

Accounting for disruptive developments in strategic planning of shipping in the Arctic

The changing climate gradually opens the way to the Arctic waters for commercial shipping. This requires long-term investments in infrastructure and hence strategic planning of shipping activities both by governments and the global maritime industry to take into account various global and regional factors influencing the economics of shipping. Many of these factors are inherently uncertain and subject to disruptive developments, such as natural disasters or marine accidents. Therefore, such extreme events and disruptive developments should be accounted for when formulating strategic policy documents that will guide the development of shipping in the Arctic.

Strategic planning of shipping in the Arctic

Shipping activities play an essential role in the global economy, as shipping is the key mode of cargo transportation worldwide [1]. At the same time, shipping is highly capital-intensive and requires long-term investments in infrastructure such as ports and vessels [2]. Therefore, both policymakers and shipping companies aim at strategic planning of shipping operations [3].

Recent climate forecasts [4] and the already observed changes in the sea ice coverage have increased the interest of policymakers and commercial actors in shipping in the Arctic [5]. Most notably, the Northern Sea Route (NSR) has a great potential to offer a faster and more efficient way for the Asia-Europe transit as well as for exporting Arctic natural resources to global markets. As a consequence, Arctic and even some non-Arctic states have developed ambitious Arctic strategies, many of which envisage a leap in the cargo volumes to be transported along the Arctic shipping routes (Figure 1). Among them is the Northern Sea Route Development Plan till 2035, adopted in 2019 by Russia as the host of the NSR. The Plan foresees that the volume of cargo on the NSR would by 2030 comprise 150 million tons, of which 30 million tons will be transit [3]. The growth volume is illustrated in Figure 1.

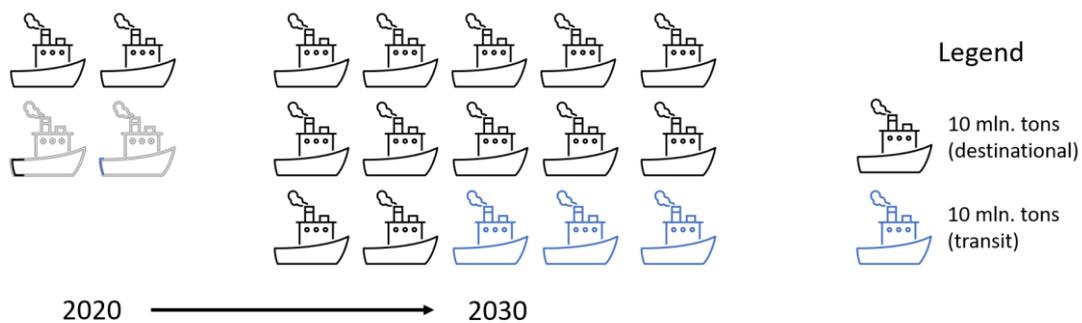


Figure 1. Current and planned volumes of shipped cargo over the Northern Sea Route.

Source: Authors' own elaboration based on [6].

However, such visions often do not explicitly account for disruptive developments in the global and regional operating environment. Such developments may influence the assumptions that the visions are based on and eventually impact the real cargo volumes in the future. Scenario planning is a tool that can help government and corporate planners address this challenge, hedge against major systemic risks and use emerging opportunities.

Disruptive developments in strategic planning

Scenarios of the Arctic shipping developed by scholars and consultants typically account for major trends and uncertainties, such as the degree of the sea ice coverage or various geopolitical and regulatory settings [7]. However, such scenarios can quite often be drastically altered by disruptive developments or extreme events. Typical examples of such developments are the COVID-19 pandemic or the Global Financial Crisis, which are often termed as "wildcards". Such developments can bring not only significant risks and losses, but also open the floor for unexpected opportunities. For example, after the container ship Ever Given blocked the Suez Canal from 26 March to 3 April 2021, Rosatom, the Russian operator of the Northern Sea Route, suggested this route as a viable alternative to the Suez Canal [8].

**Each day of the Suez Canal blockage by
Ever Given ship in spring 2021 held up to
\$9,6 billion of trade. [9]**

From the perspective of strategic planning, disruptive developments vary in terms of

- The potential impact they may have on the strategic planning subject
- Plausibility of their manifestation in the future
- Warning signs indicating the current potential of their manifestation
- Their omittance by policymakers in the current strategic planning process

Disruptive developments which are critically important for strategic planning usually combine the features of high potential impact and the presence of warning signs. However, both plausible and implausible developments should be accounted for. The former ones constitute critical trends, whereas the latter ones are true "wildcards". Moreover, those developments and events which are currently omitted in the strategic planning processes should be paid special attention to.

The black swan theory provides a useful conceptual metaphor for facilitating stakeholders' understanding of critical trends and wildcards (Table 1). So-called "black swans" [10] are developments that are rare and very difficult to predict but may have a massive impact. Therefore, it is essential to scan the horizon to detect them as early as possible. Particular attention in strategic planning should also be paid to "dirty white swans", as despite their plausibility and observed warning signs, their impact might be underestimated during the strategic planning process.

Table 1. Various types of disruptive developments relevant for strategic policy planning.

Development notion	Description	Examples
 White swan	Highly plausible development/event, warning signs observed, is not omitted; critical trend	Market fluctuations
 Dirty white swan	Highly plausible development/event, warning signs observed, is omitted	Floods
 Grey swan	Moderately plausible development/event, warning signs observed, is not omitted	Population changes
 Black swan	Highly implausible development/event, no warning signs observed, is omitted; wildcard	9/11 terrorist attacks

Source: [11].

All these developments, by definition, have a high impact on the subject of strategic planning. We next discuss the findings of our foresight exercise, which identified different “swans” in the context of Arctic shipping.

Disruptive developments relevant for shipping in the Arctic

A recent expert survey conducted as a part of the NDI project “Emerging trade routes between Europe and Asia” identified disruptive developments that strategic planning of shipping in the Arctic should account for. Eight experts were proposed 21 developments for each type of shipping (destinational and transit) over the time horizon until 2050. Figure 2 displays ten most relevant developments, which were assessed with respect to the four abovementioned features: impact, plausibility, presence of warning signs and omittance by decision-makers (Figure 1). These disruptive developments can have either positive or negative impact on shipping operations in the Arctic.

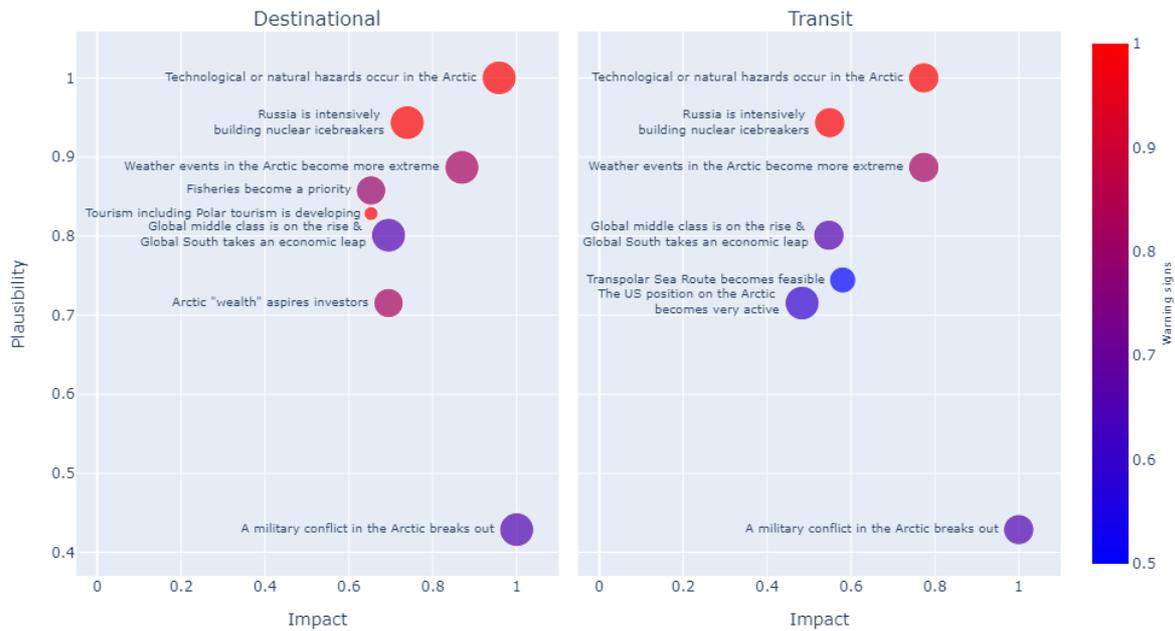


Figure 2. Critical disruptive developments for shipping in the Arctic¹.

Based on the expert assessment, the disruptive events were classified into four categories suggested in Table 1 using the K-Means clustering method [12] (Table 2). These developments are further classified as “regional”, directly connected with the Arctic, and “global”, originating from outside of the Arctic. Developments marked with “transit” are relevant for transit shipping, developments marked with “destinational” are relevant for destinational shipping, and developments marked with “transit & destinational” are relevant for both types of shipping in the Arctic.

¹ The figure is based on the expert assessment of disruptive developments impact (x-axis), their plausibility (y-axis), observed warning signs (color bar, 1 – prominent warning signs observed, 0 – no warning signs observed), and whether the development is omitted (size of circles, larger size denotes large omission). Values are averaged across eight participating experts and normalized.

Table 2. Various types of disruptive developments relevant for strategic planning of shipping in the Arctic.

Notion	Description	Major disruptive developments
 White swan	Highly plausible development/event, warning signs observed, is not omitted; critical trend	<ul style="list-style-type: none"> • Russia is intensively building nuclear icebreakers (regional; transit & destination) • Fisheries become a priority (regional; destination) • Polar tourism is developing (regional; destination) • Technological or natural hazards occur in the Arctic (regional; transit & destination)
 Dirty white swan	Highly plausible development/event, warning signs observed, is omitted	<ul style="list-style-type: none"> • Weather events in the Arctic become more extreme (regional; transit & destination) • Global middle class is on the rise & Global South takes an economic leap (global; transit & destination) • The US position on the Arctic becomes very active (regional; transit)
 Grey swan	Moderately plausible development/event, warning signs observed, is not omitted	<ul style="list-style-type: none"> • Arctic "wealth" aspires investors (regional; destination) • Transpolar Sea Route becomes feasible (regional; transit)
 Black swan	Highly implausible development/event, no warning signs observed, is omitted; wildcard	<ul style="list-style-type: none"> • A military conflict in the Arctic breaks out (regional; transit & destination)

Disruptive developments relevant for both major types of Arctic shipping – transit and destination – partially overlap. However, there are also distinct disruptive developments for each of them. The following developments are relevant for both types of shipping:

- **"Russia is intensively building nuclear icebreakers"** – this development is highly plausible and has a significant (positive) impact on both types of shipping, particularly for destination shipping. Higher icebreaker availability will enable longer navigation periods and sailings of a larger number of ships [13]. It is currently being observed nowadays [14], but perceived as somewhat omitted in strategic

planning beyond Russia. Therefore, it can be considered as a critical trend ("white swan").

- 🕒 **"Technological or natural hazards occur in the Arctic"** – this development is deemed highly plausible and has a very high (negative) impact on destination shipping and a slightly lower impact on transit shipping. Maritime accidents (groundings, releases of cargo, ballast water discharges, etc.) with damage to the environment might lead to stricter marine safety and environmental protection regulations which will significantly restrict shipping in the Arctic waters [15]. There are already warning signs of this development, for example, a total of 512 shipping incidents in the Arctic were reported during 2010-2019 [10]. However, it is somewhat omitted in strategic planning and can thus be classified as a "dirty white swan".
- 🕒 **"Weather events in the Arctic become more extreme"** – this development also has a high (negative) impact on both types of shipping. For example, in November 2021, more than 20 ships were stuck on the Northern Sea Route due to unexpectedly early freezing of parts of the Laptev and East Siberian Seas after an abnormally warm October [17]. However, it is considered slightly less plausible than technological or natural hazards. The observed warning signs are also not as prominent, but as it is somewhat omitted in strategic planning it may be a potential "dirty white swan".
- 🕒 **"Global middle class is on the rise & Global South takes an economic leap"** – this development is deemed quite plausible and has a moderately high (positive) impact for both types of shipping as additional demand on certain types of commodities can fill the ships with cargo [18,19]. Some warning signs are already observed, nevertheless, it is somewhat omitted in the strategic planning. It has the potential to become a "dirty white swan" if more warning signs are observed and if it will still be at least partially omitted by policymakers.
- 🕒 **"A military conflict in the Arctic breaks out"** – this development stands out in its impact on both types of shipping (highly negative), as a military conflict will literally stop all kinds of shipping operations except military in the affected areas, but it is not considered as not highly plausible with no apparent warning signs observed. It is, however, somewhat omitted in strategic planning and therefore a potential "black swan".

There are also essential disruptive developments specific to a particular type of shipping. For destination shipping, the following developments are suggested to be considered:

- 🕒 **"Fisheries become a priority"** – this development can have a moderately high (positive) impact on the destination shipping and is more plausible than the previous one. Both Arctic and non-Arctic states have plans to increase fishing in the

Arctic waters. This will inevitably lead to presence of their fishing fleets in the Arctic Ocean [15]. Some warning signs of it are observed [20], and it is also considered to some extent in strategic planning. Therefore, it can be regarded as a trend ("white swan").

- **"Polar tourism is developing"** – this development is attributed to a similar (positive) impact and plausibility as the development of fisheries. Transport of tourists accounts for an increasing share of marine traffic in the Arctic Ocean [21]. However, the observed warning signs are even more prominent [22], and included in strategic planning. Thus, it can be treated as a critical trend ("white swan").
- **"Arctic "wealth" aspires investors"** – this development can have a moderately high (positive) impact on destination shipping, as shipping is the major mode of transportation of various natural resources extracted in the Arctic, and it is moderately plausible. At the same time, some warning signs of this development are already observed [23], and it is partially omitted in strategic planning. Thus, it can be considered as a "grey swan".

Transit shipping can be impacted by several other developments:

- **"The US position in the Arctic becomes very active"** – this development has a moderate (positive) impact on transit shipping, and it is moderately plausible. For example, it is anticipated that major offshore discoveries in the Chukchi Sea might lead to a significant expansion of marine support activities in Alaska [15]. Some warning signs are observed; however, it is often omitted in strategic planning. It is potentially a "dirty white swan".
- **"Transpolar Sea Route (TSR)² becomes feasible"** – this development has a moderately high (positive) impact on transit shipping and is moderately plausible in the future. Opening the TSR even for a few months per year might enable shorter transit times and allow shipping operators to avoid paying the fees for using the Northern Sea Route [24]. Currently, there are few warning signs observed. At the same time, it is somewhat omitted in strategic planning. It can become a "white" or a "grey swan" if more warning signs are observed.

Concluding remarks

Disruptive developments and events of various nature might have a significant impact on shipping in the Arctic. While some of them are included by decision-makers in strategic policy processes, others are not. Therefore, for mitigating possible risks and benefiting from potential opportunities, a careful audit of such disruptive

² Transpolar Sea Route is a prospective shipping route connecting the Atlantic Ocean and the Pacific Ocean across the center of the Arctic Ocean [25].

developments should be a part of strategic planning of shipping operations. Different types of shipping – destinational and transit – are prone both to common and distinct (for a particular type of shipping) disruptive developments. These developments may originate not only from the Arctic itself but also from the rest of the world.

Destinational and transit shipping: Definitions

Destinational shipping:

- From outside the Arctic to the Arctic or from the Arctic to outside the Arctic
- Ships going to the Arctic to load, unload, or perform an economic activity there

Transit shipping:

- From outside the Arctic to outside the Arctic

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Co-funded by
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