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How do differing risk perceptions between public and private sectors in Norway influence the security of critical maritime infrastructure?

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This article explores how different risk perspectives among public and private actors influence the security of critical maritime infrastructure in Norway. Considering recent geopolitical events, such as the sabotage of the Nord Stream pipeline in the Baltic Sea in 2022, the need for effective coordination between these actors has become increasingly evident. The article discusses theoretical perspectives on risk to highlight the challenges that arise when public and private actors have differing perceptions of risk. This is a conceptual paper that does not include empirical data but rather interprets existing theories and real-world events to provide insights into the complexities of maritime security governance.

Keywords: risk perception, security, maritime infrastructure

1. Introduction

The 9/11 terrorist attack in New York 2001 represents an example of modern unforeseen threats. In response to the phenomenon, global maritime security measures like the International Ship and Port Facility Security Code (ISPScode) were implemented to safeguard maritime infrastructure from deliberate damage. In 2003, the oil and gas industry on the Norwegian Continental Shelf (NCS) introduced recommended guidelines, such as supply chain security for offshore facilities (Offshore Norge), to strengthen security for maritime critical infrastructure not covered under the ISPSregulation. Nearly two decades later, Europe was taken by surprise when the unprotected Nord Stream 1 and 2 gas pipelines were damaged in what appeared to be an act of sabotage. These pipelines, which transported gas from Russia to Germany, were critical to supplying a Europe that stood in support of Ukraine's fight against Russia. The Nord Stream phenomenon highlighted society's critical reliance maritime infrastructure for energy and economic stability. These pipelines were central to political

strategies for supplying gas to Europe. Without these pipelines, the predictability that underpins societal safety was significantly undermined. The incident placed Norway as Europe's leading supplier of gas, critical for maintaining industry, production of goods and consumables, but also for heating and cooking in the homes of millions of Europeans. Norwegian maritime infrastructure became crucial for Europe's energy security during geopolitical tensions. In response to this incident, NATO Secretary General Stoltenberg addressed private sector to take control over its infrastructure - business is also politics, Stoltenberg stated (2023). Stoltenberg underscored that while authorities are for establishing rules responsible and frameworks, companies have an independent duty to exercise due diligence. He cautioned against allowing short-term economic interests to override fundamental national security concerns, reinforcing the idea that business decisions have significant political and security implications. Between the private responsibility for the security of maritime infrastructure, and the various authorities that regulate such security, there are several different standards and approaches to risk.

Previous research has identified diverging risk perspectives between stakeholders within the maritime domain in Norway (Stene & Utne, 2019). This paper examines how this divergence might hinder coordinated efforts to secure critical maritime infrastructure against unknown threats.

2. Critical maritime infrastructure

Critical maritime infrastructure forms the backbone of global trade, energy distribution, communication networks. approximately 90 percent of the world's goods transported by ships. Additionally, an extensive network of submarine cables, spanning thousands of kilometers across the ocean floor, facilitates nearly all global internet telecommunications traffic. making it indispensable for modern communication and commerce. Submerged gas pipelines, such as Nord Stream, are equally critical, transporting vast amounts of natural gas across continents to ensure energy security for millions of people. A port facility, often perceived as merely concrete and steel, is, in fact, highly specialized infrastructure designed to support advanced transport systems. For instance, equipment essential for societal safety is transported in containers, while soybeans—crucial for animal feed due to their high protein content—are shipped in bulk carriers. Similarly, Liquefied Natural Gas (LNG) from Norway to Germany, a key resource following the Nord Stream pipeline disruption, is transported in specialized vessels requiring tailored port facilities (Kystverket, 2024). As such, maritime infrastructure is not only critical for societal safety but also inherently vulnerable. Submarine submerged gas pipelines, and port facilities are exposed to natural hazards, technical failures, and potential sabotage. The importance of critical maritime infrastructure is contextdependent, reflecting the unique needs and vulnerabilities of each society. The recent incidents on submerged cables in the Baltic Sea underscore its indispensable role in maintaining essential services and safeguarding public welfare. Assessing the complexity of maritime infrastructure demands an holistic security perspective to determine its vulnerabilities and potential threats.

In global politics, security often emphasizes protecting the state and safeguarding human lives, vet it remains a multifaceted concept, shifting across political and situational contexts. Olsen et al. (2007) define societal safety as "the society's ability to maintain critical social functions, to protect the life and health of the citizens and to meet the citizens' basic requirements in a variety of stress situations." This broad definition extends to safeguarding critical infrastructure, including maritime systems, that ensures the functioning of modern societies (Morsut, 2021). Resilient societies are characterized by their governmental organizational capacities to address both predictable and unpredictable hazards. They can recover swiftly from crises while maintaining public trust in governance and critical infrastructure systems (Engen et al., 2021). Societal safety intersects with national security, human security, and incident management, such as responses to accidents or malicious acts. This interconnectivity highlights the layered and politically sensitive nature of societal safety.

Norwegian White Paper No. 17 (2021-2021) reinforces this broad understanding of societal safety by encompassing "safety and security against the whole spectrum of challenges, from naturally occurring events, via life-threatening major crises, health, environment, and material values, to security challenges that threaten the nation's independence or existence." Buzan et al. (1998,p. 5) argue that "threats vulnerabilities can arise in many different areas, military and non-military, but to count as security issues they must meet strictly defined criteria that distinguish them from the normal run of the merely political." For a threat to be considered a security issue, it must be framed as

an existential risk to a referent object by a securitizing actor. This framing garner support for emergency measures that extend beyond conventional governance practices. This perspective underscores the dual nature of critical maritime infrastructure: it acts both as an enabler of societal safety and as a potential target for deliberate harm. Jore (2019, p. 29) further refines the definition of security, emphasizing the need for resilience against 'deliberate. intentional, and malicious acts such as terrorism, sabotage, organized crime, or hacking.' In a globalized world, where power dynamics are shaped by flows of trade, energy, information, the significance of maritime infrastructure grows in tandem with vulnerabilities (Key, 2004).

3. Risk

Risk has traditionally been defined based on probability. However, as Aven (2007) suggests, probability requires knowledge and is often founded on assumptions that may prove incorrect. Therefore, uncertainty becomes a critical element in understanding risk. Decisions are often made, despite the absence of precise This highlights the inherent probabilities. uncertainty in phenomena. Aven emphasizes that risk inherently forward-looking intrinsically linked to uncertainty. Hence, risk assessments rely on subjective methods, making them susceptible to the uncertainties inherent in individual knowledge. Thus, the concept of risk navigates the tension between objective and subjective dimensions (p. 52). Slovic and Peters (2006) argue that as humans gained more control over their environment, tools like probability theory, risk assessment, and decision analysis were developed to enhance the rationality of experiential thinking. These formal approaches to risk in fields like economics, management science, and game theory assume that odds are quantifiable and that numerical probabilities can be assigned to potential outcomes. This "hard" or realist perspective on risk prioritizes objective measures, focusing on reducing the highest risks first (Renn, 1992). It adds value in contexts such as identifying deficiencies in complex technical systems or improving their safety performance. Conversely, sociological, psychological, and cultural perspectives on risk — the 'soft' approaches — take a constructivist stance. Scholars such as Beck (1992), Luhmann (2002), Renn (2008), Drottz-Sjøberg (1990, 2008), Douglas and Wildavsky (1982), and Kasperson and Kasperson (2005) view risk as a social or cultural construct. These approaches emphasize that risk management is influenced by lifestyle preferences, societal values, and cultural norms, integrating both scientific and cultural dimensions (Renn, 1992, 2008; Kasperson & Kasperson, 2005). In a societal safety context, this perspective considers how societal values shape our understanding of risks and the systems put in place to address them.

Where realist approaches focus on filtering 'noise' from relevant information, constructivist perspectives emphasize how risk communicated and interpreted (Engen et al., 2016). These differing views result in varying definitions of risk and approaches to risk management. Engen et al. (2016) argue that constructivist perspectives influence not only our understanding of societal safety and security but also how society is organized to address uncertainty. Security, in this context, becomes an elastic concept associated with vulnerability (McSweeney, 1999), the absence of danger (Kaufman, 2013), or robust mechanisms to defend against threats. Luhmann (2002)highlights the elusiveness of defining risk in scientific terms, stating that efforts to pin it down often leave us 'befogged, with an impression of being unable to see beyond our front bumper' (p. 6). This reflects the tension between probabilistic models, which attempt to measure risks with known odds, and the 'Knightian uncertainty' identified by Knight (1921), which recognizes that in an ever-changing world, our knowledge of future events is inherently imperfect.

Risk applies to situations where outcomes are unknown but measurable, while uncertainty

refers to scenarios where we lack sufficient information to assign probabilities accurately. Both perspectives are incomplete representations of reality in today's complex societies. Renn (2008) suggests a more systematic classification of risk perspectives to establish a robust theoretical framework that bridges these views. In the context of societal safety, risk must be understood as encompassing 'activities and their belonging consequences, as well as uncertainties whether they will happen and what the consequences will be' (Aven, 2022, p. 59). Societal safety inherently involves managing risks across a broad spectrum of challenges, from natural disasters and health crises to malicious acts like terrorism and sabotage. McSweeney (1999) and Kaufman (2013) highlight the importance of integrating diverse perspectives on vulnerability and security to create resilient systems.

Understanding risk requires balancing technical precision with an awareness of its social and cultural dimensions. Only through such a comprehensive approach can societies effectively prepare for and adapt to the uncertain challenges they face.

3.1. Risk perception

The subjective understanding of risk—what individuals regard as safe or dangerous—varies significantly. Unknown substances technologies are often perceived as more dangerous than familiar ones, while regulated activities tend to be seen as safer than those lacking direct control. These subjective perceptions frequently lead to discrepancies between assessments of uncertainty related to risk and statistical data on accidents or injuries accessible to the public (Aven, 2007, p. 54). According Kahneman (2012),to subconscious mind largely controls human consciousness. His research highlights that decision-making is predominantly driven by the brain's fast, intuitive System 1 rather than the rational but slower System 2. This cognitive divide often results in different conclusions, even when processing the same input, and may explain the varying perceptions of risk between the public and private sectors. Cultural, organizational, or personal values can shape risk perceptions, with public sectors often emphasizing societal safety and private sectors prioritizing financial outcomes.

Research has revealed distinct differences in risk attitudes among decision-makers, depending on whether choices are based on personal versus corporate values or financial versus recreational risks (Weber et al., 2002; Utne, 2017). An illustrative example is the perception of threats to maritime infrastructure in Norway before and after the Nord Stream phenomenon. Such events often reduce public trust in safety or security measures, underscoring the dynamic and contextual nature of risk perception tied to observable phenomena. It came clear to public, that the veins of societal safety for Europe was unprotected on the seabed. Although it is not possible to fully secure all subsea infrastructure on the NCS, the presence of Coast Guard military aircraft near vessels. offshore installations, and armed Home Guard soldiers guarding oil and gas refineries has been widely covered in the media. However, these security forces often lack clear guidance on what specific threats to look for, leading them to rely on general indicators of suspicious activity. This highlights how subjective interpretations of risk can be misleading, as they often hinge on knowledge-based probabilities. If uncertainty is not effectively communicated, it can influence risk aversion (Utne, 2017).

Risk aversion, defined as a preference for certainty over uncertainty, is shaped by the stakes involved and the decision-maker's proximity to the values at risk. Risk-averse organizations tend to favor alternatives offering high potential gains under uncertain conditions rather than lower but more secure returns. When confronted with uncertainty, individuals and organizations often rely on cognitive biases or judgments rooted in experience (Weber et al., 2002) These 'pre-programmed' responses or gut

instincts serve as shortcuts in decision-making but can vary based on the nature of the organization and its distance from the values at risk. Kahneman (2008) suggests that in an increasingly complex and uncertain world, these biases can lead to reactive measures aimed at safeguarding perceived values. In such cases, humans often draw conclusions based on what is observable, ignoring potential risks that remain unseen. Luhmann (2002) posits that discussions around risk perception, calculation, acceptance are inherently linked to the selection of risks deemed worthy of attention. This underscores the importance of balancing cognitive biases with rational analysis in managing risks.

Understanding risk perception is essential for improving safety and security measures for critical maritime infrastructure. Whether addressing observable or unknown threats, these perceptions significantly influence how risks are assessed, managed, and prioritized.

3.2 Risk habituation

Exchange of knowledge between stakeholders can help identify possible causes that coincide with the nature of a phenomenon's habitat, thus contributing shared situational to understanding and aiding the identification of risks and potential consequences (Aven 2007; 2014). As Aven (2007) asserts, risk inherently future-oriented. Observations of phenomena do not guarantee accurate predictions of future consequences, making the time dimension a critical factor in risk assessment. However, perception of time varies subjectively. Nothing seems to take as long as waiting for water to boil. A related quote suggests that while a man may accept that there are hundreds of billions of stars, he will still touch a bench marked with wet paint to confirm it. These adages underscore the role of time in risk perception, highlighting the balance between accepting distant concepts without questioning and the human tendency to seek verification of immediate phenomena. Once a phenomenon is confirmed and becomes familiar, we often accept it with less apprehension. Habituation, the diminished response to repeated exposure to a phenomenon, can shift perceptions of threats, normalizing previously unknown risks and integrating them into a 'new normal' (Kim et al., 2022). The Nord Stream phenomenon exemplify dynamic. Following this the sabotage, Norwegian authorities faced criticism inadequate measures to secure oil and gas facilities. Media and experts highlighted vulnerabilities in critical maritime infrastructure vital to societal safety, particularly as Unmanned Aerial Vehicles (UAV) sightings and calls for enhanced security measures surged. Despite these concerns, the Norwegian government emphasized that no direct security threats to Norway were apparent. However, the rise in deliberate, deniable attacks, such as the Baltic Connector damage (2023), the telecom cable severance (2024), or the ESTlink 1 (2024) demonstrates the same vulnerability to critical maritime infrastructure, especially submarine cables and gas pipelines. Repeating threats that do not result in significant damage may fail to provoke the same urgency as novel risks, illustrating risk habituation and heuristic thinking in risk perception. Risk perception, whether assessed by individuals, groups, or societies, is influenced by cognitive biases and instinctual reflexes. Everyday decisions often diverge from rational judgment, as seen in behaviors like buying lottery tickets based on subjective gain assessments rather than statistical probabilities (Adams, 1995; Kahneman, 2012). Observations, such as winning even a small prize, may reinforce misjudgments, encouraging repeated behavior. Misconceptions, portrayals, and difficulties in understanding probabilities can influence decisions. Hence, when phenomena become commonplace in the news, this can lead to risk habituation. Over time, we may become desensitized to deviant occurrences, diminishing our attention and response to potential dangers.

Understanding risk habituation highlights the importance of balancing emotional responses and analytical reasoning, particularly in managing critical maritime infrastructure within a rapidly evolving risk landscape.

4. Discussion

The public and private sectors in Norway demonstrate distinct risk perspectives, as evidenced by their responses to the Nord Stream phenomenon in 2022. Private actors, such as operators on the Norwegian continental shelf, demanded increased security measures to protect critical maritime infrastructure. These demands were rooted in observable threats, including reports of UAV activity, which garnered significant public and media attention. For instance, Norwegian police received 395 UAVrelated notifications between July and December 2022, many of which were likely false observations (Politiforum, 2022). Constructivist theories provide a framework for understanding this reaction, emphasizing how risk is perceived as more immediate and tangible when amplified through social mechanisms like media and political narratives (Slovic & Peters, 2006). Media coverage played a critical role in framing the events as urgent, reinforcing the private sector's calls for immediate action to mitigate perceived vulnerabilities. In contrast, the public sector, represented by the Norwegian Police Security Service (PST) and the government, adopted a more measured approach. PST assessed the probability of sabotage in Norway as low unless the conflict in Ukraine escalated further (PST, 2023). Despite this assessment, the government implemented visible but strategic measures, such as deploying the Home Guard to refineries and increasing patrols around oil platforms. Such actions exemplify a realist perspective, focusing on objective risk analyses prioritizing long-term stability over immediate, reactive measures (Renn, 2008, Engen et al 2018). This approach highlights the public sector's responsibility to balance immediate public concerns with broader societal and geopolitical stability in times of uncertainty.

difference in risk perception demonstrates the divergent priorities of the two sectors. Private actors focus on safeguarding operational continuity and addressing risks perceived as immediate threats to their assets. In contrast, public authorities emphasize a more systemic perspective, aiming to maintain societal trust and long-term strategic stability. The divergence can be further analyzed through the realist interplay of and constructivist perspectives. Realism emphasizes importance of systematic analyses and prioritizes measures based on objective probabilities and systemic vulnerabilities. broader **Public** authorities, such as PST, rely on long-term geopolitical trends and calculated assessments of escalation risks. This focus explains why government responses often appear conservative, prioritizing stability-oriented measures over addressing all perceived threats. The deployment of military resources near oil platforms and refineries served as a visible deterrent. reinforcing public confidence without unnecessarily escalating the situation.

Conversely, constructivist perspectives focus on how risk is shaped by societal interactions, cultural norms, and media-driven narratives. Slovic (2000) highlights how emotional and intuitive judgments dominate in uncertain situations, particularly when media coverage amplifies perceived dangers. For private actors, who face direct operational and financial consequences, risk is more immediate and concrete. The Nord Stream phenomenon was framed by media as a critical threat to Europe's energy security, emphasizing the urgency of protective measures. This framing influenced private sector responses, which sought swift, decisive actions to mitigate the perceived risks.

The dynamic interaction between these perspectives reveals inherent challenges in coordinating risk management. While realism advocates for sustained vigilance and systemic stability, constructivism explains how societal

and media narratives drive urgency, often prioritizing visible, short-term solutions over comprehensive strategies. This tension is vividly illustrated by the Nord Stream case, where the public sector's systemic focus conflicted with the private sector's calls for immediate measures. Over time, risk habituation has likely contributed to diminishing attention to maritime vulnerabilities, despite recurring incidents such as the Balticconnector damage in 2023 and undersea cable disruptions in the Baltic Sea in 2024. Habituation refers to the process by which repeated exposure to threats normalizes them, reducing perceived urgency and severity (Kim et al., 2022). While the Nord Stream phenomenon initially garnered widespread reactions. subsequent events lacked the same symbolic resonance, leading to less intense media coverage diminished stakeholder engagement. Media narratives play a pivotal role in this process. The Nord Stream phenomenon carried a clear geopolitical significance, making it a focal point of public and political discourse. Later incidents, such as the Balticconnector pipeline severance, did not evoke the same level of urgency, partly due to their framing as isolated or less dramatic events. This gradual desensitization to recurring threats illustrates the risks of habituation, where stakeholders may become complacent despite increasing frequency and complexity of incidents. Realist perspectives offer a contrasting lens. While habituation reduces the perceived urgency of addressing risks, realist frameworks emphasize the need for consistent vigilance and systematic measures. This divergence creates a paradox: constructivist influences, through desensitization and shifting narratives, may weaken the collective will to act, even as realist analyses highlight escalating vulnerabilities. For example, the undersea cable disruptions in 2024 underline the growing interdependencies and systemic risks in critical infrastructure. Yet, lack of public and political attention suggests a troubling normalization of these threats. Neither realism nor constructivism alone provides a comprehensive framework for managing today's complex risk environment. Renn's (2008) classification of risk offers a pathway to integrate objective analyses with the social and cultural dimensions of risk perception. This integrative approach is essential for addressing the discrepancies between public and private sector priorities and for fostering a unified risk management strategy. Renn's framework can help explain how the public sector's long-term focus on systemic resilience can be reconciled with the private sector's demand for actionable, short-term solutions. For instance, developing shared risk narratives that connect individual phenomena's, such Balticconnector and Nord Stream, to broader systemic vulnerabilities can sustain stakeholder engagement and counteract risk habituation. Additionally, this approach can collaboration between sectors by emphasizing interdependencies and shared their responsibilities.

5. Conclusion

A balanced integration of realist and constructivist perspectives helps identify systemic vulnerabilities while understanding how perceptions drive action. This dual approach is essential for tackling dynamic challenges and ensuring both operational continuity and long-term resilience in critical maritime infrastructure.

To harmonize risk perceptions, mitigate habituation effects, and enhance resilience, stakeholders should emphasize strategic media engagement, comprehensive risk education, and strong public-private partnerships. Resilience-focused narratives should emphasize the interconnectedness of infrastructure systems, fostering shared responsibility and proactive measures. Ultimately, the security of critical maritime infrastructure is not just about physical barriers. By acknowledging and actively addressing differences in risk perception, organizations can build resilience not just in infrastructure, but in decision-making processes and strategic foresight.

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