily connect roles and functions but not individuals, and should thus be seen as merely one part of the coordination process in organizations (Selznick, 1957, p. 8). The informal coordination will tend to build on lateral relationships, personal communication, and organizational culture (Martinez and Jarillo, 1989, p. 491).

It has been argued that ‘when the totality of interacting groups and individuals become the object of inquiry, the latter is not restricted by formal, legal, or procedural dimensions....A proper understanding of the organization process must make it possible to interpret changes in the formal system ... in their relation to the informal and unavowed ties of friendship, class loyalty, power cliques, or external commitment’ (Selznick, 1948, p. 27) because ‘... that which is not included in the abstract design (as reflected, for example, in a staff-and-line organization chart) is vitally relevant to the maintenance and development of the formal system itself’ (p. 25). Moreover, formal coordination procedures may not be effective in all circumstances (Seidman and Gilmour, 1986, p. 225; Thomas, 2003, p. 24) – especially in multi-organizational settings where there is no clear formal structure and where traditional top-down control mechanisms may be insufficient (O’Toole, 1997). In complex situations, formal organizational structures may fail: and then informal mechanisms may compensate for the formal shortcomings or serve as supplementary means of coordination (Chisholm, 1989, pp. 23, 36). Therefore, in this study, informal mechanisms are regarded as equally important and potentially effective means of coordination.



In analysing formal and informal coordination mechanisms, one important aspect is the nature of their interplay (Lie, 2010, p. 6). The theoretical assumption is that the synergetic interplay of formal and informal mechanisms leads to better interorganizational coordination; conversely, a competitive relationship between the two mechanisms will result in weaker coordination. Articles II and III examine the interplay of the coordination of formal and informal mechanisms in terms of synergies and competition, focusing on how this interplay may affect interorganizational coordination and thus the effectiveness of an OSER system.

Thus, interorganizational coordination in OSER systems is established both through formal (organizational structure, law and regularization, formal agreements, contingency plans) and informal (lateral relationships and personal communication) mechanisms of coordination. The analysis will focus on the interplay of the formal and informal means of coordination, so as to reveal whether they work together synergistically or impede each other.

From the analytical assumptions discussed above, the following research questions emerge: (2) *How do formal and informal mechanisms of interorganizational coordination provide for the effective functioning of an OSER system?* and (2a) *What is the relationship between formal and informal coordination mechanisms?* Articles II and III in particular deal with these questions.

#### ***2.4. Coordination as a function of organizational interdependence***

Interdependence implies that inadequate performance of one individual part affects the total and thus the other parts (Thompson, 1967, p. 54). Interdependence is implicit for interorganizational coordination (Alexander, 1995, p. 31; Halpert, 1982, p. 57; Meijers and Stead, 2004, p. 5; Lindblom, 1965; Litwak and Hylton, 1962; Litwak, 1970; Thomas, 2003: 19; Thompson, 1967, p. 55) as it ‘suggests the minimum condition for any form of linkage’ (Litwak and Rothman, 1970, p. 147). It characterizes the relationship between the actors who interact to create an outcome (Pfeffer and Salancik, 1978, p. 40). Interdependence among organizations is an essential precondition for coordinated organizational relationship (Alexander, 1995; Litwak and Hylton, 1962), and coordination among organizations is a function of the degree of interdependence (Litwak and Rothman, 1970, pp. 147–150). With interorganizational systems where the actors have individual responsibilities specified in their

mandates, understanding the nature of the interdependencies between the organizations involved is crucial for understanding their coordination.

The study is based on the premise that interdependence can affect interorganizational relations. Studies of interorganizational analysis emphasize ‘mechanisms that maintain distance between units as well as mechanisms which integrate units with each other’ (Litwak and Rothman, 1970, p. 140). Here I assume that interdependence may facilitate effective coordination, or it may hamper it. ‘Facilitative’ and ‘competitive’ interdependence are the two categories of interdependence in focus in this study.

Interdependence in an OSER system is primarily provided by the shared purpose of conducting a joint response operation (Tuler, et al., 2007, Walker et al., 1994). The agenda is set by the regulatory framework and contingency plans that define how activities are to be conducted, the responsibilities of individual authorities and their patterns of interdependence and coordination. In a multi-organizational setting, it is vital for the participating organizations to agree on the goals (Walker et al., 1994, p. 21). For organizations working together to achieve individual or shared goals, interdependence provides a commonality of purpose (Chisholm, 1989, p. 37) that facilitates effective coordination (Seidman and Gilmour, 1986, p. 223).

On the other hand, interdependence may create obstacles for coordination and even induce competition among participating organizations (Thomas, 2003, p. 3; Pfeffer and Salancik, 1978). Interdependent organizations have less freedom of action or lower organizational autonomy<sup>3</sup> (Mulford and Rogers, 1982, p. 15). Increasing interdependence reduces each organization’s ability to maintain its identity associated with the internal core task (Wilson, 1989, pp. 182, 187) or organizational ability to achieve its goals. When core functions are threatened, organizations may exhibit competitive behaviour (Ellison, 1995, p. 44) that triggers the urge to protect autonomy (Wilson, 1989, p. 192). One consequence may be failure in interorganizational coordination (Peters, 1998, p. 303).

Organizational performance could be compared to the behaviour of fish in coral reef: ‘[t]o survive [an organization] needs to find a supportive ecological niche. Sometimes that niche is

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<sup>3</sup> Autonomy is here defined as a ‘condition of independence sufficient to permit a group to work out and maintain a distinctive identity’ (Selznick, 1957, p. 121).

specified by law, ... [b]ut often law is sufficiently vague as to give the founding executive a chance to seek out a niche' (Wilson, 1989, p. 188–189). Interdependencies and the struggle for survival may lead to different kinds of strategies in organizational behaviour. On the one hand the need for an organization to survive generates a strong motive for inter-agency coordination (Halpert, 1982). However, reliance on their organizational environments may create uncertainties (Thompson, 1967, p. 13). To ensure stability and survival, organizations may seek to buffer their boundaries (Scott, 2003, p. 128) and/or protect their autonomy – or 'turf' (Wilson, 1989, p. 179). As turf is primarily a resource (Thomas, 2003, p. 34) the more resources an organization has at its disposal, the better (Bardach, 1996, p. 177 cited in Thomas, 2003, p. 33) as this reduces organizational sensitivity and uncertainty (Dimock, 1952, p. 282 cited in Thomas 2003, p. 32). This may lead organizations to act imperialistically (Wilson, 1989, p. 187), seeking to enlarge their jurisdictions to protect their autonomy (Downs, 1967, p. 215, Thomas 2003, p. 28). Various forms of non-cooperative behaviour (Jennings and Krane, 1994, p. 342) and attempts to exclude competitive organizations from domains can be the outcomes of such strategies. Clearly, then, autonomy protection aimed at preserving identity and organizational ability for goal achievement may become a barrier to interorganizational coordination (Wilson, 1989, p. 192; Jennings, 1994, p. 57; Jennings and Krane, 1994, p. 342).

The analytical implication is that an OSER system should be approached as a structure based on interdependence among individual organizations. Since interdependence may create different incentives of organizational behaviour in terms of coordination, it is necessary to study the nature of interdependencies among and between organizations – in particular in interorganizational settings like OSER systems – to understand coordination patterns among the individual organizations.

To explore how interdependence affects organizational behaviour in terms of interorganizational coordination in an OSER system, the following research question has been formulated: *how do the patterns of interdependence among organizations in OSER systems affect interorganizational coordination?* The impacts of interdependence on interorganizational coordination are discussed in articles II and III. These studies discuss the causes of interdependence among organizations in an OSER system and how interdependence may both facilitate and obstruct effective interorganizational coordination.

## ***2.5. The effectiveness of OSER systems***

The search for ways to increase the effectiveness of organizational performance lies at the heart of organizational studies (Cameron, 2011). How to manage oil spills for greater chances of a successful outcome has attracted widespread interest and discussion (see for example Harrald et al., 1992; Harrald, 1994; Walker et al., 1994; Weller, 1997; Kuchin and Hereth, 1999; Ott et al., 1999; Ornitz and Champ, 2002; Tuler et al., 2007; Davidson et al. 2008). Organizational effectiveness can be measured by various yardsticks, depending on how an organization is conceptualized (Scott and Davis, 2007, p. 326). In the context of this project, effectiveness is understood as ‘the ability of the OSER system to respond to an oil spill which requires a comprehensive coordination effort’ (Ivanova and Sydnes, 2010, p. 140). Organization is a key factor for successful oil spill response (Harrald, 1994; Ott et al., 1999). And coordination of the participating organizations is a main condition that must be met for a response operation to be successful, i.e. effective (Harrald, 1994, p. 213).

The success of OSER operation is a multi-dimensional concept (Harrald, 1994, p. 218). Measured instrumentally, it is associated with achieving response objectives (Walker et al., 1994, p. 21): that an OSER system ‘will effectively, efficiently, and safely respond to oil spills’ (Ott et al., 1999). This entails the ability of organizations to employ the right amount of available resources in accordance with the procedures defined in the contingency plan to deal with emergency situations (Harrald, 1994, p. 213; Walker et al., 1994, p. 21).

In my articles, the analysis of effectiveness is based on two approaches. One involves mainly statements from informants: in interviews, I posed specific questions that made it possible to draw conclusions as to the effectiveness of an OSER system. A more specific approach was applied in article IV, on the Norwegian–Russian bilateral regime for joint oil spill response in the Barents Sea, where effectiveness was studied by examining its outputs, outcomes, and impacts (see Young, 2004). Outputs include the procedures implemented to transform the regime from a paper arrangement into a practical process. The outcomes are the changes in organizational behaviour that emerge as the result of the creation and functioning of a regime. These changes involve, *inter alia*, compliance and conformance on the part of the regime members to the regime. The impacts of a regime are related to its problem-solving capacity or ability to deal effectively with the problem it is meant to tackle. My assessment of regime

effectiveness also builds on qualitative data; textual documents (academic publications, multilateral and bilateral agreements, evaluation reports, protocols of the joint meetings, and publicly available information from relevant web sites) and interview data from informants involved in the cooperation. The qualitative approach was chosen due to the absence of formal objective standards for evaluating effectiveness.

If an individual OSER system can be considered a ‘regime’, the effectiveness of such a system can be assessed by examining its outputs, outcomes, and impacts. We return to the indicators of effectiveness employed in the analysis of the Norwegian–Russian bilateral OSR regime in chapter 5, where I use them to summarize the discussion of effectiveness of the Norwegian and Russian OSER systems presented in the articles.



### **3. Methodology**

In this chapter, I present and discuss the collection of empirical data for my study: what sort of material was collected, why certain methods of data collection were chosen, how the process of data collection was conducted, what challenges were experienced and what I learned in the process. Finally, comments will be made regarding the robustness of the study.

#### ***3.1. Research questions and methodology***

‘Good social science is problem-driven...’ (Flyvbjerg, 2007, p. 432). Naturally the process of data collection in this study was inspired by the research objectives I had formulated. The form and content of the research questions have informed the choice of a qualitative<sup>4</sup> research strategy (Silverman, 2005, pp. 99–100, 111; Yin, 2009, p. 8) and helped to limit the data-set to reasonable proportions (Jensen and Rodgers, 2001, p. 239).

Research is more than collecting data to discover answers to certain questions: it involves the application of systemic procedures typical of different research strategies (Berg, 2007, p. 8). My choice of the qualitative research tradition has predetermined the selection of research strategy and the methods of data collection here, not least the case-study form. Case study has been defined as ‘an empirical enquiry that: investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident ... relies on multiple sources of evidence ... and ... benefits from the prior development of theoretical propositions to guide data collection and analysis’ (Yin, 2009, p. 18). Case studies are used for the analysis of organizational and managerial processes (Yin, 2009, pp. 4–5), such as organization of oil spill emergency response examined here.

The cases in the project consist of two national (the Norwegian and the Russian) studies and one international (Norwegian–Russian) case. OSER systems are the cases in the two national studies, whereas the bilateral Norwegian–Russian OSR regime is the case in the international one. The three cases are united by a common geographical focus, the Barents Sea. More space is given to the examination of the Russian OSER system. The Russian case study was the first

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<sup>4</sup> Quantitative analysis deals with counting and measuring, whereas qualitative strategy focuses on non-numerical values and expressions rather than quantifications (Berg, 2007, pp. 3, 8–9). Qualitative research generally examines social settings, the individuals who inhabit them and the processes within these settings related to how people structure their settings, give meanings to their daily lives through symbols, rituals, social structures and roles, and make sense of themselves and others.

to be conducted. The absence of available scholarly information on the system made it more challenging and time-consuming to collect data on the Russian case. Before I could proceed to analyse interorganizational coordination in the Russian OSER system it was necessary to get an overview of the system itself. It was not possible to perform both tasks within the scope of a single research article, and so the Russian case was investigated in two articles. The Norwegian case was less complicated in terms of data collection, as data on the Norwegian OSER system are publicly available.

One advantage of the case study is its ability to “close in on” real-life situations and test views directly in relation to phenomena as they unfold in practice’ (Flyvbjerg, 2004, p. 428). In addition, case study allows use of a full range of sources, including documents, artefacts, interviews and observations (Yin, 2009, p. 11). To provide better quality of my data I combined three methods of data collection: textual analysis, interviews, and observation.

One of the challenges in conducting the study was that neither the Russian system nor the Norwegian–Russian bilateral OSR regime discussed here has ever been involved in a large oil spill operation. Therefore, there are no incidents on which to base an evaluation of their actual performance. This had implications for data availability and collection. I had to rely heavily on interview data in investigating the Russian case, to compensate for the lack of textual materials.

This study combines elements of three different types of case studies (Yin, 2009, p. 8). First, as descriptive fact-finding aimed at clarifying the status of oil spill emergency preparedness in Norway and Russia, where the challenge is to conduct detailed analysis of one phenomenon (OSER system) in two different national contexts. Second, this study is explanatory in terms of the research questions asking ‘how’. Finally, it should be seen as exploratory research, as the conclusions generate further questions, defining the grounds for new research (Yin, 2009, pp. 8–9). The study also belongs to the interpretive research tradition.<sup>5</sup>

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<sup>5</sup> The interpretive and positivist traditions are two main schools of thought in social science. Rejecting the subjectivity of knowledge (Delanty and Strydom, 2003, p. 14), positivism applies the models and methods of natural science to the study of human affairs (Burrell and Morgan, 1979, p. 7) and is consequently associated with quantitative methods of data collection. Interpretive philosophy, based on the premise that the social world should be approached in a different way than the natural world, focuses on social relations and on how the processes of meaning-making, interpretation and communication are conducted (Hatch and Yanow, 2003, pp. 65, 70). It stresses that knowledge comes *a priori* before the research process and should therefore be treated as a matter of interpretation (Hatch and Yanow, 2003, p. 66; Denzin and Lincoln, 2000, p. 6), so qualitative research methods are preferred in this tradition.



### ***3.2. Interview***

Interviewing is one of the most extensively applied methods of data collection within organizational studies (Cassel, 2009, p. 500) and a main source of empirical information for case studies (Yin, 2009, pp. 106–109). Semi-structured interviews have been an invaluable source of empirical information for the Norwegian, the Russian, and the Norwegian–Russian case studies presented here. Though the data were collected through a range of sources, interviews stand out as a key source of information that otherwise would not have been available – for example, regarding informal mechanisms of coordination and effectiveness of the OSER systems. My interview data are qualitative in nature.

Interviewing formed the starting point of this study. After having been admitted to the PhD programme in Norway I was waiting for the visa formalities to be settled. During that period, in August 2007, three unstructured interviews were conducted with Russian informants, with representatives of the organizations that dealt with OSER in the Murmansk region. These were a controlling authority, an emergency response organization, and a non-governmental organization that conducted expert analyses of OSER in the Murmansk region. Interviewing at this initial stage provided important primary knowledge on the research subject. In particular, it enabled me to identify areas that later proved useful in formulating the research questions. In addition, meeting informants prior to my actual fieldwork made it easier to establish further contacts.

Between August 2007 and December 2010, a total of 26 interview sessions were conducted with 17 Russian informants. All the interviews, with two exceptions, were conducted in Murmansk. With three exceptions, the interviews with Russian informants were conducted in Russian. Again with three exceptions, I was the sole interviewer; the informants were interviewed individually, with one exception. Twelve interviews with 13 Norwegian informants were carried out between December 2009 and June 2011, in Tromsø, Horten, and Stavanger.

All the Norwegian and three Russian informants were interviewed in English with Are K. Sydnes, who is the co-author of three chapters in this study. There were 2 on-line (Skype)

interviews, one with a Norwegian and one with a Russian informant, and two telephone interviews with Norwegian informants. All other interviews were conducted face-to-face, a procedure considered to provide better data quality, due to the greater opportunities to re-mould and re-direct the conversation (Stephens, 2007, p. 211). My experience has shown that being able to communicate directly while interviewing generally offered more room for dialogue with the informants, whereas telephone communication led to a dry, factual and less flexible conversation. I believe that having face-to-face communication helped to establish an atmosphere of trust, so essential in interviewing (Miller and Glassner, 2004, p. 133) and in consequence improved the quality of the empirical data.

In an interview setting there is always the concern whether the information the respondent provides to the researcher is truly what he or she is thinking. Respondents may not be eager to share their personal attitudes, especially when the subject may be somewhat touchy (Miller and Glassner, 2004, pp. 126–127). Issues related to OSER proved to be a sensitive topic for discussion both in Norway and Russia, in particular for officials and members of the civil service. My informants did not refuse to answer questions, but they were cautious in their judgements. I was aware that the inappropriate disclosure of personal insights and confidential information might have negative consequences for the informants.

To ensure confidentiality and to encourage the sharing of personal opinions and attitudes, I made sure, at an early stage, that interviews would remain anonymous. All informants have been number-coded and are referred to as ‘INF number XX’ in the articles. I asked for permission to record interviews with a dictaphone. Two of the Russian informants preferred handwritten notes to be taken; among the Norwegians, four interviews were recorded and the remainder involved note-taking. In the cases when interviews were conducted together with Are K. Sydnes, both of us took notes and later discussed and compared them. As the interviews were semi-structured, additional questions were asked in the course of the interviews. All records were later transcribed.

To make the process of data collection more transparent, the methodology section of each article provides lists of informants in the form of a table with the name of the organization, the level of seniority of the informant, and the interview date<sup>6</sup>. Two general criteria for

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<sup>6</sup> See Annex I for a complete list.

selection were the formal position of the individual informants together, and the relevance and formal role of their organizations in oil spill emergency response activities. These organizations included governmental and municipal authorities, response organizations, controlling and coordinating authorities, private companies, non-governmental organizations, scientific research institutions, and industry. Some informants were interviewed once, while with others (on both the Norwegian and Russian sides) several sessions were conducted. Some informants, also on both sides, were contacted by mail after the interview sessions to clarify issues that arose during the analysis of the interviews.

Prior to interview sessions, informants were provided with a short description of the project; and those who requested it also received a list of interview questions. Some informants, in particular the Russian ones, did not ask to see the questions in advance. Interviewees represented a wide range of organizations and had diverse functions, so there was no single questionnaire for all informants. With the Russian informants, individual questions were prepared depending on the functional tasks of the organizations they represented. These questions fell into six categories: (1) the organization itself, (2) coordination, (3) risk, (4) capacity, (5) plans, (6) personal.

In the Norwegian case, all questions were organized into identical categories: (1) the national OSER system in Norway, (2) the role of the organization in the national OSER system, (3) coordination between various actors within the Norwegian OSER system, (4) the risk of oil spills, (5) contingency planning in Norway, (6) other issues. However, the content of the questions varied slightly and some individual questions were asked depending on the functional tasks of the organization the respondent represented and the issue discussed. Moreover, questions from category 4 on risks of oil pollution were abandoned rather early, when it became evident that there was close consent among the Norwegian informants as to the sources of risk.

There are differences between the two sets of questions because the questions for the Norwegian case (which was investigated later) were made more specific. In addition, the inavailability of literature on the Russian OSER system led me to ask questions unnecessary in the Norwegian case, where data could be obtained through other sources. Annex II provides examples of the questions in the course of the interviews.

In some cases, the questions served as points of departure reflecting the most important issues that needed to be dealt with. Sometimes I used information obtained from one informant to formulate additional questions to another interviewee, or to collect data to support (or not) what another person said. The non-rigid schedule and structure characteristic of qualitative interviews (Bryman, 2008, pp. 437–438), allowed for flexibility in communication and better interaction with the informants. Respondents felt less constrained and sometimes talked freely, touching on important issues that would have otherwise have remained undiscovered.

Formulating the interview questionnaires proved to be a learning process in terms of getting new knowledge and sharpening my interviewing skills. The first questionnaire was intended to be used for several interview occasions. However, I soon understood that it would be necessary to develop individual sets of questions because the organizations in question were so diverse. I also recall a situation when the Russian informant (who had not asked to see the questions prior to our meeting) took the questionnaire and started looking through it, simultaneously analysing and commenting on the weak sides and advantages of the questions and giving advice regarding the types of questions that should to be asked to various informants. Gradually, the quality of the questions improved. I started to establish categories or groups of questions, like the ones in the Norwegian case. And as I learned more about the subject of my research, the questions could become increasingly precise.

When doing interviews in two different national contexts it is difficult to avoid comparing how the informants, representatives of different countries, handle the process. Overall, both the Norwegian and Russian informants were willing to meet and I experienced no refusals. Most informants were generous with their time – in fact, the longest interview lasted for more than two hours. In addition, some informants, particularly on the Norwegian side, helpfully provided clear instructions on how to get to their office, assisted with transportation, and even provided something to eat. Unexpectedly, I found that very few Russian informants feared being recorded, and were also very open in their comments. In contrast, as I had expected the reverse situation, many of the Norwegian respondents were opposed to my using a dictaphone. Interestingly, while trying to arrange interviews with some organizations of the Norwegian OSER system I was advised to contact the Norwegian Coastal Administration instead, because ‘they are responsible for everything and will be able to answer all the questions’ (from a phone conversation with a potential informant). As a result, some

informants on the Norwegian side had to be convinced that their point of view would be valuable for my research.

### ***3.3. Textual analysis***

It is difficult to imagine a study of an organizational setting without document analysis. Textual materials were important sources of empirical information also in this study, and the findings are largely based on their analysis in addition to the interview data. Documents can serve as both inputs and outputs of social activities. Therefore they should be regarded as part of social interaction and as independent data (Atkinson and Coffey, 2004, p. 59). In this study both the content as the initial value of a document (Prior, 2003) and its function and the effect it produces (Prior, 2003, p. 4) have been central. For example, contingency plans were analysed in terms of their content and of the constraints they impose on organizations.

Extensive literature searches were conducted to gather primary and secondary texts. Official documents (international agreements, laws and regulations, official reports, protocols of the joint Norwegian–Russian meetings, the work programme of the Joint Norwegian–Russian Environmental Commission, contingency plans, training exercises evaluation reports, interorganizational agreements) have served as the primary sources of information. Secondary sources include the scholarly literature (articles and books), formal agency documents, conference proceedings, and relevant scientific reports. Collecting primary data through document searches provided me with useful background information prior to field visits (Yin, 2009, p. 103).

Legal documents publicly available on the websites of the Russian federal and regional governments were used extensively in articles I and II, the Russian case study, to study the regulatory framework and organizational functions in the Russian OSER system. Scientific publications, reports, and conference papers and articles provided information on petroleum developments in the area and data related to the management of oil spill response. In articles II, III, and IV, contingency plans were scrutinized to identify the coordination procedures. In article III, the Norwegian case study, law documents, governmental white papers, reports and presentations of various agencies and contingency plans provided data on the key actors within the Norwegian OSER system and their responsibilities, and made it easier to

distinguish the basic principles and recent developments in the system. Article IV, the Norwegian–Russian case study, relies on the analysis of scholarly publications, multilateral and bilateral agreements, multilateral and bilateral training exercise evaluation reports, protocols of the joint Norwegian–Russian meetings, and the work programme of the Joint Norwegian–Russian Environmental Commission.

Publicly available textual data was also gathered through Internet searches of the websites of various organizational and institutions referred to in the articles. The poor availability of textual data on the Internet on the Russian case in general and very limited publicly available information on the subject on the websites of the Russian ministries of Transport and Emergencies should be noted. The information on the website of the Murmansk Basin Emergency Rescue and Salvage Department proved to be very general and limited, nor was it clear how often it is updated. By contrast, the websites of the Norwegian Coastal Administration and the Ministry of Fisheries and Coastal Affairs have separate regularly updated sections on acute pollution and oil spill emergency preparedness. Many of the documents used for the analysis were not directly publicly available and were obtained through respondents. Examples are the Joint Norwegian-Russian Contingency Plan and training exercise evaluation reports referred to in article IV, interorganizational agreements examined in article II and the Russian contingency plans examined in article I and II.

### ***3.4. Observation***

Ethnographic research makes frequent use of observation, which involves ‘entering the setting of some group and simply watching and listening attentively’ (Berg, 2007, p. 192). Observation as a method of data collection was used only once in this study, when Are K. Sydnes and I participated as observers at the inaugural meeting of the Norwegian forum for oil spill preparedness and response in the High North, held in Tromsø, Norway in February 2011. The mandate of the forum is to facilitate coordination among actors in OSER in the Norwegian High North (Norwegian Coastal Administration, 2010b). The meeting was a closed event and special permission required to be present there. The key value of attending the meeting lay in getting an overview of the wide range of actors within the Norwegian OSER system and gaining access to their presentations. In addition, it provided an opportunity to meet new informants, and two interviews with Norwegian informants were

arranged as a result of this meeting. Furthermore, it provided access to new empirical data for the Norwegian–Russian case study that helped to sharpen the study objective in terms of formulating more precise research questions.

### ***3.5. Research robustness***

Research must ensure that the methods used are reliable and the conclusions valid. The quality of any empirical social research is commonly measured through four widely used tests: construct validity, internal validity, external validity and reliability (Yin, 2009, p. 40). The following section presents some remarks on the quality of my study and the efforts taken to achieve it.

#### **3.5.1. Ensuring reliability**

Reliability has to do with consistency or replicability of research measurements (Silverman, 2005, p. 224). Research is considered reliable if, when ‘a later investigator followed the same procedures as described by an earlier investigator and conducted the same ... study all over again, the later investigator should arrive at the same findings and conclusions’ (Yin, 2009, p. 45). To demonstrate that research techniques are reliable, the researcher must ensure that procedures are systematically documented to demonstrate the consistency of applying the categories (Silverman, 2005, p. 224). The process of data collection has to be open and transparent. However, the criterion of replicability may be challenging. For example, it is impossible to replicate the interview process, because any interview setting will always be contextual. Nor is there any no guarantee that another researcher will contact the same informant, or even if the informant is the same that an interview will be granted. I recall from my own experience one Russian informant who agreed to meet me only after this person found out that a close relative of mine was working at the same organization. After having learnt this, the informant became eager to meet me, and was frank and open during the interview session, sharing personal opinions. Another interview with a Russian informant was arranged on the request of a mutual acquaintance. I am uncertain how successful I would have been if I tried to arrange the meeting with that informant directly, or whether another person would have granted an interview. Two interviews with Russian informants were arranged by other informants whom I had visited earlier. In particular, interviewing in Russia I observed

that being introduced by someone in some cases was helpful in getting informants' consent to meet and facilitated open dialogue during the interviews. In all cases, I tried to be open about my sources of information and the methods of data collection applied, to allow others to scrutinize the data collection process and quality.

To increase the reliability of data and to reduce the possibility of misinterpretation I sometimes used a dictaphone during interviews, but always with the consent of the respondent. Annex I provides detailed information regarding the interview sessions when a dictaphone was used.

### **3.5.2. Ensuring internal validity**

Reliability is related to validity. Achieving valid conclusions is a central objective of any research. Regarded as a synonym for 'truth: interpreted as the extent to which an account accurately represents the social phenomena to which it refers' (Hammersley, 1990, p. 57) validity is frequently mentioned as the most important criterion for research (Bryman, 2004, p. 28). Validity in qualitative analysis concerns 'the integrity of the conclusions that are generated from a piece of research' and can be distinguished in the forms: as *construct validity* (measurement validity), *internal validity* and *external validity* (generalizability) (ibid).

*Construct validity* concerns the accuracy of the operational measures used to denote the theoretical meaning of the concepts in the study (Bryman, 2004, p. 28). In this study, I operate with a range of concepts (e.g. OSER system, interorganizational coordination, interdependence, organizational structure) whose dimensions are defined by their definitions. These concepts are further made operative with the empirical data. The theoretical problem addressed in the study is related to interorganizational coordination, which is defined as 'both a process – the act of coordinating – and a goal: the bringing together of diverse elements into a harmonious relationship in support of common objective' (Seidman and Gilmour, 1986, p. 224). Empirically the issue of interorganizational coordination is addressed in articles II and III by studying relationships among the organizations participating in an OSER system. Effective interorganizational coordination is crucial to the success of an oil spill response operation. An OSER system is understood here as a structure based on interdependence – and



interdependence can affect interorganizational coordination. My analytical propositions suggest that certain factors facilitate coordination while others hamper it. From the analysis, coordination emerges as an intermediate variable that affects the effectiveness of OSER systems and is affected by interdependence. Through the analysis of interorganizational coordination, I have also addressed the issue of the interplay of the formal and informal means of coordination, to see whether they work together synergistically or impede each other.

*Internal validity* is concerned with the causal relationships (interdependences) between variables in the study (Bryman, 2008, p. 32). This form of validity is relevant for explanatory studies where the researcher seeks to provide evidence on how and why event  $x$  led to event  $y$ . The trap here is when the conclusion about the causal relations between  $x$  and  $y$  is made without considering a possible third variable  $z$ , which may also cause  $y$  (Yin, 2009, pp. 42–43). As to the theoretical proposition for this study, internal validity gives rise to two questions: is the relationship between interdependence and interorganizational coordination genuine? and can we be sure that interdependence truly causes variations in interorganizational coordination? Yet another question concerns the causal effect of coordination on how effectively an OSER system performs. To increase internal validity, I have employed explanation building supported by a logic model (Yin, 2009, p. 41) which demonstrates the causal relationship between the main variables.

To increase the validity of conclusions, a range of methods of data collection (interview and textual analysis) have been employed – a strategy referred to as triangulation. Triangulation involves the use of various kinds of data and methods to check whether they corroborate each other (Bryman, 2008, p. 700). In my work, combining two research techniques has provided access to a broader data-set, thereby helping to yield a fuller picture of the phenomena under study: OSER system and interorganizational coordination.

In addition, respondent validation (Silverman, 2005, p. 212) was used. During the interview process, many informants showed an interest in the results of this study and asked to be provided with the articles when they were published. Both Norwegian and Russian informants regarded this as an opportunity to learn new things about each other. For me it was a good opportunity to receive feedback and evaluation. In practice, one Russian respondent has read article II after it was published, and has provided positive feedback. In particular it was

commented that the key points of the case were presented correctly. Constructive feedback from a Norwegian informant (who was contacted for an interview and asked for the draft version of the paper) was received on the Norwegian–Russian case study.

### **3.5.3. Ensuring external validity**

External validity, or generalizability, defines to what extent it is possible to take a broader view from the research results, beyond the specific research context (Bryman, 2008, p. 55). Do the results of this study permit such generalization? Generalization from just three single cases to a broader set of cases is difficult to conduct with any certainty. Case studies often examine phenomena within real-life contexts (Yin, 2009), which implies that the knowledge produced is context-dependent. The major point of criticism concerning the case-study approach is the failure of a single case to serve as a basis for generalizing (Yin, 2009, p. 43). In quantitative research, generalizability can be achieved by, for example, statistical sampling procedures that allow researchers to feel confident about the representativeness of the sample and to make broader inferences (Silverman, 2001, p. 248).

Although these methods are not immediately applicable in qualitative research, generalizability can be increased through some techniques that do not follow a purely statistical logic. Such strategies include using theory in single case studies and using replication logic in multiple case studies (Yin, 2009, p. 41). In addition, analytical generalization as an alternative to statistical generalizations is important in case-study research that involves generalization of ‘a particular set of results to some broader theory’ (Yin, 2009, p. 43).

To show that the findings of a given case study can be extrapolated to a broader set of similar cases, the researcher must demonstrate that similar theory can be applied for the analysis. In this study, the analysis builds on similar analytical approaches to the study of interorganizational coordination and interdependence in the Norwegian and Russian systems. In addition, Mintzberg’s approach to the analysis of organizational structure is applied to illustrate the structural specifics of the Norwegian and Russian OSER systems. The intention behind applying an identical analytical tool is to ensure external validity of the data. That both cases support the same analytical approach indicates that the chosen theory is fruitful for the

purpose at hand, and that the received results are valid. This means that the chosen theory may have wider applicability than the particular cases studied.

My objective is to show whether the findings regarding the Norwegian and Russian OSER systems may be both true and important for a broader set of OSER systems. In addition I wish to check the applicability of my analytical approaches to interorganizational coordination and Mintzberg understanding of the organizational structuring to the analysis of OSER systems, or other complex organizational settings as well.

### ***3.6. Limitations of data collected***

One weakness in my interview data is the absence of any representatives of the federal authorities among the Russian informants. Moreover, I did not manage to gain access to Russian national reports from exercises. To compensate for these shortcomings, data from other sources were used, such as interviews with the Norwegian representatives at the ministerial level, and Norwegian national reports from exercises.

In addition, a larger number of informants might have been interviewed for the Norwegian case study. The Norwegian OSER system discussed in article III consists of an extensive number of participants. However, due to time constraints, representatives from only seven organizations were interviewed. On the other hand, there is little to indicate that additional data would have changed the conclusions of this study. There seems to be broad consensus on most central aspects of the Norwegian OSER system.

I should also mention the limited use of observation as a method of data collection. There were a few missed opportunities to participate as observer in national and international training exercises. This could have further improved the quality of my findings.

### ***3.7. Concluding remarks***

The study of the Norwegian and Russian OSER systems has demonstrated how valuable qualitative data can be for the analysis of an interorganizational setting. A qualitative approach was used to understand how organizations within an OSER system are linked to

each other. Qualitative data permitted better understanding of the complexity of interorganizational relations, as interviews provided insight into the participants' views and assessments. In addition, the qualitative approach made it possible to evaluate the effectiveness of OSER systems based on statements from respondents. This was especially important in the Russian case, where data are lacking or unavailable.

## **4. Findings**

### ***4.1. Relationship between the articles***

Taken together, my four articles contribute to a holistic picture of how OSER is organized on the Norwegian and Russian sides of the Barents Sea and how cooperation between the two systems is established. Article I ‘maps’ the Russian OSER system, and article II examines interorganizational coordination within the Russian OSER system. It proved necessary to conduct two studies of the Russian system because academic knowledge on this topic had not been established. Before embarking on a discussion of interorganizational coordination I had to provide an overview of the formal structure of the system and its main principles – and the scope of the study did not allow that to be done within the constraints of a single research paper. Article III examines the organizational structure of the Norwegian OSER system and patterns of coordination among the main actors. Finally, article IV discusses how the Norwegian and the Russian OSER systems operate together through the bilateral OSR regime and how effective this regime is.

Throughout the study, coordination has been approached as a key factor affecting effective functioning of the OSER systems. Therefore, all four articles provide conclusions on effectiveness.

My approach to the analysis has been informed by a range of analytical approaches. Article I was inspired by systems theory, with the system itself as a unit of analysis; I further examined the OSER system from the vertical and horizontal dimensions. Articles II and III draw on analytical approaches to interorganizational coordination (Alexander, 1995; Challis et al., 1988; Chisholm, 1989; Hall et al., 1977; Jennings, 1994; Lie, 2010; Martinez and Jarillo, 1989; Oliver, 1990; Peters, 1998; Seidman and Gilmour, 1986; Thomas, 2003). In article IV, the study of the effectiveness of the Norwegian–Russian bilateral OSR regime is conducted through qualitative analysis of the outputs, outcomes, and impacts of that regime. Approaches to the analysis of regime effectiveness vary due to the challenges of establishing reliable indicators. The qualitative approach applied in this case was justified by the absence of formal objective standards for evaluating effectiveness.

## 4.2. Article findings.

Table 4 provides an overview of the articles.

No.	Article I	Article II	Article III	Article IV
Title	Oil spill emergency preparedness in the Russian Arctic: a study of the Murmansk region	Interorganizational coordination in oil spill emergency response: a case study of the Murmansk region of Northwest Russia	Oil spill emergency response in Norway: coordinating interorganizational complexity	The Norwegian-Russian oil spill response regime in the Barents Sea: an untold story of success
Main focus	Analysis of the organizational aspects of the OSER system in the Murmansk region of Russia	Interorganizational coordination in the OSER system in the Murmansk region of Russia	Analysis of the organizational aspects of the Norwegian OSER system, particularly its formal structure and the mechanisms of interorganizational coordination	Organizational aspects and effectiveness of the bilateral Norwegian-Russian cooperation on OSR in the Barents Sea
Relation to the main research objective	The study maps the Russian OSER system	The study examines interorganizational coordination within the Russian OSER system	The study maps the Norwegian OSER system and examines interorganizational coordination among the organizations within it	The study examines how well the bilateral Norwegian-Russian cooperation functions to provide oil spill emergency preparedness in the Barents Sea
Research questions	How the OSER system in the Murmansk region is organized in terms of its formal structure and the roles and functions of the key actors ascribed by their mandates?	<ol style="list-style-type: none"> <li>1. What is the formal structure and coordination mechanisms established within the OSER system of the Murmansk Region?</li> <li>2. How organizational interdependencies affect organizational behavior in terms of coordination?</li> <li>3. How effective the OSER system in the Murmansk region is?</li> </ol>	<ol style="list-style-type: none"> <li>1. How are the formal organizational structure of the Norwegian OSER system and the interorganizational coordination mechanisms established?</li> <li>2. To what extent formal and informal means of coordination are supplementary/synergetic or non-compatible/competitive?</li> <li>3. Whether and how the interdependencies between the organizations in the OSER system facilitate coordination or create incentives for competitive behavior?</li> </ol>	<ol style="list-style-type: none"> <li>1. How is the bilateral Norwegian-Russian cooperation on OSR organized?</li> <li>2. What factors facilitate and hinder international cooperation?</li> <li>3. How effective is the bilateral OSR regime in terms of its outputs, outcomes, and impacts?</li> </ol>
Analytical approach	Systems thinking as a point of departure in the analysis followed by the analysis of the OSER system from the vertical and horizontal dimension	Analytical approaches to interorganizational coordination	Analytical approaches to interorganizational coordination	Analysis of the regime's outputs, outcomes, and impacts

**Table 4 . Overview of the thesis articles.**

### **4.2.1 Article I**

Of all four articles this one proved the most challenging in terms of conducting research. I was surprised to discover that the structure of the Russian OSER system is nowhere described. Systems thinking has provided a valuable starting point in the analysis of an OSER system and the complexity of its organizational structure. Due to the scarcity of academic literature, the conclusions are based largely on interview data.

In this article I show that the functioning of the Russian OSER system is hampered by substantial shortcomings that need to be addressed. Lack of a clearly formulated and unified state policy is a major limitation. The system is a complex organizational setting, fragmented in terms of political authority and its regulatory base. Horizontally, the formal structure of the Russian OSER system is based on two subsystems – one for sea, one for land – operating independently under different ministries according to their mandates. Vertically, both sectors function at two levels: federal and regional. The OSER system acts in accordance with an extensive legislative framework developed by the Russian government and the federal authorities. However, this framework is partial and at times contradictory. Policy malfunctions have resulted in lack of precision in how the functions and areas of responsibility of the main federal authorities are defined. Lack of state funding hampers development of the OSER system and has become a constraining factor for the activities of response organizations that struggle to improve their capacities. Insufficient funding has led to the commercialization of oil spill response services. The scientific component of OSER remains largely on the periphery of the system, incorporated only occasionally. With no system for monitoring or tracking oil spills, control of oil pollution in the OSER is weak.

### **4.2.2 Article II**

This article studies interorganizational coordination in the Russian OSER system. In the Russian system, coordination functions as a simultaneous interplay of formal and informal mechanisms. The formal coordination is primary in the system. It defines the structure, roles and functions of the interacting organizations (its formal organizational structure), and establishes the operative coordination procedures and patterns of interaction in an emergency

situation. Informal coordination is common among the actors, who are well known to each other. Incentives for informal coordination are increased by organizational interdependence which is based on the commonality of purpose. Informal contacts help actors to solve practical challenges both in their daily activity and in emergency situation, thus functioning as important complementary coordination tools. By compensating for the shortcomings of the formal mechanisms, informal coordination contributes to the effectiveness of the Russian OSER system. For example, daily personal contacts among organizational executives are regarded as ‘important complementary coordination tools’ (Ivanova and Sydnes, 2010, p. 152) and ‘the most important factor facilitating communication’ (INF, 8: Ivanova and Sydnes, 2010, p. 152). They ‘produce[] a positive impact on the work process [by helping] to minimize the effect of red tape [and thereby] increase[] efficiency of emergency response’ (INF, 10: Ivanova and Sydnes, 2010, p. 151). Informal contacts (through personal phone contacts, direct requests, correspondence, and electronic mails) are especially important in emergency situations (INF, 10: Ivanova and Sydnes, 2010, p. 151). Together, formal and informal mechanisms act in a complementary way: ‘[w]hile formal coordination is the force that shapes the OSER system and defines how it operates, informal interactions are the means that help the formal wheel to function by smoothing its malfunctions’ (Ivanova and Sydnes, 2010, p. 154).

Empirical evidence indicates that mutual dependence is high among organizations in the Russian system. United by a common purpose, participating actors rely on each other’s inputs to provide effective OSER. This facilitates incentives for effective coordination because the actors are mutually dependent on each other’s resources. On the other hand, interdependencies obstruct coordination. The issue of commercialization of oil spill response services resulting from inadequate federal policy (touched upon in article I) is discussed here in detail. Lack of funding obstructs the ability of response providers to improve their capacity and forces them to seek additional sources of income, leading to competition for resources and clients. The effectiveness of the Russian OSER system remains a theoretical issue since no major accidents have yet occurred in the Murmansk region. However, the majority of our informants were positive as to the system’s ability to respond in an actual emergency situation.



### 4.2.3 Article III

The article tests the same analytical approach to the analysis of interorganizational coordination as article II. We outline the formal structure of the Norwegian OSER system and mechanisms of coordination intended to make it function as a whole. The Norwegian system is based on a complex organizational structure which unites multiple actors at different levels. The Norwegian approach to the organization of OSER builds on a unitary, clearly formulated, communicated state policy where agreement on general principles is shared among the participating organizations. Cooperation among the private, municipal and state levels of contingency is the core of the organizational principle of the Norwegian OSER system. In a major emergency situation, all three contingency levels can be mobilized to act as one integrated national system. Strong organizational culture in the system is based on the shared belief that the national OSER system is a ‘well-run team’ where ‘people know ... how to act together’ (informants in article III). Considering the amount of political attention that the issue of oil OSER has recently gained in Norway, a rather surprising finding is that responsibility for the OSER system is almost fully delegated to a single agency, the Norwegian Coastal Administration.

The Norwegian OSER system relies heavily on formal mechanisms of interorganizational coordination: formal mandates, contingency plans and interorganizational agreements. There is a continuous drive for further formalization of the procedures. Because ‘Norway is a small country’, informal interactions among the actors are natural, since everyone knows each other. Informal communication is in many cases an outcome of prior formalized arrangements: ‘everything that is being done is first and foremost based on formal agreements at higher levels, and all other actions are in line with formal procedures’ (informant in article III). The major input of informal coordination is that it facilitates effective functioning of the OSER system. For example, a representative of the Norwegian Clean Seas Association has noted that the informal contact with the Norwegian Coastal Administration ‘assists ... in doing a better job in combating an oil spill ... much more efficiently’ (informant, article III). Daily informal communication helps the actors to know each other (informant, article III) and thereby facilitates ‘build[ing] the formal framework’ to be invoked in the event of acute pollution (informant, article 3). As such, the formal and informal mechanisms are two complementary parts of one process. They function synergetically, providing more effective coordination.

#### **4.2.4 Article IV**

Article IV shows that established Norwegian–Russian bilateral OSR cooperation in the Barents Sea has developed, both professionally and personally, into what we assess as an effective bilateral regime. The general framework for cooperation, the roles and functions of the cooperating parties, and the operative coordination procedures in an emergency situation have been established through a set of formal institutional procedures. The stability of the established formal arrangements has given rise to strong informal relationships between the actors, relationships that function as an important facilitator for cooperation. We regard the regime as effective because it has managed to establish procedures for the provision of mutual assistance in responding to oil pollution in the Barents Sea. These procedures are practised regularly through bilateral and multilateral training exercises.

Bilateral Norwegian–Russian cooperation proceeds at both the ministerial (managerial) level, where the Norwegian Ministry of Fisheries and Coastal Affairs and the Russian Ministry of Transport are involved, and the agency level (professional or operative), between the Norwegian Coastal Administration and the Murmansk Basin Emergency Rescue and Salvage Department. Strong and successful cooperation at the agency level has made this cooperation ‘a very special technical branch for especially interested people’ (informant, article IV).

Article IV also identifies some aspects that inhibit effective cooperation and may ultimately affect joint response procedure in an emergency situation. These include obstacles caused by bureaucratic procedures on the Russian side; Norwegian uncertainties as to how the Russian OSR system will function in an emergency due to the multiplicity of actors and to the differences in approaches experienced in planning and conducting exercises; and insufficient knowledge of the domestic OSR system in Russia on the Norwegian side. One important finding is what inhibits cooperation often originates in factors external to the cooperation and does not stem from the relationship between the key authorities responsible for operative cooperation.

Analysis of the inhibitors predominantly linked to factors on the Russian side reveals that these factors are results of the shortcomings of the Russian OSER policy. The inadequacy of

this policy at the national level produces negative outcomes for the bilateral cooperation. Empirical evidence indicates that outcomes of the bilateral cooperation have had limited effect on national policies in Norway and Russia.

### ***4.3. Summary of the findings***

To facilitate this summary of the main findings I have plotted them into a table (see table 5). In addition to the findings directly related to the main research questions, the table contains sections on outputs, outcomes, and impacts that I have tried to identify for the Norwegian and Russian OSER systems.

An OSER system is a complex structure of mutually dependent organizations, each relatively autonomous, that must work together to serve a larger system. Interorganizational coordination is established through formal and informal mechanisms. Both mechanisms are at play simultaneously, although formal procedures are the primary means of coordination. Their main function is to define the formal structure, including the roles and functions of the interacting actors, and to establish coordination procedures for daily activity as well as for emergency situations. Informal interactions are regular among the actors, but the functions vary. It is not the formal and informal coordination mechanisms individually but their interplay that provides for effective functioning of an OSER system. Therefore, while coordination must be recognized as a complex process, the focus of the analysis must be on how formal and informal aspects work together. Interdependence is characteristic of an OSER system and may affect organizational behaviour in term of interorganizational coordination. The study has provided evidence that interdependence may both facilitate and hamper interorganizational coordination.

	Russia	Norway	Norwegian-Russian bilateral regime
Interdependence	based on the commonality of purpose	based on actors mutual dependence on each other's inputs to provide effective and efficient OSER	based on a common understanding of a problem to be addressed and a shared interest to strengthen the joint efforts in combating acute oil pollution in the Barents Sea
Coordination mechanisms	formal and informal; interplay is synergetic	formal and informal; interplay is synergetic	formal and informal
Formal coordination	defines the formal organizational structure and establishes the operative coordination procedures and patterns of interaction in an emergency situation	defines the formal structure of the system, roles and functions of the interacting organizations; establishes the operative coordination procedures and patterns of interaction in an emergency situation	defines the roles and functions of the interacting parties and establishes the operative coordination procedures in an emergency situation
Informal coordination	facilitates the formal mechanisms and compensates for their shortcomings	facilitates effective functioning of the OSER system; is often based on formalized procedures	informal relationship is an important facilitator for cooperation
Output	substantial shortcomings in the regulatory framework; organization process is not accomplished	based on a unitary, clearly formulated, communicated and agreed upon among the participating actors state policy	regime functions through a set of established and functioning institutional arrangements (bilateral agreements, contingency plan, joint training exercises and planning procedures)
Outcome (in terms of coordination)	formal and informal mechanisms function simultaneously; informal coordination somewhat in opposition to formal; competition among the response providers as one of the outcomes of interdependence and organizational shortcomings in the system	formal and informal mechanisms function synergetically as two complementary parts of one process, providing for more effective coordination; no major coordination challenges that impede the system's effectiveness	regime has become a strong partnership based on the procedures established by the functioning institutional arrangements; stability of the formal arrangements has given rise to informal relationships between the actors and the development of a "special culture around this cooperation"; limited effect on the national OSR policies
Impact	effectiveness remains a question; informants are in general optimistic but some express doubts related to the shortcomings of the regulatory framework	the system has been strengthened substantially during the last years and is being constantly improved; despite the absence of major challenges related to interorganizational coordination it is an issue to be considered for the effective functioning of the system and is being continuously dealt with to be improved	procedures for the provision of mutual assistance in responding to oil pollution in the Barents Sea are established and regularly practiced; effectiveness in terms of ability to handle a major accident remains a question

**Table 5. Overview of main findings**

## **5. Discussion**

In this chapter, I return to the research tasks and deliberate upon them in relation to the analytical perspectives outlined above and the possible implications of these findings. Finally, I will reflect on the effectiveness of the Norwegian and Russian OSER systems.

### ***5.1. The OSER systems revisited***

Having presented the major findings, it is time to revisit the OSER systems that have been the unit of analysis throughout this study, to view it in terms of organizational theory. In this section, I highlight the key structural characteristics of the Norwegian and Russian OSER systems, on the basis of Mintzberg's approach discussed in section 2.2, and examine how these are determined. This discussion will involve the main issues related to formal and informal aspects of interorganizational coordination and organizational interdependence within the OSER systems.

To facilitate the discussion, I have modelled each OSER system on the 'ideal' model of an OSER system presented in section 2.2 (figure 3). It should be noted that these models take into consideration all the components of the OSER systems. I discuss how the five basic components bring forth the main structural characteristics of the Norwegian and Russian OSER systems, and how the structure is affected by the mode of operation.

OSER systems are large, and consist of a wide range of organizations that may be involved in an emergency situation (see for example annex I in article III or table 3 pp. 146–147 in article II). My analysis throughout the study has focused on the organizational aspects of OSER and on the key actors in particular. In terms of the basic components this means I have concentrated on the strategic apex, the operating core, and (to a limited extent) the middle line. The technostructure and support staff are presented in the studies but not analysed explicitly, although there is a focus on the contingency planning and exercises that constitute an important part of technostructure. Here I stay with this approach and discuss the OSER systems' configurations based on the key actors referred to in the articles. In addition, I build the discussion on the two main modes of operation of OSER systems: the steady-state and the emergency modes, presented in sections 2.1 to 2.2.

In line with Mintzberg, I warn the reader that ‘the case for each configuration is overstated to make it clearer, not to suggest that every organization ... exactly fits a single configuration’ (Mintzberg, 1983, p. 156). Thus, the presentation of system structures in terms of particular configurations is done for analytical and illustrative purposes, and deviations between the ‘ideal’, theoretically consistent and the real combination may emerge.

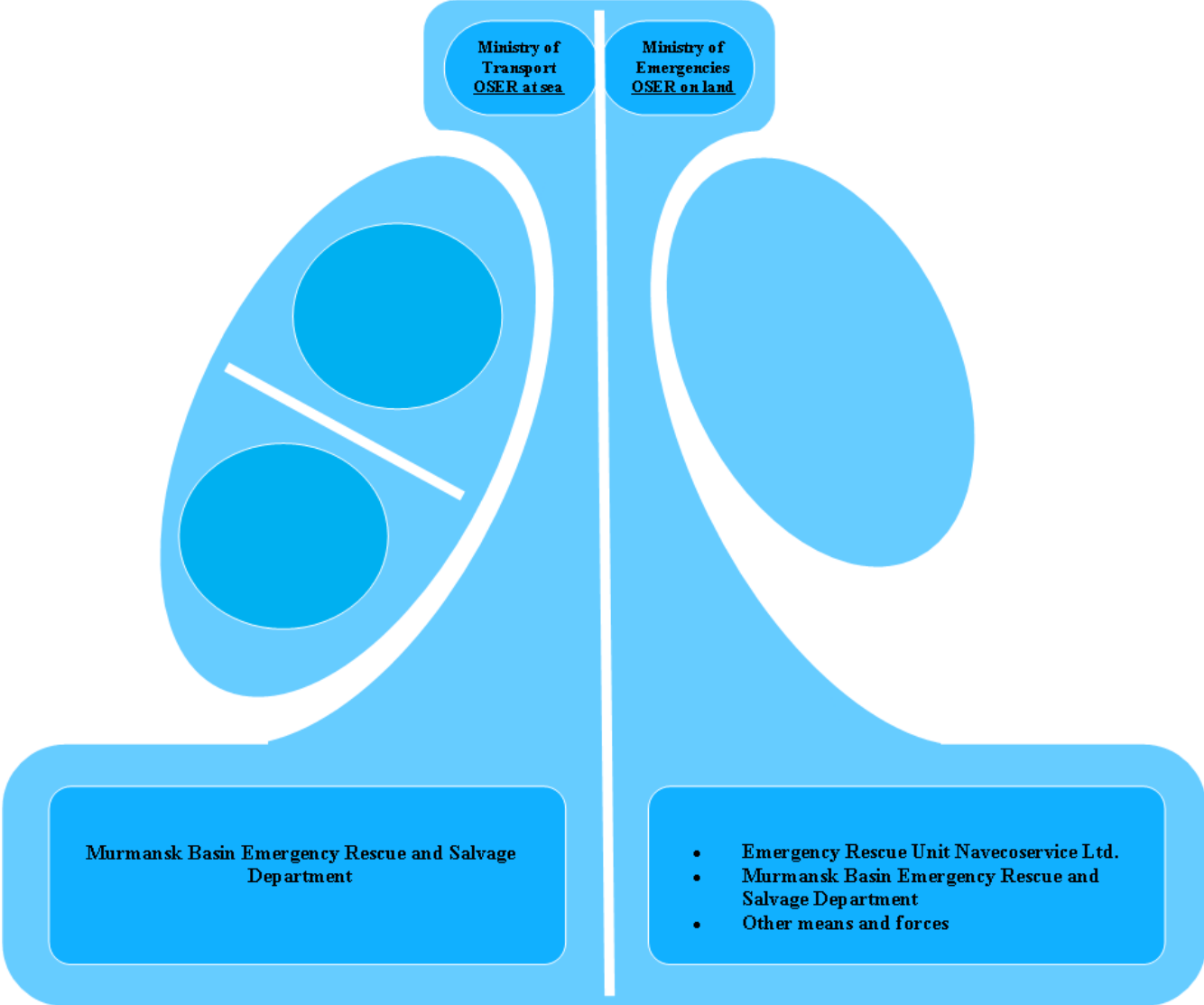
### **5.1.1. The Russian OSER system**

On the whole, the Russian OSER system is a cumbersome, sector-based structure established at the federal and regional level, with several ministries and their underlying agencies sharing responsibilities. Despite the sectorization, interdependence among the organizations in the system is high. The Russian informants repeatedly emphasized the OSER system as a tight community where organizations rely on each other’s inputs to enable an effective oil spill response operation. Representatives of the Russian system noted that participating actors ‘are well acquainted with each other; they communicate regularly also on a personal basis’ (Ivanova and Sydnes, 2010, p. 154).

The Russian system is based on a hierarchical command structure established at multiple levels: the federal centre makes decisions, while the regions execute them and also bear responsibility for conducting OSER operations in case of emergency (Ivanova, 2011). Articles I and II identified several substantial shortcomings in the Russian OSER system, including lack of a clearly formulated and unified state policy, sectorization, fragmented and incomplete regulatory base, lack of state funding that hampers the activities of response organizations, commercialization of oil spill response services, science being relegated to the periphery of the system, and the absence of a system for monitoring or tracking oil spills. The lack of a unified state policy and single responsible authority has affected the unity of the organizational structure of the OSER system. (See figure 5a for a model of the Russian system in the steady-state mode.)

The strategic apex is split because the two federal authorities, the Ministry of Emergencies and the Ministry of Transport, that take part in OSER policymaking (in addition to the

government itself).<sup>7</sup> A dual strategic apex gives rise to a split middle line which connects it to the operating core. As to this middle line, for OSER at sea it consists of the federal authorities subordinate to the Ministry of Transport (the Federal Agency of Marine and River Transport, the State Marine Emergency Rescue and Salvage Coordination Service, Gosmorspasslužba), and Murmansk Marine Salvage Coordination Centre; for OSER on land, it involves the Main Department of the Ministry of Emergencies in the Murmansk region. The operating core is composed of two parts, representing the two sectors of the national OSER system responsible for land territory and for sea. The latter is represented by the Murmansk Basin Emergency Rescue and Salvage Department (MBERSD); the former, by private professional response providers, MBERSD, and other search-and-rescue services and teams.



**Figure 5a. Configuration of the Russian OSER system (steady-state mode)**

<sup>7</sup> To simplify, I have not included in the model the Ministry of Natural Resources and Ecology (another key actor in the Russian OSER system), which is responsible for policymaking in the sphere of control and supervision. If this actor were shown in the figure, the strategic apex would be split into three parts.

Sectorization of the Russian OSER system has also affected its technostructure element. Contingency planning for the land territory and for sea is disjointed and uncoordinated. The OSER system at sea operates in accordance with the Regional Oil Spill Contingency Plan for the Western Arctic Sector produced by the Central Marine Research and Design Institute. OSER operations on land are conducted in line with the Murmansk Regional Oil Spill Contingency Plan developed by the regional Emergency Commission and approved by the Main Department of the Ministry of Emergencies in the Murmansk region.

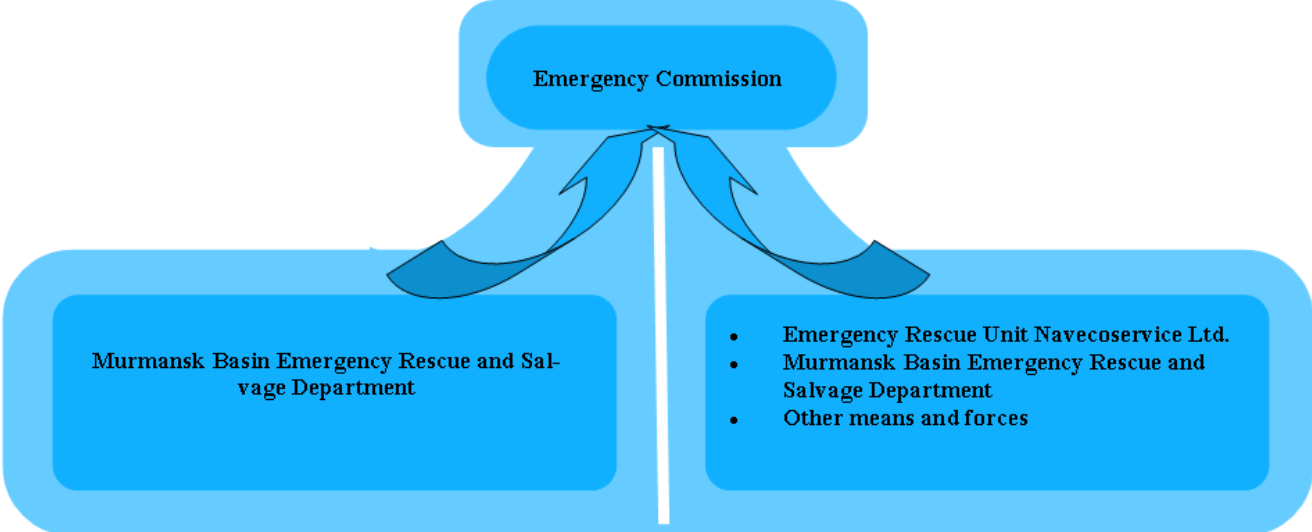
Study findings reveal that the scientific component that is part of technostructure is not closely coupled with the rest of the Russian OSER system. The activities of scientific research institutions in the region are unsystematic and lack a common agenda. In terms of the structural configuration, this implies that technostructure element in this part is somewhat loosely coupled with the rest of the structure. This study does not indicate whether the procedures for training exercises are sector-based or unified, so I can offer no conclusions regarding sectorization there. Nor has the support-staff component been discussed in detail in the studies, although article II provides an overview of organizations that perform oil spill support functions (see table 3 in article II, pp. 146–147). In addition, article I reveals that a proper system of environmental monitoring and tracking of oil spills has not been established in the region. This implies that the support-staff component in the Russian OSER system is weakened.

A notable feature of the Russian OSER system is that its organizational structure changes drastically in the emergency mode. The configuration is transformed into a more linear structure. This emergency-mode structure resembles the simple structure configuration consisting of the strategic apex and operational core (see figure 5b).

The strategic apex is represented by the regional Emergency Commission, a new institutional body that appears in particular in emergency situations. The Commission is a coordinating body to be convened in the event of an oil spill and is headed by the regional government. The main task of this body is to mobilize, organize and bring together all available resources and organizations needed for a successful OSER operation in the Murmansk region. The Commission is a platform that integrates all structural components of the system, including



the technostructure and support staff. It unifies the sea and land sectors and also includes representatives of the technostructure and support staff on a needs basis. The operating core remains functionally sectoral but is unified through the Emergency Commission.



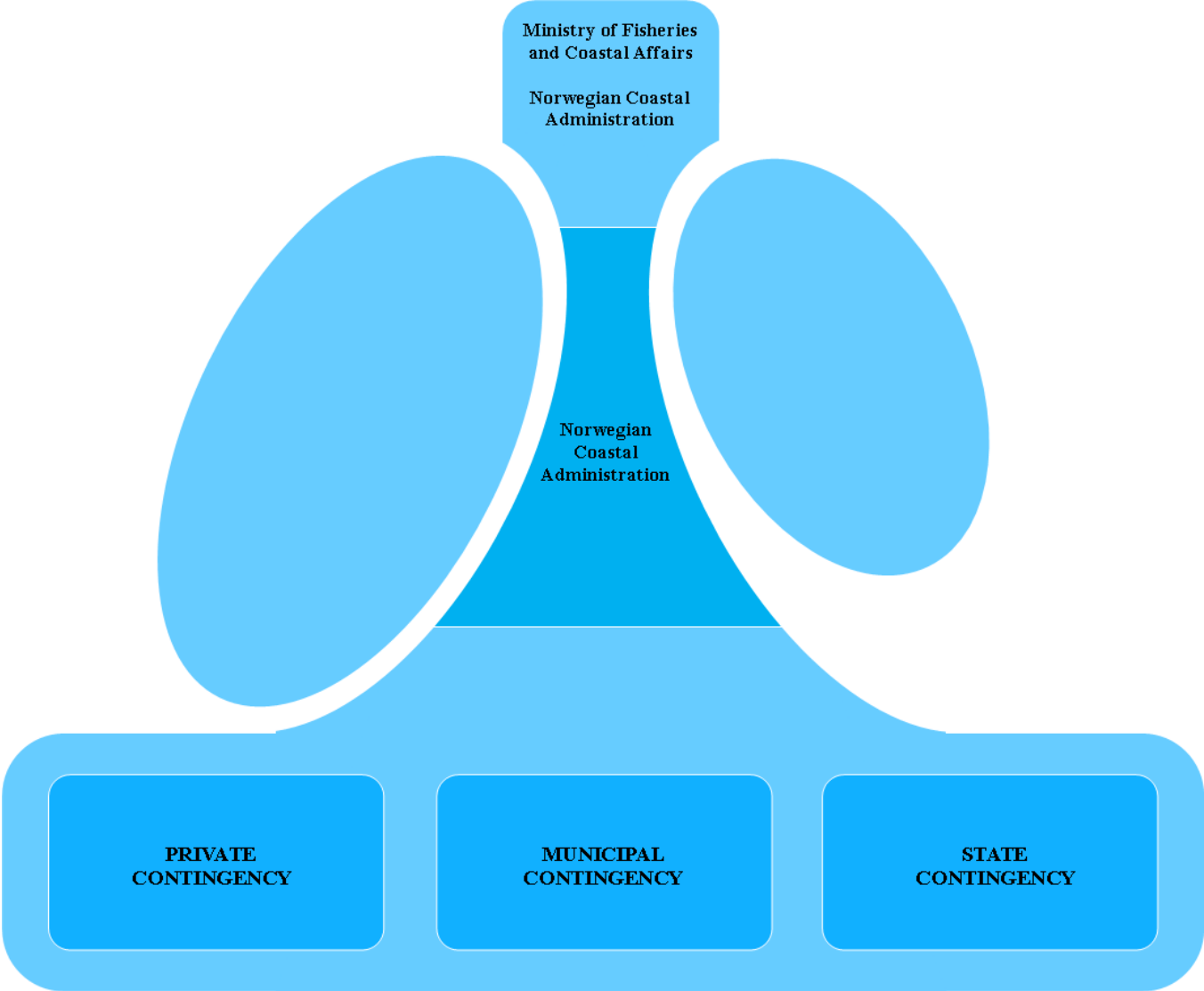
**Figure 5b. Configuration of the Russian OSER system (emergency mode)**

Comparison of the two structural configurations shows that the Russian system experiences different pulls depending on the mode of operation. In the steady-state mode, it functions as a contingency bureaucracy ready to provide its services if an emergency occurs (Mintzberg, 1983, p. 175). Its structure gets pulled in the direction of technostructure (due to the continuous drive to standardize procedures through contingency planning) and strategic apex (because the power of the federal authorities in the Russian system is strong and most regional-level actions are subject to their approval). In the emergency mode, the structure is simplified and becomes more linear. Now it is pulled in the direction of the strategic apex and operating core, where the strategic apex integrates the components of technostructure and support staff.

**5.1.2. The Norwegian OSER system**

The Norwegian OSER system is tightly coupled and unified (see figure 5c). As noted by one Norwegian informant, the national OSER system is relatively small community, with fewer

than 100 people working with oil spills in Norway. Our Norwegian informants have repeatedly described the national OSER system as ‘a well-run team’ where ‘a few people ... know how to act together’ (informants, article III).



**Figure 5c. Configuration of the Norwegian OSER system (steady-state mode)**

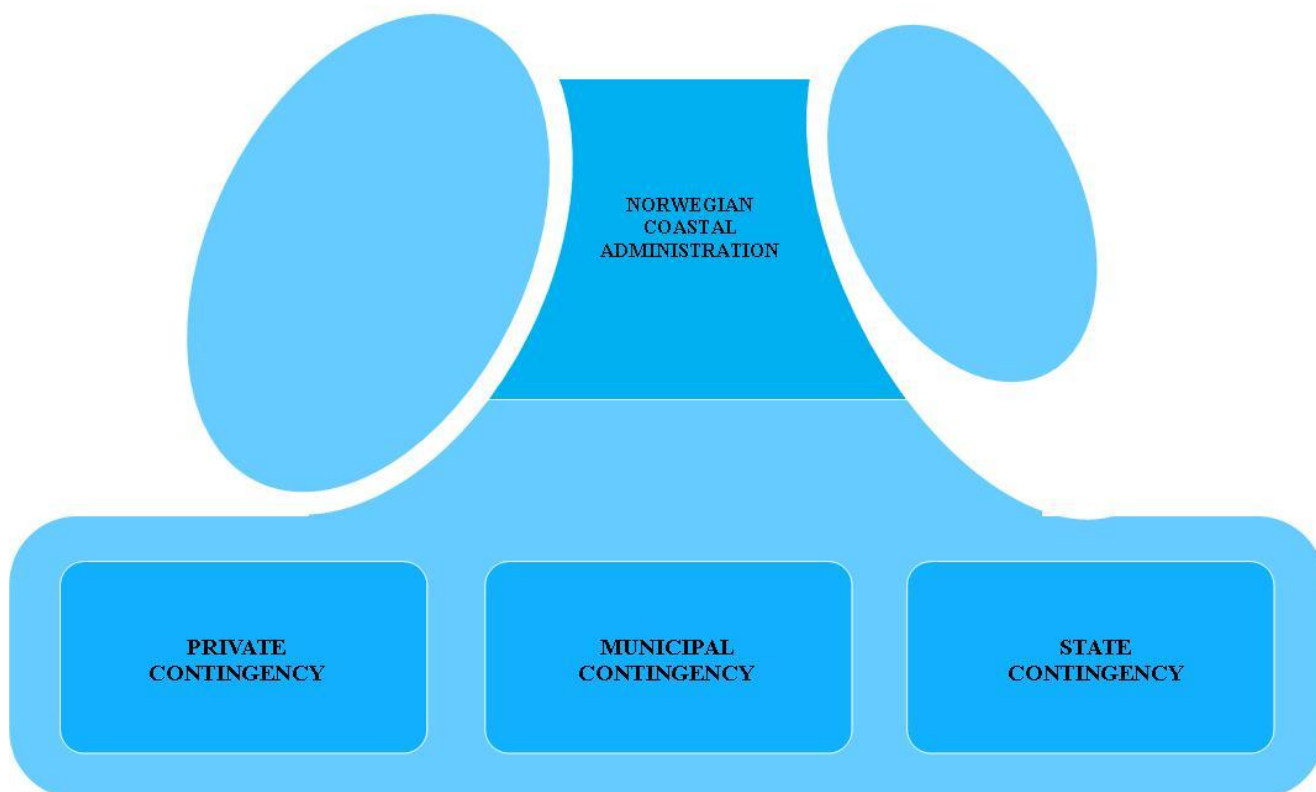
In the Norwegian OSER system a small strategic apex stands against a relatively large operating core. The system is multi-level. Unlike the Russian system, there is a clear centre of authority: the Norwegian Coastal Administration has sole responsibility for the organization and coordination of the country’s OSER system. The national contingency is delegated to subsystems of the private sector (established by oil operators, terminals and the Norwegian Clean Seas Association (NOFO)), the municipal level (established by the municipalities and inter-municipal emergency response regions), and the state level (established by the

Norwegian Coastal Administration). Thus, the operating core is composed of three subsystems. When required, all three may be mobilized to act as one integrated national system. Therefore, they are modelled as a single operating core unit.

The technostructure is a strong and tightly coupled element in the structure of the Norwegian system. All levels of preparedness act in accordance with contingency plans that are standardized, coordinated and integrated into one national OSER plan to ensure that the national system will function as a single integrated response organization in the event of an emergency. Regular exercises are conducted at all national levels of preparedness in accordance with an annual programme established by the Norwegian Coastal Administration. These include integrated exercises where personnel and resources from private industry, the municipalities, the government and the Coast Guard are involved. The support-staff components of the Norwegian OSER system are not discussed in detail in the study, but the overview of the actors (see annex I in article III) shows that there are many organizations that may become involved in an OSER operation if needed. I therefore conclude that the support staff is a strong element in the Norwegian OSER system.

A particular feature of the Norwegian system is that the Norwegian Coastal Administration is the dominant national actor in the system, functioning as part of the strategic apex, the operating core, the middle line, the technostructure, and even the support staff. The Norwegian Coastal Administration is like a hub (see figure 1 in article III) that mobilizes and coordinates the other key national actors.

In an emergency situation, the organizational structure of the Norwegian system remains relatively similar to the state-state mode (see figure 5d). It turns into a somewhat truncated version of the steady-state mode structure in that it becomes more flat while retaining the key structural components. The system is led by the Norwegian Coastal Administration. The components of technostructure and support staff become to a certain degree detached yet remain integral to the configuration, as organizations representing these may at any time be called on to provide their services for a response operation.



**Figure 5d. Configuration of the Norwegian OSER system (emergency mode)**

Like the Russian OSER system, the Norwegian system is affected by different pulls depending on its mode of operation. Functioning as a contingency bureaucracy in a steady-state mode, the system is pulled in the direction of the technostructure and strategic apex. In the emergency mode, the middle line and the operating core become the core of the system. If we disregard the technostructure and the support-staff components invoked on demand in an emergency situation, the structure of the Norwegian OSER system in the emergency mode is in fact very similar to the simple structure configuration.

### ***5.2. The OSER systems compared***

The discussion above and the findings of the study have revealed several similarities in the Norwegian and Russian OSER systems. Both are complex organizational structures consisting of multiple interdependent organizations that interact with each other. The systems are primarily state-run and are based on a command and control approach. Both systems are

contingent in that they adjust their organizational structure and the number of actors involved to the mode of operation and the complexity of the incident.

**5.2.1. Interorganizational coordination**

The function of interorganizational coordination in the Norwegian and Russian OSER systems is to bring together the multiple parts of a complex OSER system and harmonize their interaction. Overall analysis of mechanisms of interorganizational coordination in the systems (see articles II and III) shows that both systems rely on the simultaneous interplay of formal and informal coordination mechanisms, and that their interaction provides for effective functioning of the system. Although approaches to the organization of oil spill response in Norway and Russia differ in certain aspects, the mechanisms of coordination are similar (see table 6).

	Mechanisms of coordination		
	Formal		Informal
	Mandated	Standardized-voluntary	Voluntary
Russian OSER system	formal organizational structure of the system; contingency plans; Emergency Commission; training exercises	formal interorganizational agreements	lateral relationships; personal communication
Norwegian OSER system	formal organizational structure of the system; contingency plans; training exercises; regular meetings, seminars, forums (eg. for the coordination of OSER in the high-north)	formal interorganizational agreements	lateral relationships; personal communication; organizational culture
	Mandated	Non-mandated (voluntary)	
	Forms of coordination		

**Table 6. Mechanisms and forms of organizational coordination in the OSER system (based on Hall et al., 1977 and Martinez and Jarillo, 1989)**

Analysis of the role of different mechanisms of coordination in the Norwegian and Russian OSER systems shows that formal mechanisms are the primary means of coordination. The

formal organizational structure of the system is a mechanism that defines how the roles and functions of the main interacting organizations are differentiated and brought together. Formalities establish coordination procedures for the steady-state mode (e.g. interorganizational agreements) and the emergency mode of operation (e.g. contingency plans). That formal approaches are the primary mechanisms of coordination is hardly surprising, given the nature of the problem to be dealt with. Oil spills are emergencies which have usually fallen under the mandate of military units, where hierarchy and formal procedures are common (Dynes, 1994). Both the Norwegian and the Russian OSER systems are based on a command and control approach that favours formalized communication based on rules and regulations. And indeed, formal coordination has been conventionally regarded as the most effective (Challis et al., 1988, p. xi; Martinez and Jarillo, 1989; Peters, 1998, p. 49; Thomas, 2003, p. 21).

On the other hand, this study has indicated that formal approaches to coordination may fail, despite their significance for the coordination process. If '[c]oordination cannot be imposed, [i]t has to be created' (Quarantelli, 1986, p. 14), this study provides evidence that the national policy framework for OSER activities play an important role in harmonizing the formal mechanisms of coordination. My findings regarding the Russian OSER system indicate that if the regulatory framework for OSER activities suffers from substantial shortcomings, formal coordination may be undermined. In such a situation, the informal mechanisms have a crucial role in compensating for the malfunctioning of the formal procedures.

In both the Norwegian and the Russian OSER systems, informal means of coordination are important, but their impacts vary depending on the circumstances. In the Norwegian OSER system, the major input of informal coordination is its ability to facilitate the formal mechanisms and thereby contribute to system effectiveness. The Norwegian case indicates that even in the presence of strong formal procedures there is a need for informal coordination. Turning to the Russian OSER system, we note that informal coordination is even more significant. As remarked by one Russian informant '...we proceed not from the notion of functional relationship but from the notion of reasonability and certain pragmatism...' (informant, article II). There it compensates for the shortcomings of the formal mechanisms (Chisholm, 1989, pp. 23, 36) and their insufficiency (O'Toole, 1997). One informant referred to in article II commented on the Russian OSER system as follows: 'on the one hand there are objective contradictions that lay in the essence, . . . there are

objective prerequisites that pull down the whole thing, that take the whole thing apart already in the bud, on the other there are human relationships that somehow smooth all that over and build up the whole thing'. Thus, it would seem that the informal aspect is crucial in the Russian OSER system.

That informal coordination is especially important in both systems in the steady-state mode of operation, i.e. when an OSER system functions as a machine bureaucracy, might appear contrary to certain key characteristics of a machine bureaucracy. As noted by Mintzberg, '... the administrative structure of the Machine Bureaucracy is ill-suited to the use of mutual adjustment [i.e. coordination by informal communication]. All the communication barriers in these structures – horizontal, vertical, status, line/staff – impede informal communication' (1983, pp. 182–183). A possible explanation for the Russian case lies in the shortcomings of the formal procedures. As to the Norwegian system, it has emerged that, although informal communication is helpful, all procedures and actions are based first and foremost on formal agreements at higher levels, and so all informal actions are in line with formal procedures.

Does the shift from the steady-state to the emergency mode of operation affect the use of mechanisms of interorganizational coordination? In the Norwegian OSER system, there is a striving for action in accordance with the formal coordination procedures established by the 'duty system', a formal organizational structure, contingency plans, and agreements in case of emergency. As commented by one Norwegian representative: 'From the first minute of an accident I have to be conscious: now we are no longer informal. Now it is a sharp situation and we have to communicate formally and correctly' (informant, article IV). This indicates that in the Norwegian OSER system informal communication becomes subordinate in an emergency situation. It is impossible to draw a similar conclusion regarding the Russian OSER system, simply because there are no empirical data: the Russian system has never been involved in a large oil spill emergency operation. However, since informal coordination is highly important in the Russian system in its daily mode of operation, I would expect it to remain significant in an acute situation as well.

### **5.2.2. Interdependence**

Interdependence in both the Norwegian and Russian OSER systems is based on a commonality of purpose, with the involved organizations aiming to achieve shared goals (see

Chisholm, 1989, p. 37; Halpert, 1982, p. 57; Seidman and Gilmour, 1986; Thomas, 2003, p. 19). My empirical findings support the theoretical propositions that interdependence can create mixed motives for coordination. It may pull interorganizational interactions together, or apart. It is this dualism of interdependence that adds to the explanation of why actors within an OSER system (the Russian one in particular) will cooperate under some circumstances and compete under others.

On the one hand, the interdependence provided by commonality of purpose produces a strong incentive for cooperation, thereby facilitating effective coordination. As a representative of the Russian OSER system noted ‘... we proceed not from the notion of functional relationship but from the notion of reasonability and certain pragmatism, what is advantageous for us, whom do we need today, who needs us, where can we earn money to support ourselves, where can we extract some profit, where can we gain something, political dividends after all. Therefore we have to cooperate . . . we are obliged, we must cooperate and we do it with those in whom we are interested and with those who are interested in us’ (informant, article II). Similarly, actors in the Norwegian OSER systems share a sense of common purpose, that the inputs of the individual organizations are crucial for providing effective and efficient response: ‘... there is little disagreement on how the system should work. . . . We are a small country, we have to cooperate and agree’ (informant, article III).

Commonality of purpose facilitates interorganizational coordination, but the latter is also interest-driven. Organizations seek assistance from each other to enhance their performance in day-to-day activities and even more so in emergency situations. This need becomes a driving force for coordination. In both the Norwegian and the Russian OSER systems, the actors’ desire to consolidate their efforts through interorganizational agreements is interest-motivated.

On the other hand, interdependencies may also provide a basis for interorganizational competition, creating obstacles to coordination. Article II shows that when organizations must depend on the same resources, organizational desires to reduce uncertainty and protect their autonomy induced by the need to ensure organizational survival may create barriers to coordination. The commercialization of OSER services in the Russian system has established incentives for non-cooperative behaviour among response providers in the Murmansk region. Seeking to protect autonomy in a situation where there is little funding and federal policies



have numerous shortcomings, response organizations look for additional sources of income and therefore compete for resources and clients. By contrast, the findings regarding the Norwegian OSER system clearly show that there is no competition among actors. There, the responsibilities of the key actors are clearly delineated and their mandates are defined by the Pollution Control Act of 1981 and by state policy. The precision of the national policy on OSER in Norway does not allow for disputes among the actors involved.

### **5.2.3. Structural configurations**

The peculiarities and dissimilarities of the Norwegian and Russian OSER systems, as shown in our discussion of the empirical findings, are reflected in the structural configurations of the systems. Compared to the Russian system, the structure of the Norwegian OSER system is more consistent and stable. Although the system changes its configuration from a more complex (contingency bureaucracy) configuration towards a more simple one, variations between the structure in the steady-state mode and the emergency mode of operation are minor. In Norway, where the national policy is consistent and where a single authority, the Norwegian Coastal Administration, is responsible for the OSER system, it is easier to maintain continuity in structure. In the Russian case, we find a larger gap between the structural configuration of the OSER system in the steady-state and emergency modes, with a distinct shift from the contingency bureaucracy structure towards a simplified structure of crisis organization.

Both the Norwegian and Russian OSER systems have strong operating cores consisting of multiple components. However, the complexity of the operating core is not the issue: what is important is whether and how these components are linked with each other. In the Norwegian case, the private, municipal, and governmental contingencies together compose an integrated national system. By contrast, in the Russian system the sea and land territory sectors are disintegrated. This is particularly significant in the steady-state mode, whereas in an emergency situation the two sectors are united under the auspices of the Emergency Commission. In addition we have noted inter-sector competition over turf at the regional level and at the level of sector ministries as well.

These structural configurations are the outcomes of national approaches and policymaking in the sphere of OSER. The Norwegian and Russian systems are based on different policy approaches and regulatory frameworks in terms of unity. The Norwegian OSER system is backed up by a clearly formulated, unified state policy: the Russian system is not. This has affected the organizational process, interorganizational coordination in particular. In the Norwegian system, there is no rivalry or competition among the actors, unlike the case in the Russian system. This is ultimately the result of Norway's unified state policy and the socialization of actors into the national duty system. The impact of the policy framework on the organizational structure of an OESR system underscores the importance of a well-developed and preferably integrated state policy as regards OSER.

From on the discussion above, we may conclude that whether an OSER system is operating in the steady-state or in the emergency mode is the main factor that determines the organizational structure of the system. My findings show that the shift from the steady-state to the emergency mode leads to a simplification in the organizational structure of the OSER systems which is – as the theory states – a characteristic of crisis organization (Mintzberg, 1983, pp. 157–158). In the emergency mode of operation, characteristics that are defined by the scope of the incident play a crucial role, determining the complexity of the organizational structure of the OSER system involved. The larger the scale of an emergency, the larger the number of the actors involved in the operation is and thus the more complex the organizational structure becomes. On the other hand, the degree of the structural changes brought about by the shift in mode of operation may be substantially limited by the stability in organizational structure provided by a consistent national OSER policy. As we have seen, the structural configuration of the Norwegian OSER system changes only partially when it shifts from the steady-state to the emergency mode.

The mode of operation is thus a factor that determines the organizational structure of an OSER system. But why does this change actually occur? Environmental instability entails adaptation problems for an OSER system, that is, for a rigid machine-bureaucracy structure. Machine bureaucracies are best suited for stable environments because they are designed for specific, predetermined missions (Mintzberg, 1983, p. 186). An emergency situation brings instability and uncertainty – conditions for which the command and control approach is ill-suited. In these circumstances a machine bureaucracy such as an OSER system needs to compensate for its 'shortcomings' by simplifying its structure. In other words, the

fundamental change in the organizational structure of an OSER system is provided by changes in the system’s environment. However, this theoretical argument is, to a certain degree, in contradiction with our empirical findings – especially those regarding the Norwegian OSER system, where the structure remains relatively stable and we can note a pull towards formalization of procedures in an emergency situation.

Although the configurations in figure 5 are similar to the ideal models discussed by Mintzberg (1983), analysis of the empirical evidence suggests that the pulls experienced by the OSER systems are not unequivocal (see previous discussion and table 7). As most organizations experience all five of the pulls under different circumstances, this is not unexpected (Mintzberg, 1983, p. 153). My objective was to simplify complex organizational reality in order to illustrate which pulls and structural configurations are favoured under particular conditions. In general terms, we may say that the pulls experienced by the OSER systems support the theoretical propositions discussed in section 2.2, with the contingency bureaucracy configuration (as a type of machine bureaucracy) reflecting the OSER system in the steady-state mode, whereas the crisis organization (as a type of simple structure) is typical of the emergency mode (see table 7).

	Directions of pulls	
	Steady-state mode	Emergency mode
Russian OSER system	technostructure and strategic apex (machine bureaucracy/simple structure)	strategic apex and operating core (simple structure/professional bureaucracy)
Norwegian OSER system	technostructure and strategic apex (machine bureaucracy/simple structure)	middle line and operating core (divisionalized form/professional bureaucracy)

**Table 7. Pulls provided by the mode of operation in the Norwegian and Russian OSER systems**

The fact that the Norwegian and Russian OSER systems adjust their configurations in accordance with the demands of the external environment should be related to the issue of

system effectiveness. If ‘the successful organization designs its structure to match the situation’ (Mintzberg, 1983, p, 122), the fact of appropriate change in the structural configuration of the OSER system will contribute to their effective performance. Yet, regarding structural effectiveness, we must consider not only whether the structure fits its situational factors, but whether internal consistency is achieved among the design parameters (Mintzberg, 1983, p, 122). And here the Norwegian OSER system clearly has greater potential for successful performance than the Russian one, due to its greater internal stability.

### ***5.3. Effectiveness of the OSER systems***

In this section, I summarize my findings on the effectiveness of the Norwegian and Russian OSER systems. The effectiveness of the Norwegian–Russian OSR regime is discussed in detail in article IV and the findings are presented in section 4.2.4. I therefore do not go into further detail on the subject here.

Viewing an OSER system as a regime, I use the indicators applied in article IV (outputs, outcomes, and impacts) to gauge the effectiveness of the national OSER systems<sup>8</sup>. Regime *outputs* involve measures employed to activate the paper arrangements of a regime into practical procedures; *outcomes* involve behavioural changes caused by the implementation of the regime (Miles et al. 2002, p. 6) including compliance (Young, 2002, p. 74); while the *impacts* of a regime concern its problem-solving capacity (Young, 2004, p. 12) or the ability to achieve its purpose (Underdal, 2004, p. 27).

As regards outputs, the national OSER regime in Russia is based on a regulatory framework that suffers from substantial shortcomings. OSER activities in Russian are governed by a number of partial and at time contradictory laws: the situation is also the result of the lack of consolidated state policy in the environmental sector (Ivanova, 2011). Among the resultant negative consequences for interorganizational coordination is competition among the response providers in the wake of commercialization of OSER services (Ivanova and Sydnnes, 2010). The question of the problem-solving capacity of the Russian OSER system, and not least how the coordination mechanism would perform in a large-scale emergency, remains an hypothetical issue, as the system has never been involved such major emergency operation.

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<sup>8</sup> See table 5 for a summary of findings on the subject.

According to Russian informants, ‘it is difficult to say how it [the system] will work out in a real-life situation, only the incident will show’; ‘[s]o far there have been no such precedents. Therefore, it is impossible to evaluate the existing [coordination] system, whether positively nor negatively. One can only guess at the way it will look’ (informants, article II). Most informants agreed that the system would function effectively (article II). As one Russian informant noted, ‘there are several response providers in the region that can actually do something, those will come and do their job’ (informant, article II). The high level of professionalism among regional response providers was also mentioned by the Norwegian partners (article IV). In addition, the national and bilateral Norwegian–Russian training exercises indicate that the system should perform effectively (article II, IV). On the other hand, some informants – both Russian (article I) and Norwegian (article IV) – have expressed doubts and scepticism. They cite organizational and legislative inadequacies, insufficient technical capacity due to lack of funding, and lack of response-support functions like oil spill monitoring and tracking.

In contrast, the Norwegian OSER system emerges as an active system. As shown in article III, as regards outputs the Norwegian regime is based on series of principles reflected in a clear-cut national policy on OSER activity. In consequence, the system appears as a ‘well-oiled machine’ where each element is aware of its function and all elements agree on how the ‘machine’ is to perform. As one Norwegian informant commented, ‘[a]s an operative system there is little disagreement on how the system should work. This should not be a problem to establish a national command system. We are a small country, we have to cooperate and agree’ (informant, article III). As the ability of the system to perform effectively in the case of an incident there is strong agreement among the informants. O. K. Bjerkemo, a senior official in the Norwegian OSER system, has concluded that Norway is prepared ‘but there are always possibilities for improvement’ (Bjerkemo, 2010). The evaluation reports of the recent incidents (eg. the Full City<sup>9</sup> operation) and the Norwegian informants themselves agree there are various issues to be deal with. Similarly, improvement of interorganizational coordination is set as a priority for further development of the system. Current initiatives in the process indicate the development of even further detailed formal structures and coordination

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<sup>9</sup> On July 31 2009 the Panama-registered bulk carrier MV Full City run aground at Sâstein, Telemark county, during a storm. The grounding caused a spill of approximately 300 tons of crude oil. The clean-up operation was led by the Coastal Administration and received considerable attention in the media.

procedures. Regarding the technical aspects, there is wide agreement on the need to increase capacity in the northern areas in order to be able to deal with the problems of on-going and projected petroleum development. Article III presents evidence that considerable efforts have been undertaken by the Norwegian authorities in recent years to strengthen OSER preparedness, in particular in the High North.

#### ***5.4. Concluding remarks***

So far, I have summarized and discussed key aspects of the Norwegian and Russian OSER systems. I have highlighted the main structural characteristics, discussed how these are determined, and deliberated on main points of interorganizational coordination and interdependence in the OSER systems. I wind up the discussion in the following chapter, which presents the main overall conclusions and formulates answers to the research questions that have guided the study.

## 6. Conclusion

### 6.1. Main conclusions

Let us return to the four research questions. My first question inquired into *the basic characteristics and determinants of an OSER system's organizational structure*. As an organizational system an OSER system is first and foremost 'a set of [organizations] standing in interaction' (von Bertalanffy, 1956, p. 39). Mintzberg (1983) describes an OSER system as a complex setting consisting of five interacting core components (strategic apex, middle line, operating core, technostructure, and support staff). Integrity and cohesion are crucial, as disruption may affect the effectiveness of system performance. The key characteristic of an OSER system is its highly adaptable and contingent nature, with a dual structure that is a function of the system's mode of operation. The complexity of the structure hinges on the extent of each specific incident and the character of the tasks the system must deal with.

I conclude that the mode of operation is a major determinant of the organizational structure of an OSER system. A shift from the steady-state to the emergency mode of operation entails a change in structural configuration – from a more complex towards more simplified bureaucratic organizational structure. The reason is the change of organizational environment, from stable towards more dynamic. In addition, my empirical findings indicate that national policy on OSER activities may substantially affect the structure of such a system.

The second and third research questions concerned *the nature of the relationship between the formal and informal mechanisms of interorganizational coordination, and how it provides for effective functioning of an OSER system*. Overall, the analytical approaches to the study of interorganizational coordination and interdependence proved applicable for studying OSER systems. Inquiry into the coordination mechanisms that are at play in the Norwegian and Russian OSER systems allows me to conclude that formal and informal mechanism are intertwined parts of the process of interorganizational coordination. I argue that formal and informal mechanisms of interorganizational coordination provide for the effective functioning of an OSER system through their simultaneous interplay. If this interplay is synergetic, coordination is facilitated; otherwise, coordination may be substantially hampered.

My findings indicate the primary nature of the formal mechanisms as the means of interorganizational coordination. However, we have also seen strong evidence of the importance of informal coordination in OSER systems, so informal procedures should not be underestimated. The findings on the importance of informal mechanisms of coordination can be seen in connection with social science disaster studies comparing the traditional command and control and the problem-solving models for organizing emergency response. Within this debate the command and control approach has been criticized for its lack of flexibility (Dynes and Quarantelli, 1976; Britton, 1989, p. 28; Harrald et al., 1992, p. 214; Walker et al., 1994, p. 42; Dynes, 1994; Neal and Phillips, 1995, p. 335; Weller, 1997). The findings of this study support the argument that approaches to the organization of OSER activity should consider the importance of informal forms of coordination, in addition to formal mechanisms, as informal forms may be able to compensate for shortcomings in the formal procedures and facilitate effectiveness of OSER systems (see Walker et al., 1994).

This argument is supported by the general propositions of organizational theory. Similarly, contingency theory argues that the form of organizational structure requires a close fit to the kinds of its tasks or the environment (Mintzberg, 1983, p. 122). The more variable and unpredictable the environment, the more organic the structure must be, and the organization will need to rely on more flexible, less formal coordinating mechanisms (Mintzberg, 1983, pp. 137–138). In particular, ‘disaster management is best served by a modified simplified bureaucratic structure, which is more organic, encourages innovation and adaptive behaviour, is flexible and focuses on end products rather than on functional prerequisites’ (Mintzberg 1979, cited in Britton, 1989, p. 10).

Finally, I had asked: *How do the patterns of interdependence among organizations in OSER systems affect interorganizational coordination?* The findings indicate that OSER is to a very high degree a multi-party activity, and interdependence is inherent in OSER systems. This study has shown that interdependence among the organizations involved in an OSER system has a twofold effect on interorganizational coordination: it may both facilitate and hamper it. We have seen that inconsistencies in national policy on OSER may create the preconditions for competitive interdependence among the organizations within an OSER system.

Though this study provides strong evidence that interdependence is inherent in OSER systems, that does not necessarily imply that both competitive and facilitative



interdependence are at play. In Russia, inconsistencies in federal policy on OSER have created preconditions for competition between organizations – in other words, they have facilitated competitive interdependence. In contrast, we found no competition among actors in Norway, where the national OSER system is based on a clearly formulated policy that provides no room for disputes among the actors. This would indicate that, by eliminating gaps or overlaps in the regulatory framework, policymakers can substantially reduce the preconditions for competitive interdependence. And such interdependence is of course counterproductive, as it hampers interorganizational coordination and thereby the effectiveness of an OSER system.

In a more demanding operational situation, interdependence among the participating organizations in an OSER system increases, also becoming more selective, depending on the phase of the incident in question. Not all organizations connected to an OSER system on a daily basis participate in emergency response work. In addition, different actors may be involved at different stages of an acute situation. These may establish patterns of interdependence in an emergency situation that are different from those in the steady-state mode of operation of the OSER system.

## ***6.2. Contribution***

This thesis has contributed to the studies of collective organizational behaviour and organizational relations in disaster situations, by providing new information and insights on interorganizational coordination in OSER systems. In focus have been the OSER systems in Norway and the Murmansk region of Northwest Russia. The main contribution of this study lies in its empirical findings. Academic knowledge on the Norwegian is scarce, especially as regards the Russian OSER system and the bilateral Norwegian–Russian OSR cooperation. Each of the four articles in the thesis has contributed new knowledge on oil spill emergency preparedness in the Barents Sea.

As to the theory contributions of the study, they are somewhat more modest. This thesis has shown that analytical approaches to interorganizational coordination can be applied to the study of coordination in the OSER systems. In particular, it is fruitful to apply Mintzberg's analytical approach to understanding organizational structure to the analysis of an OSER

system, i.e. an interorganizational setting. This approach has made it possible to shed light on the structural specifics and challenges of the Norwegian and Russian OSER systems. In addition, I have demonstrated graphically how and why an OSER system undertakes a transition from one structure to another. That similar structural components play key roles in the steady-state and the emergency modes of operation in both the Norwegian and the Russian OSER systems would indicate that the findings of this study may hold true for other OSER systems as well. This implies that Mintzberg's analytical approach may be applied to the analysis of OSER systems or perhaps also to other complex organizational settings.

The findings of the study indicate the need for caution in developing a policy framework for OSER activities. There may be good reasons to disintegrate OSER activities when responsibility is placed under several authorities. This may, however, also entail a range of negative implications for the effective functioning of the OSER system.

### ***6.3. Issues for further research***

This study was motivated by increased concern over the status of oil spill emergency preparedness in view of current and projected large-scale petroleum developments in the High North. Such developments may bring considerable socio-economic benefits, but can also entail substantial costs if a major accident should occur. Oil spill emergency preparedness and response remain an important research topic not only for scientific but also for societal needs.

This study has concentrated on the system level of analysis. I suggest that further research should proceed with the examination of the processes within the OSER systems. Organizational culture has not been in focus in this study. The importance of culture has been underlined in article II, III and IV, but has not been discussed in detail. Empirical findings indicate that the organizational culture within both the Norwegian and the Russian OSER systems is similar, based on mutual readiness to help one another, which in turn stems from the conviction that success depends on the efforts of all. However, in the Norwegian system this culture is established by the state, whereas in the Russian system it is very much created by the participants themselves through the sense of interdependence. Closer study of these issues is needed to understand how organizational culture is established in OSER systems and how it may affect organizational interactions.

My empirical findings indicate that cooperation and the ministerial/agency level are two loosely coupled processes, in Norway and Russia alike. However, I have not delved into the question of why this is so. The theoretical propositions suggest that relationships between agencies are driven by different logics of interdependence, according to the level at which they are established. This can affect the outcomes of cooperation (Thomas, 2003). Analysis of the bilateral Norwegian–Russian cooperation on OSR is a topic that merits further examination.

Recent communication with some of my Russian informants has indicated that new environmental legislation and new regulations on OSER activities are to be adopted soon. The process has been slow, and, as commented by one informant, little is likely to change in the nearest future due to the absence of preconditions. All the same, the new legislation may add momentum, because the emphasis is somewhat different from that of current legislation. Therefore, a follow-up study of the Russian OSER system will be needed, to see whether and how changes in the legislation will affect the future development of the system.



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## Annex I: List of informants

Type of organization	Name of organization	Number of informants	Level of seniority	Interview date	Dictaphone / notes
Russian informants					
Governmental authorities	Committee of Nature Use and Ecology of the Murmansk region	2	high (for both)	Aug 2007, Oct 2008	Dictaphone
Controlling / coordinating authorities	Department of the Federal Supervisory Natural Resources Management Service (Rospirodnadzor) in the North-West federal district. Department for Surveillance at sea (Murmansk region)	1	high	Oct 2008, May 2010	Dictaphone
	The Main Department of the Ministry of Emergencies of Russia in the Murmansk region	1	high	Oct 2008, May 2010	Notes
Response organizations	Murmansk Basin Emergency Rescue and Salvage Department (MBERSD)	2	high (for both)	Oct 2008, May 2010, Apr 2009, Oct 2010	Dictaphone / notes
	Emergency Rescue Unit "NavEcoService" Ltd.	1	high	Aug 2007, Oct 2008, Oct 2009, May 2010	Dictaphone
Scientific and Research Institutions	Murmansk Marine Biological Institute	1	high	Oct 2008	Dictaphone
	Central Marine Research and Design Institute Ltd. (CNIMF)	1	high	Oct 2008	Dictaphone
NGOs	WWW-Russia Barents Sea Regional Office	1	middle	Oct 2008	Dictaphone
	Bellona-Murmansk	1	middle	Oct 2008, Oct 2010	Dictaphone
	Environmental Harmony Evolution Fund	1	high	Aug 2007, Oct 2008	Dictaphone
Private companies	Oil Reloading Complex "Belokamenka" (oil operator)	1	high	Oct 2008	Dictaphone
	OOO Ramboll Barents	1	middle	Dec 2010	Dictaphone (Skype)
	Akvaplan-niva AS (research and consultancy)	1	high	Nov 2010	Dictaphone
	"Industrial Safety Systems" LLC (OSER plans developer)	2	high	May 2010, Oct 2010	Dictaphone
Total	Informants				17
	Organizations				14
	Interview sessions				26
Norwegian informants					
Governmental authorities	Ministry of the Environment	1	high	July 2010	Dictaphone
	Ministry of Fisheries and Coastal Affairs	3	high (for all)	Dec 2009; May, June 2011	1,2 Notes; 3 Notes (Phone)
	Climate and Pollution Agency (Klif)	2	middle and high	July 2010; Feb 2011	Notes (Phone)
Municipal authorities	Tromsø municipality	1	high	Jan 2011	Dictaphone
Response organizations	Norwegian Coastal Administration	3	high (for all)	Dec 2009 (2 int.); Oct 2010; July 2010	Notes
Associations	NOFO	2	high (for both)	July 2010	Dictaphone
NGOs	World Wildlife Fund (WWF)	1	high	Feb 2011	Dictaphone (Skype)
Total	Informants				13
	Organizations				7
	Interview sessions				12





## **Annex II: Interview questions**

### I. Questions to the Russian informants

#### General:

1. How is the oil spill emergency response system organized in Russia?
2. Which authority is responsible for the establishment of the OSER system in Russia?
3. What are the core tasks of your agency?
4. What is the official procedure in a situation of oil spill emergency? Who is responsible for what?

#### On coordination:

5. What other organizations do you coordinate / cooperate with (what kind of organizations are those)? Is this a mandatory coordination established by law, or is it initiated by the organizations themselves (what is the driving force in this coordination)?
6. How far does the need to coordinate activity with others affect the performance of your organization? To what extent is it important for the success of your organization?
7. Do you encounter any problems or difficulties in working with other organizations (e.g. lack of understanding, lack of mutual interests)?
8. Which factors do you think influence (both positively and negatively) the interaction between your organization and other organizations (e.g. different organizational goals, different ways of operating, etc.)?
9. Is there any informal coordination?

#### On the risks of oil spills

10. What in your opinion are the greatest sources of danger (the main reasons for emergencies) related to the possibility of oil spill accidents, both potentially and at present?
11. What percentage of emergencies concern oil spills during transport?
12. How frequent are incidents related to oil spills?
13. What measures for preventing oil spills are being taken in the Murmansk region?
14. (to one of the informants) During our previous conversation you mentioned that far too little attention is paid to land territory, all the focus is on sea. Can we talk more about it? Who pays little attention? Why? Do they not realize the risks? Has anything changed since the last time?
15. (to one of the informants) Your organization provides oil spill response at sea. How would you evaluate the overall priorities: sea/land territory?

#### On capacity (to organizations taking part in emergency response operations):

16. How well prepared is your organization in terms of capacity (equipment, specialists)? Can you manage to meet the time requirements of 4 to 6 hours? What is the maximum size of an oil spill you are prepared to deal with?
17. Do you face any difficulties in conducting oil spill response operations? If yes, what kind of problems and how do you solve them?
18. How often do you conduct training exercises?

### On contingency plans<sup>10</sup>

19. Do you think that the contingency plans existing today assist in getting prepared for emergency situations?
20. Do the plans provide for more effective response operations?
21. How often are the plans revised?
22. How is the system of state ecological monitoring organized?

### Personal questions

23. What do you believe are the underlying principles upon which the overall oil spill emergency response system in Russia is built? Who do you think are the key actors in the process? What does the Russian OSER system aim at?
24. What in your opinion are the key components of an effective OSER?
25. What are the root causes of spills? How would you estimate the role of human factors as a cause of accidents?
26. What do you think is required to reduce the probability of future accidents?
27. Do you believe that increased oil transport will lead to increased risks of oil pollution?
28. Can you comment on the legislation currently governing the sphere of OSER in Russia? Do you see any issues where improvement is needed?
29. Why do you think companies sometimes choose to conceal information about oil spills?
30. There are quite a few organizations that are involved in providing oil spill prevention and emergency response in the region. Do you think they all work like one whole system aiming to provide adequate measures to protect people and the environment from harmful consequences of the oil spill accidents? Do you see any issues that require special attention?
31. Do you observe any duplication of functions among the authorities?
32. What do you think of the system of reimbursement for environmental damage in Russia?
33. What, in your opinion, is the level of compliance among companies?
34. What liabilities for accidents have the companies that are engaged in oil operations?
35. If you encounter a situation of avoidance in complying with current legislation how do you usually deal with it?
36. According to the law, companies are subjected to various types of responsibility (disciplinary, criminal, civilian). To what extent does the law function in real life?
37. Are the compensation payments required from companies for environmental damage adequate as regards the real estimates of the damage?
38. What is your opinion regarding the effectiveness of the oil spill emergency response system in the Murmansk region? Could you comment on any matters that require special attention?

## II. Questions to the Norwegian informants

### Group 1 : The national system of oil spill emergency preparedness and response in Norway

1. When was the system of oil spill emergency preparedness and response established in Norway?
  - what was the background for this?

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<sup>10</sup> The questions are primarily about the federal and regional contingency plans.

2. Who are the main actors in the Norwegian system of oil spill emergency preparedness and response at the national level?
  - which organizations are the main actors?
  - what are their responsibilities?
  - how are all the actors united into one system?
3. What is your opinion on the design of the system?
  - does the design of the system work well?
4. Is there anything special regarding the system of oil spill emergency preparedness and response in the Barents Sea?
  - what means are available?
  - are these means sufficient?
5. The capacity of the system has been criticized at all levels (state, municipal, and private) mainly with reference to old equipment (municipal) and inadequate preparedness (private). How would you comment on this?
6. How would you evaluate the level of oil spill emergency preparedness in relation to projected developments in the petroleum sector in the Barents Sea and increased transport of oil from the Russian Arctic?

Group 2 : Coordination between different actors within the Norwegian system of oil spill emergency preparedness and response

1. What other organizations does the Coastal Administration coordinate / cooperate with
  - on a daily basis?
  - routinely?
  - in an emergency situation?
2. What are the reasons or needs for the coordination?
3. How is the coordination formally established (meetings, forums, procedures)?
  - on a daily basis?
  - in an emergency situation?
4. In what situation does such coordination take place?
5. Do you have any informal contacts with other organizations?
  - what are they?
  - what are the reasons?
  - in what situations?
6. Have you ever experienced challenges when coordinating with other organizations
  - on a daily basis?
  - in an emergency situation?
7. Which factors do you think can improve coordination?
8. Which factors can cause potential coordination problems?
9. How does the system work in case of an accident?
  - what are the responsibilities of different actors?
  - how does the procedure work?

Group 3 : Risks of oil spills

1. What are the most obvious risks as regards accidental oil spills?
2. What measures are taken in Norway to mitigate the risks of accidental oil spills?

3. What is your opinion regarding the perception of various risks among different actors within the Norwegian system of oil spill emergency preparedness and response?

#### Group 4 : Contingency planning in Norway

1. What kinds of contingency plans exist in Norway?
2. What is the function of contingency plans?
3. Which authority is responsible for making the plans?
4. How often are the plans revised?
5. How are the various contingency plans coordinated?
6. What is your opinion of the effectiveness of the contingency plans?

#### Group 5 : Other issues

## **Part II**



## List of articles

**Article I:** Ivanova, M., 2011. Oil spill emergency preparedness in the Russian Arctic: a study of the Murmansk region, *Polar Research*, 30, 7285, DOI: 10.3402/polar.v30i0.7285.

**Article II:** Ivanova, M. and Sydnes, A.K., 2010. Interorganizational coordination in oil spill emergency response: a case study of the Murmansk region of Northwest Russia, *Polar Geography*, 33 (3), pp. 139–164.

**Article III:** Sydnes, M. and Sydnes, A.K., 2011. Oil spill emergency response in Norway: coordinating interorganizational complexity, *Polar Geography*, 34 (4), pp. 299-329.

**Article IV:** Sydnes, M. and Sydnes, A.K. The Norwegian–Russian oil spill response regime in the Barents Sea: an untold story of success. In: E. Røsæg & A. Proelss, eds. *Safety in the North*. Studies in international law of the sea and maritime law series. Baden-Baden : Nomos (2012 forthcoming).

## Article I

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## **Article IV**

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