FFI Norwegian Defence Research Establishment

EXTENDED SUMMARY

How to secure the supply of food and fuel during crises and war

Extended summary of FFI report 26/010

This study investigates how war in Norway and its proximity could affect the national security of supply, focusing on food and fuel. The analysis identifies 30 vulnerability factors and recommends 15 measures for improving the national supply chain preparedness.

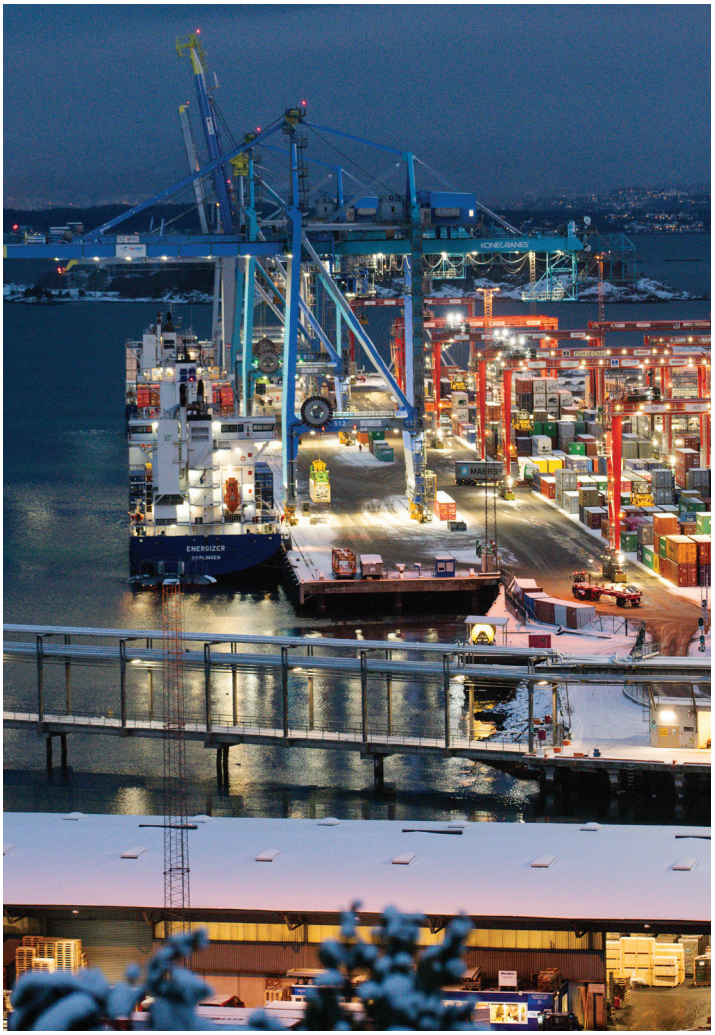


Photo: Hans Kristian Riise / Oslo Havn

Norway is highly dependent on imported food products, intermediate goods (like additives for fuel production or feed ingredients for meat and fish production) and several types of refined fuel products. Increased centralization and the adoption of "just-in-time" logistics has reduced the national preparedness margins. This can exacerbate the consequences of war as well as other disturbances such as global trade conflicts and extreme weather events.

The Norwegian Defence Research Establishment has been commissioned by the Ministry of Trade and Fisheries to analyze how to secure civilian and military needs when global supply chains are disrupted.

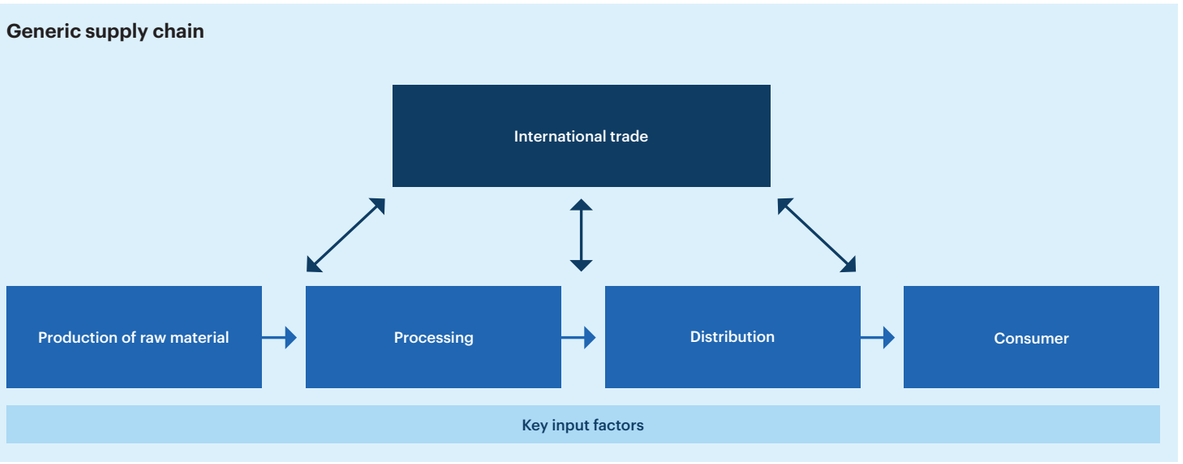
The study identifies four key findings:

1. Norway is reliant on imports of diesel and jet fuel and operates only a single refinery. This creates a potentially significant gap between fuel availability in peacetime and the demand during wartime.

2. Energy and digital infrastructures are highly interdependent and critical to the entire supply system. Increasing electrification further amplifies this vulnerability. At the same time, the war in Ukraine has demonstrated that energy supply is a priority target during conflict.

3. The capacity to distribute supplies represents a key vulnerability, due to limited and exposed transport routes, restricted access to transport resources, particularly in Northern Norway, as well as concurrent requirements due to military mobility.

4. Food supply in Norway is vulnerable due to its dependence on imported goods and production inputs, as well as a reliance on labour that cannot be easily substituted.



A generic supply chain includes international trade, production of raw material, processing, distribution, and consumer – supported by key input factors, such as energy, labor force, and intermediate goods.

Vulnerability factors
A holistic perspective on supply chains is essential for understanding security of supply during crises and wartime.

In the study, we identified 30 vulnerability factors that may affect national security of supply for fuel and food, that should be considered when strengthening supply preparedness.

These vulnerability factors are grouped into five categories: input factors, geography and structure, regulatory conditions, the market, and governance and collaboration. The vulnerability factors were mapped through literature, a workshop with 28 different Norwegian stakeholders representing supply chains for food and fuel, and documented experiences from the Covid-19 pandemic and war in Ukraine.

To explore how these vulnerabilities may unfold in practice, we apply a scenario-based approach. The scenario illustrates how disruptions can propagate across different parts of the supply chains.

War scenario

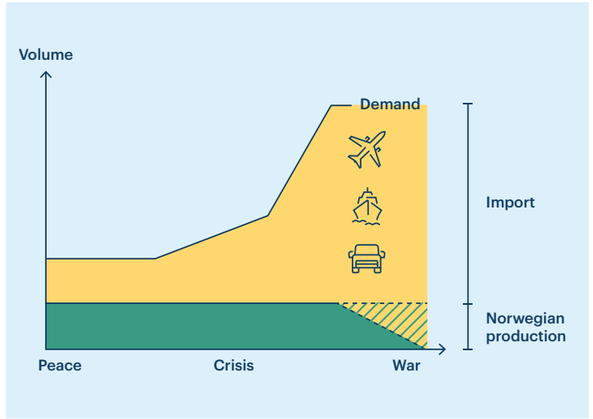
The report outlines a scenario involving a military conflict in the Baltic region while limited military attacks in Northern Norway and Finland takes place, activating NATO article 5. Society is at the same time experiencing global trade conflicts and cases of hybrid interference. The military mobilization diverts labour away from critical societal functions.

Several factors contribute to **reduced imports**. Increased protectionism and export restrictions limit access to critical goods.

Disruptions to global supply chains also weaken the production capacity of key trade partners, reducing the availability of both raw materials and finished products for export. In addition, disruptions to maritime routes cause delays, and fewer vessels sail to Norway due to increased operational risk.

Input factors	Geography and structure	Regulatory conditions	The market	Governance and collaboration
Energy (electricity, fuel)	Centralization	Taxation	Globalization	International cooperation
ICT and digital systems	Geographic connectivity	Trade barriers	Diversity	Public-private partnership
Labor	Climate	Prioritization-mechanisms	Complexity	Information sharing
Water	Regional demand	Quality requirements	Market integration	Cross-sectoral collaboration
Machines & components		Security requirements	Demand	
Transport assets		Environmental requirements	Economic conditions	
Transport infrastructure		Other legislation		
Facilities and land				
Intermediate goods				

Photo: Stian Olberg, DSB



The figure illustrates that fuel demand is likely to increase significantly due to military operations in a wartime scenario, while Norway's domestic fuel production may decline as a result of sabotage or attacks. Consequently, Norway would face a substantial need for imports.

A combine harvester is harvesting grain in Sørum, Norway. Photo: Vidar Ruud / NTB

Shortages and rising prices of input factors **put pressure on production and processing activities**. Destruction of facilities as well as unstable access to electricity, information and communication systems, intermediate goods, and labour, reduces the production capacity for both fuel and food from land and sea-based sources.

Distribution faces major challenges due to damaged transport assets and concurrent demands for resources, resulting in shortages of both transport capacity and labour. At the same time, unstable access to electricity and ICT systems further disrupts the storage and transport of goods.

Demand and consumer behavior are also affected in the wartime scenario. Panic within society may lead to the hoarding of food and fuel, while population movements create shifts in regional demand. At the same time, military fuel requirements increase, while civil sectors also require fuel for purposes such as transport and emergency power.

The war scenario result in both shortages and increased prices for a range of goods and Norwegian production will need to be restructured to adapt to the new conditions. The production of raw materials will need to adapt based on the availability of input goods, and consumer products may need to be reformulated with alternative ingredients. Even when goods are available, logistical disruptions may prevent end-users from accessing food and fuel products.

Geographic differences
The analysis highlights a twofold geographic risk picture for national security of supply. Northern Norway is particularly vulnerable due to the large distances, low resource density, and the concurrent civilian and military requirements for fuel, food and transportation. Southern Norway is to a greater extent exposed to system failure in central production, storage and infrastructure nodes which can affect supply of essential goods for large parts of the population.

- **Northern Norway:** Capacity constraints and long distances, particularly for fuel supply, can lead to rapid and severe consequences for both civilian and military sectors.
- **Southern Norway:** Disruptions to key electricity and ICT nodes for production and storage can quickly have wide-ranging impacts on large parts of the population.

Policy measures
The study identifies more than 60 and prioritizes 15 measures to strengthen security of supply in crises and wartime. Ensuring security of supply is inherently a cross-sectoral responsibility, requiring coordination and planning between civilian and military stakeholders. Hence, effective supply preparedness must be established before a crisis occurs, through collaboration, coordination and prioritization under conditions of sustained supply scarcity and uncertainty.

Summary of recommended measures, expected effects, and recommended priorities

Measure	Effect	Pri
Establish/fill regional stockpiles for fuel, good and critical inputs	Increases redundancy, creates shorter supply lines, increases endurance	A
Establish national preparedness stockpiles for intermediate goods and fuel components	Reduces vulnerability during trade shortfalls, increases flexibility during crises	A
Secure access to electricity	Prevents cascading failures, secures operations in critical nodes	A
Clarify regulatory mechanisms	Reduces hoarding, strengthens preparedness and operational capability	A
Map dual roles and key skills	Reduces risk for personnel shortages and ensures operations	A
Establish civil-military preparedness contracts	Ensures access to fuel, transport, and food for the Armed Forces	A
Increase international collaboration	Reduces vulnerability during import shortfalls, increases flexibility	A
Establish shared planning assumptions	Increases coordination and effective use of resources	A
Strengthen digital security	Prevents digital sabotage and system failure	A
Increase and establish scalable national production	Increases flexibility and production when imports fail	B
Strengthen transport infrastructure	Reduces logistical disruptions and ensure ability to distribute goods	B
Secure operational robustness at Mongstad	Increases temporary production capacity and reduces risk of operational losses	B
Reduce trade barriers	Ensure rapid access during supply disruptions	B
Plan for regulatory adjustments	Increases flexibility and reduces logistical disruptions	B
Distribute preparedness information to the population	Decreases demand shocks and stabilizes demand	C

Read the full report on FFI's website (Norwegian only):
ffi.no/publikasjoner/arkiv/nasjonal-forsyningssikkerhet-i-krise-og-krig-sarbarheter-konsekvenser-og-tiltak-for-mat-og-drivstofforsyningen

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