



The Future of Arctic Marine Navigation in Mid-Century

Scenario Narratives Report

**Arctic Marine Shipping Assessment
of the Arctic Council's
Protection of the Arctic Marine Environment
Working Group**

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GBN Global Business Network
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Table of Contents

| | |
|---|-----------|
| Introduction..... | 2 |
| About Scenario Planning..... | 3 |
| The Scenario Framework..... | 5 |
| Scenario Comparison Table | 6 |
| “Arctic Race” | 7 |
| “Polar Lows” | 10 |
| “Polar Preserve” | 13 |
| “Arctic Saga” | 16 |
| “Wildcards” | 19 |
| Areas and Issues for Research | 20 |
| Acknowledgment of Participants | 21 |

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Global Business Network

Founded in 1987 and a member of Monitor since 2000, Global Business Network (www.gbn.com) specializes in helping organizations adapt and compete more effectively and more responsibly in the face of mounting uncertainty—whether it’s uncertainty about their future, the future of their industry, or the future of the world at large. A pioneer in the application and evolution of scenario thinking, Monitor GBN’s consulting and training services focus on strategy, decision-making, innovation, visioning and alignment, and organizational and leadership development.

Introduction

This document serves as the final Scenario Narratives Report for the Future of Arctic Marine Navigation in Mid-Century, a project of the Arctic Council's Protection of the Arctic Marine Environment (PAME) working group and Global Business Network (GBN), a member of the Monitor Group. The purpose of this project, and these scenarios, is to systematically consider the long-term social, technological, economic, environmental, and political impacts on Arctic Marine Navigation of Key Finding #6 of the Arctic Climate Impact Assessment (ACIA) published by the Arctic Council and the International Arctic Science Committee in November 2004. These scenarios are meant to summarize and communicate a set of plausible and different stories of the future in which critical uncertainties play out in ways that challenge planning decisions being made in the present.

For this scenarios project on the Future of Arctic Marine Navigation, we convened two workshops to gather the perspectives and ideas of a highly diverse group of stakeholders. The first workshop was held at the GBN office in San Francisco in April 2007, and the second at the offices of Aker Arctic Technology in Helsinki in July 2007. Because this project rests on Key Finding #6, all of the scenarios assume continued global climate change that results in significantly less Arctic ice cover, at least in the summer, throughout the 2030s and 2040s. It is our intention that these scenarios will provide material for deeper discussions about the future and earlier decisions by the countries, peoples, and industries active in the Arctic region.

Setting the Stage — Dr. Lawson Brigham, Chair of the Arctic Marine Shipping Assessment (AMSA), briefly outlined 10 key Arctic issues that participants should keep in mind during the project.

1. Arctic Council

- Intergovernmental forum (no treaty)
- Eight Arctic states (primary customers of AMSA): five have Arctic Ocean basin coastlines, three have no coastlines in the Central Arctic Ocean
- Permanent participants (Arctic indigenous groups), observers, NGOs

2. Many Stakeholders

- Most outside the Arctic
- Such as the global maritime industry, which has many elements

3. Circumpolar Issue

- Yet local/regional impacts

4. Natural Resources/Trade and Arctic Governance

- Key relationship between these two forces

5. Arctic Ocean

- Politics of the ocean
- UNCLOS implications

6. Arctic Ocean Is the Earth's Least Explored Ocean

- Surrounded by land

7. Arctic Sea Ice Remains in Winter

- Retreat in Summer

8. Arctic Has Vast Natural Resources

9. Influential Documents

- Arctic Climate Impact Assessment
- Arctic Marine Strategic Plan

10. Key Challenge

- Balancing freedom of navigation with robust marine safety and environmental protection efforts

About Scenario Planning

A Brief History

The idea of scenarios—telling plausible stories about the future—is as old as humankind. Scenario planning is a tool for ordering individual and organizational perceptions about alternative future environments in which today’s decisions might play out. This methodology has been used by the military, but only in the last 30 years, in the face of increasing uncertainty and complexity, have corporations and other large global organizations begun to develop sophisticated scenario planning processes.

Royal Dutch/Shell made the tool famous by using it to great effect, with two examples being particularly noteworthy: once to anticipate the Arab oil embargo (OPEC), and then again to anticipate and prepare for the dramatic drop in oil prices during the 1980s. In both cases, the use of scenarios forced leaders to examine their deeply held assumptions, and to practice what they would do if the unthinkable happened (which it did, both times).

Developing Scenarios

So what is scenario planning, as we practice it at GBN? The process is highly interactive, intense, and imaginative. It begins by isolating the decision to be made, or the issue to be explored. Sometimes, scenario projects are very specific, and ask questions such as, “Should we spend x dollars doing y thing?” Sometimes, projects are more general, such as the one that probed the changing nature of national security (and therefore where the U.S. government ought to be putting its resources).

The initial phase usually involves rigorously challenging the mental maps that shape our perceptions, and then searching for relevant information that challenges our assumptions, often from unorthodox sources. We all see certain things relatively clearly and have blinders on about others. Our perceptions are shaped by our past successes and failures, which may no longer be relevant. A good scenario planning project expands leaders’ peripheral vision and forces them to examine their assumptions.

The next steps are more analytical: identifying driving forces (social, economic, environmental, political, and technological); predetermined elements (i.e., what is inevitable, like many demographic factors that are already in the pipeline); and critical uncertainties (i.e., what is unpredictable or a matter of choice, such as public opinion). These factors are then prioritized according to importance and uncertainty.

These exercises culminate in two to four carefully constructed scenarios. In practice, scenarios resemble a set of stories, written or spoken, built around carefully constructed plots. Stories are a time-honored way of organizing knowledge; when used as planning tools, they defy denial by encouraging—in fact, requiring—the willing suspension of disbelief. Only a few scenarios can be fully developed and remembered; each should represent a plausible alternative future, not a best case, worst case and “most likely” continuum. The test of a good scenario is not whether it portrays the future accurately but whether it enables an organization to learn and adapt.

Using Scenarios

Once the scenarios have been fleshed out and woven into narratives, the team identifies the implications for the organization and for the focal question. The team then works out the options for action first within each scenario and then across the set, looking for robust strategies that will work regardless which future unfolds. Then the team lists leading indicators to be monitored on an ongoing basis—the events to watch that will indicate which future (or combination of futures) is actually unfolding.

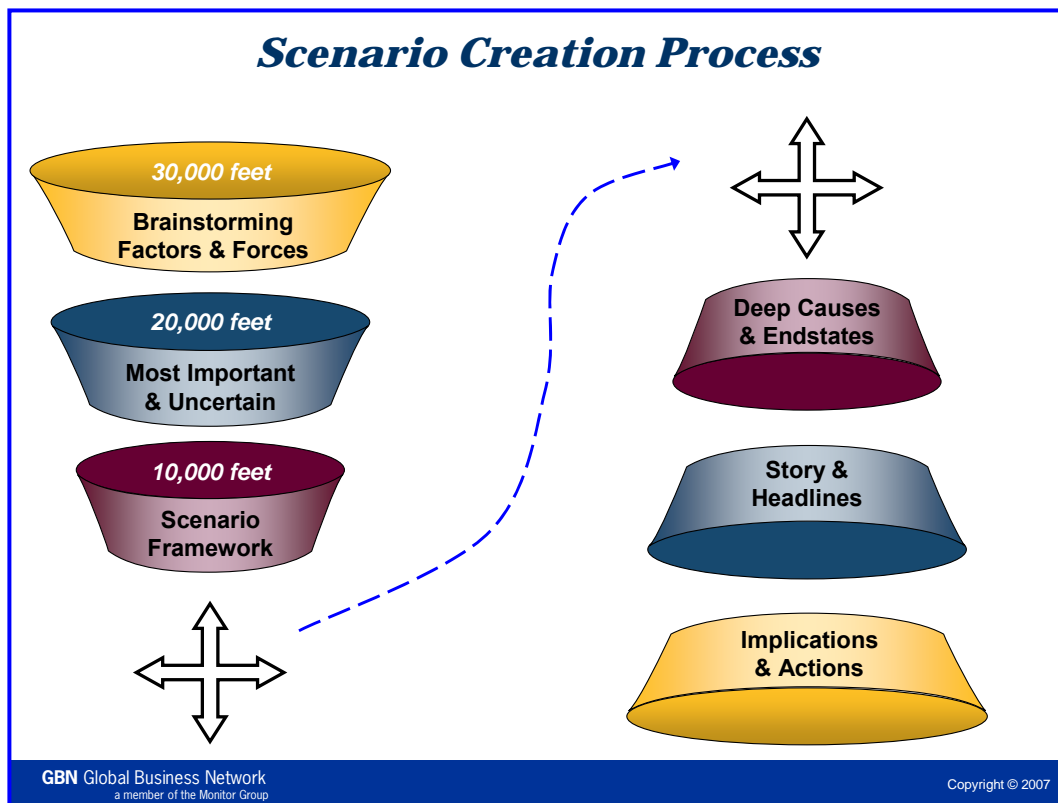
By rehearsing the future in this way, scenarios enable an organization to adapt more quickly to what is actually happening, and to anticipate better what could happen. In the face of some major new development, the organization doesn’t have to spend months in denial and then more months developing options. Scenarios are

also helpful tools for generating new ideas and testing their efficacy. New proposals can be flown through the scenarios, using them as a sort of wind tunnel to test their resilience.

Hence, organizations can avoid wishful thinking—blindly pursuing their own visions without the discipline of a thoughtful strategy that might actually turn that vision into a reality. Decisions that have been pre-tested against a range of what fate may offer are more likely to stand the test of time. And taking an informed long view may give an organization the courage to stick to a set of priorities, rather than backing off in the face of resistance or failure.

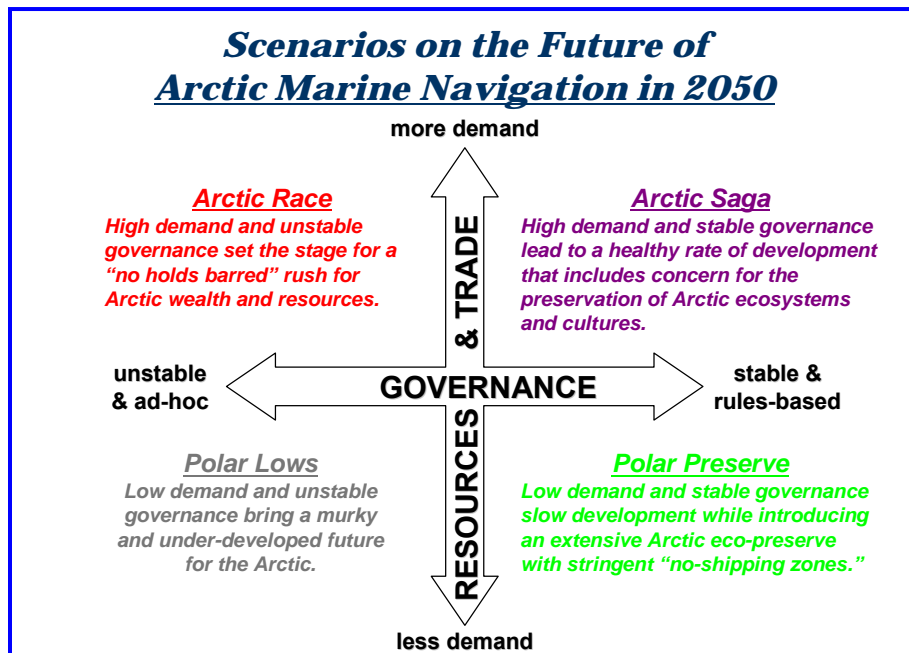
Scenario planning is intellectually rich and challenging. But it’s not a dry academic exercise. It’s a conversation, involving human beings who want to learn together. Therefore, it’s a complex process of group dynamics that must be managed carefully if it is to succeed. When it does, a group of people creates something together—an analysis, a vision, a language for describing the world, a plan of action—that makes them more committed and able to work together effectively.

Scenario planning is often combined with other sorts of tools. Sometimes a scenario team goes on a “learning journey” together to directly experience new ideas, developments, or situations. Sometimes the organization needs to work on its definition of itself—its vision or values, or its definition of its own distinctive competencies—and then test that in each of the alternative futures. Ultimately, scenario planning is an ongoing process of organizational learning—and the scenarios are a platform for re-perceiving the changing external environment.



The Scenario Framework

The scenario narratives that follow, although written by Global Business Network, are based upon material created by participants at the two AMSA/PAME scenario creation and analysis workshops in 2007. Through brainstorming, work in small groups, and spirited plenary discussion, project participants collectively agreed that the two factors detailed below—“Governance” and “Resources & Trade”—are the most important and uncertain in shaping the Future of Arctic Marine Navigation in Mid-Century. By crossing these two critical uncertainties, participants formed the scenario matrix shown here. This framework also allows the incorporation of many of the other uncertainties explored at that workshop, while still creating four different scenarios that are plausible and relevant to the full range of Arctic stakeholders.



Governance

This uncertainty axis describes the degree of relative Governance stability, both within the Arctic region and internationally.

- ← **Less stability** implies shortfalls in legal structure and transparency, as well as a propensity for actors and stakeholders to work on a more unilateral basis rather than by collaborating in a cooperative, international fashion.
- **More stability** implies not only efficiently operating legal and regulatory structures, but an international atmosphere more conducive to collaborative and cooperative development.

Resources & Trade

This uncertainty axis describes the level of demand for Arctic Resources and Trade. Framing this in a global context exposes the scenarios to a broader range of potential market developments, such as the rise of Asia or political instability in the Middle East.

- ↑ **More demand** implies exactly that—higher demand from more players and markets around the world for resources in the Arctic, including open water for trans-shipment trade.
- ↓ **Less demand** is also straightforward, with fewer players interested in fewer Arctic resources.

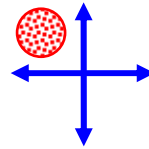
Scenario Comparison Table

| | Arctic Race | Polar Lows | Polar Preserve | Arctic Saga |
|--|---|--|--|--|
| Framing Uncertainties | <p>↑ More Demand for Resources and Trade</p> <p>← Less Stable Governance</p> <p><i>High demand and unstable governance set the stage for a “no holds barred” rush for Arctic wealth and resources.</i></p> <p><i>This is a world in which many international players anxiously move to outwit competitors and secure tomorrow’s resources today. Political tensions are high, and brinkmanship is the name of the game.</i></p> | <p>↓ Less Demand for Resources and Trade</p> <p>← Less Stable Governance</p> <p><i>Low demand and unstable governance bring a murky and underdeveloped future for the Arctic.</i></p> <p><i>This is a world in which domestic disturbances divert attention from global issues, and simmering frictions cause prolonged divisiveness that never becomes extreme enough to coalesce distinct blocs.</i></p> | <p>↓ Less Demand for Resources and Trade</p> <p>→ More Stable Governance</p> <p><i>Low demand and stable governance slow Arctic development while introducing an extensive eco-preserve with stringent “no-shipping zones.”</i></p> <p><i>This is a world where concern about the environment, coupled with geopolitical and economic interests elsewhere, drives a movement toward the systematic preservation of the Arctic.</i></p> | <p>↑ More Demand for Resources and Trade</p> <p>→ More Stable Governance</p> <p><i>High demand and stable governance lead to a healthy rate of development that includes concern for the preservation of Arctic ecosystems and cultures.</i></p> <p><i>This is a world largely driven by business pragmatism that balances global collaboration and compromise with successful development of the resources of the Arctic.</i></p> |
| High Concept | | | | |
| Primary Drivers of Change | <ul style="list-style-type: none"> Global competition among many nations for future rights to resources, esp. oil and gas, intensified by rise of Asia Acute demand for water worldwide, continuing Middle East tensions Climate warms faster than models predicted | <ul style="list-style-type: none"> Global economic downturn, and increasing national protectionism Increased domestic troubles worldwide, including regional outbreaks of new-generation Avian flu Recession of Arctic ice slower than models projected | <ul style="list-style-type: none"> Arctic oil and gas reserves disappointing Alternative energy emerges as viable source for global growth Public concern about climate change and conservation, especially impacts to the Arctic | <ul style="list-style-type: none"> Expanded global economic prosperity Systematic development of oil, gas, and hard mineral resources Shared economic and political interests of Arctic states Climate warms as expected |
| Key Implications for Arctic Marine Navigation | <ul style="list-style-type: none"> Much activity, primarily military, and dominantly destination for resource extraction Unilateral governance regimes lead to inconsistent infrastructure with incompatible standards Seasonal trans-Arctic passage possible, but not permitted politically | <ul style="list-style-type: none"> Minimal Arctic marine traffic, consisting of government re-supply and research, with periodic disruptions Market for “ice-class” ships cools, reducing R&D Low attention to regulations, with unenforced and mismatched standards, and no new infrastructure | <ul style="list-style-type: none"> Harmonized rules for Arctic ship design and pollution prevention Seasonal trans-Arctic shipping possible but proves prohibitively expensive due to environmental restrictions, frequent patrols, and aggressive enforcement Growth of Arctic marine tourism allowed through limited number of “use permits” | <ul style="list-style-type: none"> Wide range and variety of marine activity Navigational infrastructure and aids expanded, making marine transport safer and more efficient New technologies make seasonal trans-Arctic shipping safer and economically viable, e.g., satellite surveillance systems |

“Arctic Race”

Quadrant Endpoints

- ↑ **More Demand** for Resources and Trade
- ← **Less Stable** Governance



The Beginning: 2009-2020

In early 2010, images of the largest ever Canadian military exercise above the Arctic Circle, featuring new special “Ice Ranger” units and patrol boats with ice re-enforced hulls, splashed across newspapers and media sites around the world. The CBC offered a live broadcast; a video clip of the exercise—titled “Start of the Next Cold War?”—was posted to YouTube and was viewed more than 15 million times within 15 days. Quite quickly, the Arctic was back in the spotlight of world attention as it had been several years earlier. And just like that, territorial tensions around Arctic seabed sovereignty were rekindled.

Russia, the U.S., and the European Arctic states moved to stake their claims too, with similarly symbolic moves. In 2012, as part of the war on terror, the Americans established Fort Prudhoe in Alaska. The Danes announced an offshore patrol plan in Greenland, citing the recent tourist ship grounding of the MV Greenland Adventurer. All Arctic states undertook security and feasibility studies, gathering more and more evidence to support their many claims. Attracted by the reported resources, private companies got into the act too, testing the waters with government contracts and partnerships, even though cost-effective technologies remained elusive.

Competition, however, was not limited to the north. Countries vied with one another in many ways all around the world—particularly the U.S. and China. Currency competition took a nasty turn shortly after the Beijing Olympics when China made several significant shifts away from the U.S. dollar to the euro. Markets around the world roiled with the news, and fortunes were made, lost, made, and lost again as investors of all sizes navigated the waves.

New coalitions formed, one notably anchored by Venezuela, China, and Russia as an alternative to World Trade Organization agreements that traced back to the Bretton Woods system of international monetary arrangements. Countries outside of the Western power spheres that had created those institutions now found strength in standing together, no longer in need of these aging arrangements. The next TRIPS rounds not only failed—they were cancelled. Intellectual property standards were yet another arena for nations to test their power and will against one another. Even internet protocol standards proved contentious, especially with the information and speed requirements of Web 5.0.

Marine navigation standards were not excepted from these dynamics either. Competing national frameworks—that were outside the International Maritime Organization process—were actually more about misinformation and claiming greater levels of traffic, as well as capability, as a way to portray more influence and control. This “activity inflation” then resulted in a more opaque picture of marine activity, giving nations even more urgency in their race for resources in the north.

The Middle: 2020-2035

By 2022, a trifecta of forces further ramped up both government and company-driven claims to the Arctic. First, the development of truly scalable alternative energy sources arrived more slowly than many had expected. Stubborn technical problems, along with confusion created by competing regional standards, meant “traditional” energy sources remained the primary fuel for national economic engines. Second, Middle East tensions flared up as the latest U.S.-led coalition squared off against Iran, once again calling into question long-term stability in the

region. And third, global temperatures rose faster than models projected, shifting rainfall patterns significantly and putting nearly as much premium on water in some regions as on oil.

Literal legions of lawyers made arguments, counterarguments, appeals, and complaints in the international courts, various venues of the United Nations, and wherever else claims could be pressed. Agreements were exceedingly rare and not always recognized by all parties. National leaders returned to the old adage “possession is nine-tenths of the law”—and started funneling more funding toward military buildup, thus matching the rhetoric of the previous 10 years. Nations emphasized “far north military presence” as a capability to be developed. This meant not only specialized cold-weather forces, but also “hard water” classes of naval vessels. Once again, national navies competed on size and force projection, engaging in exercises under the guise of convey escorts, scientific expeditions, and coordinated search and rescue capabilities. Showdowns between ships were not uncommon, playing a game of brinkmanship yet never reaching the point of actual engagement.

By 2025, China and India were developing navies that could guard their network of secure maritime transport routes from energy states to their ports of Hong Kong, Shanghai, Calcutta, and Mumbai. China managed to sign an energy deal with Russia, one that included significant reductions in the amount of gas and oil that Russia would export to the EU. Russian-Chinese trade increased, with both countries making use of the Northern Sea Route with well-publicized “demonstration voyages.” Norway, nervous about future Russian plans, reluctantly decided to invest in more naval forces to protect its own Arctic interests. Japan did the same. Mariners began calling the Bering Strait the “Bering Gate,” with U.S. and Russian patrols on continuous deployment.

The next year, the Canadian Arctic Lines shipping company was formed as a joint venture between the Canadian government and a private shipping firm. The charter set out specific goals of “controlling Canadian Arctic waterways for Canadian benefit.” This venture exemplified the necessity for close coordination between national militaries and private partners, essentially “country companies.” Another partnership between the Russian government and several international commercial companies (which were required to have Gazprom as a significant shareholder) to more fully exploit the Shtokman fields also illustrated the point. Private vessels that did venture into the region without military escort were labeled “rogue,” and turned back with heavy fines.

Sensing opportunity, so long as properly affiliated, some companies shifted north to the Arctic with an infusion of people, capital, resources, and production facilities. Russia enacted the “Arctic Development Law” to attract more qualified labor to the north, paying relocation costs. The barrage of development far surpassed the activity involved in building past pipelines. This sort of rush led, not surprisingly, to poorly planned communities—and therefore to rapid growth, congestion, and even sprawl. Although this military-backed development brought infrastructure, it completely diverted efforts away from more sustainable economic sectors such as tourism.

By 2032, the regional divisions inspired by strategic, military, and commercial claims in the Arctic pervaded international trade relationships. The five countries with coastal territory bordering the Arctic Ocean spoke of forming an alliance—the Organization of Arctic Ocean States (OAOS)—against the sharing of Arctic resources by other nations, potentially fracturing the G-20 as non-Arctic countries scrambled to align with the Arctic resource-rich. Tourism disappeared as oil and gas buildup took precedence over preserving the more pristine areas. Competition for claims over territory trumped attention to and concern for the environment, leaving a number of spills and other oil and gas blowouts unpublicized and untreated. Increased seasonal thawing reduced the thickness and extent of sea ice, further facilitating marine traffic and resource extraction. As the sea ice melted more quickly, it took with it important aspects of local Arctic indigenous sustainable marine hunting use, while simultaneously providing for extended fishing seasons. Global commercial fleets, at least those with the proper geopolitical affiliations, were allowed to follow Arctic fisheries further north.

In anticipation of trans-Arctic shipping, Iceland established the Icelandic Commodities Exchange (ICE) route between Dutch Harbor, Alaska, and Helquvik Port in Keflavik, Iceland. While marginally increasing regional traffic into the Icelandic port, the lack of uniform laws and governance in the Arctic region prohibited ICE from reaching its trans-Arctic potential.

The End: 2035-2050

Between 2035 and 2040, several large Arctic communities were essentially overrun by military buildup. Frequent low-level spills and dumping had already brought chronic maladies, but now protests erupted across the Arctic. In 2041, various governments granted *ad hoc* compensatory damage payments. These payments, however, fell short of the massive investments needed for the communities to adapt or relocate. Months after the payments were offered, land claims became an issue in Russia, forcing more police presence. New tensions emerged as a newly wealthy Siberia pushed back against Moscow, demanding more autonomy. International terrorists threatened the Alaskan oil and gas pipelines, and in response, the National Guard was put on permanent patrol. The U.S. took advantage of this general chaos by asserting jurisdiction over waters along a boundary with Canada that had been the subject of dispute for decades. Because this was backed by the presence of a U.S. Naval fleet, relations between the two neighbors hit their lowest point in memory. In retaliation, Canada closed access to “its” Arctic waterways.

These were also the years when economic activity in the Arctic reached an all-time high, with real GDP growth reaching 8 percent across the region. Of course, this development was not based on intra-Arctic relations. The pursuit of physical resources expanded beyond oil and gas to hard minerals, some of which were in extraordinarily high demand. In the rush for these resources, speed and security took priority, not surprisingly at the expense of any environmental concerns. So the real surprise was water—fresh water. The lakes and rivers of the Canadian and Russian Arctic had become a very valuable global commodity. Eager entrepreneurs formed companies with names like “Arctic Source, Unlimited.” The Canadian Indigenous Water Federation sought venture funding for an Arctic shuttle system of water tankers and terminals to supply climate-induced drought areas. Tripoli and Abu Dhabi vied to become the first terminal to receive Arctic water.

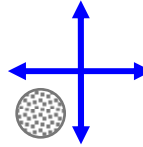
In August, 2045, after loading at newly developed fields in the Kara Sea, Beijing’s latest pair of Arctic LNG tankers, escorted by an ice-capable Chinese frigate, followed a Russian icebreaker east along the Northern Sea Route for homeport. While crossing the Sea of Japan, a maneuvering misunderstanding resulted in the frigate firing across the bow of a Japanese patrol vessel. The Japanese, claiming international rights, mobilized their fleets, and for several days it appeared as if the one-hundredth anniversary of Japan’s surrender following World War II would also be the first time since then that Japan engaged in Pacific warfare. Russia intervened, however, feverishly shuttling political envoys through negotiations that diffused the situation and prevented an escalation to war. Clashes and flare-ups continued with regularity, but threadbare diplomacy and bilateral agreements helped to maintain relative peace. Although no nation supported universal standards that they had not originated, the Arctic states pushed maritime technology and design forward.

In 2050, military and intelligence experts generally agreed that a Great Arctic War had narrowly been avoided several times in recent years—and that if there were going to be a real world war of the 21st Century, it would most likely be sparked in the open summer waters of the Arctic Ocean. Though most agreed that the potential for real skirmishes, or worse, remained very strong, some held out hope (and the example of the first Cold War, back in the 20th Century) for continued avoidance.

“Polar Lows”

Quadrant Endpoints

- ↓ **Less Demand** for Resources and Trade
- ← **Less Stable** Governance



The Beginning: 2009-2020

The United States consumer engine finally stalled in 2008, and American housing market woes spread worldwide. While the U.S. and emerging markets faltered, the slow and steady economic recovery in Europe acted as a stabilizing force in the global economy. Europe’s strategies for incremental efficiency gains were adopted worldwide as a more sensible alternative to the U.S. push for “clean green.” Energy producing states capitalized on global instability by playing up the inherent uncertainty of investing in “alternatives” versus “proven” natural resources. Using the profits accumulated through oil price inflation in the early 2000s, they expanded the terms of their resource nationalism by forcing China, the U.S., and Europe to bid against one another for their investment petro-capital.

In the Arctic, exploration and development slowed as the focus on the region fixed on claims for future development. The Russian “moon landing” two miles below the North Pole in 2007 set off a rash of territorial disputes, featuring overlapping and conflicting claims by the U.S., Russia, Norway, Canada, and Denmark. UNCLOS covenants were violated, redrafted, and nearly abandoned; signatories could not find common ground and unanimously agree on the proper methods for resolving the Arctic territorial disputes. Meanwhile, the ice appeared to be melting more slowly than anticipated.

In response to its continuing economic malaise, the U.S. erected trade barriers in 2009 to, in the words of one senator, “protect the fragility of the American economy.” Marching under a banner of “More Jobs—or Mobs,” scores of disenfranchised textile and technology workers stormed Capitol Hill and successfully lobbied for a wave of protectionist tariffs. These tariffs penalized overseas imports of everything from socks to circuit boards, especially those coming from China; legislators pushed for higher standards and a higher yuan. Unfortunately, these protective measures failed, and set in motion cycles of greater market volatility that dragged the global economy through a series of false recoveries and market corrections.

In early 2016, as the global economy entered another period of halting recovery, two health inspectors closing down a poultry farm in Guangzhou became the first vectors for a SARS-like epidemic of Avian flu. The flu spread along the global supply chain from the port of Hong Kong to Rotterdam to New York and Los Angeles. The global economy was once again plunged into a 16-month economic tailspin as national governments worldwide implemented well-practiced quarantine and emergency response plans. A massive backlash developed against China’s continuing inability to maintain proper health standards; lawmakers on *both* sides of the Atlantic called for punitive tariffs and alternative supply chains in the event China would again source a global contagion. By 2020, each region around the world was moving along its own separate path to recovery from economic malaise, epidemic, or both.

The Middle: 2020-2035

Economic growth was revamped as the global recovery from recession and pandemic kicked into a higher gear. The big story was growth in the emerging markets. Following the chaotic instability of the previous decade, China, India, and the rest of Asia pursued an independent growth path built on their own increasingly sophisticated industrial base and burgeoning masses of middle-class consumers. In the U.S. and Europe, growth continued at a slower pace as they embarked on separate courses to install an energy efficient infrastructure.

Both had refocused their efforts in earnest on energy independence, as energy experts around the world warned of a possible renewal of conflicts in the international community.

In the mid-2020s, energy price volatility began to increase again. Prices rose as consumers and investors speculated on future energy shortages. Russia preemptively raised its transit fees in expectation of higher revenues. OPEC, after waiting patiently through the economic downturn, once again announced significant production cutbacks in order to maintain crude prices near US\$200 a barrel. As competition intensified, all the players exercised strict control over energy infrastructure—often implementing incompatible systems. Europe pushed ahead in refining diesel technologies; the U.S. continued its charge to hybrid cars; and the Asian sphere followed a “plug-and-play” model of small electric vehicles in its dense cities.

By 2030, concerns about Arctic development were largely ignored, as regional tensions and competition obscured the need for cooperative development. Although the indigenous populations of the region appreciated the independence, drilling and transport projects languished in a bureaucratic morass despite the economic pressure. “Do we develop according to U.S., European, or Asian standards?”; “How do we serve multiple markets with different regulatory guidelines?”; “Who secures our trading routes?”; “Who do we trust?” Only adding to the complexity was the fact that fragmenting ice, moved by wind currents, created increased hazards to navigation and made exploration and development dicey. Corporations from around the world lost hundreds of millions on pilot projects attempting extraction from rigs operating in unstable ice conditions. As a result, energy extraction attention returned to the usual, traditional places.

In 2034, contentious territorial disputes continued as changes in the ice affected the migratory patterns of whale pods. The Inuit and other indigenous groups struggled to adapt to new whaling challenges. All along the continental shelf, redundant investment and competing technologies added to inefficiency and waste. In April 2034, the last polar bear passed away—but the world didn’t notice. Simmering regional conflicts were so entrenched that no one wanted to waste their time to actually administrate in the still-frigid north.

The End: 2035-2050

US\$12,263. That was the price of a round-trip economy ticket from New York to Moscow to Shanghai in 2036. High taxes, regional travel fees, and fuel costs passed on to the consumer meant that only the well-heeled could afford to travel outside their home regions. By the late 2020s the emergence of developing world markets, combined with the realization that sources were finite, pushed energy prices to unprecedented highs. In the early 2030s regional cartels formed to control resources inventories and prices as Asia, North America, and Europe competed with one another to secure energy rights. As a result of these “mini-curtains,” strict lines were drawn for travel and global trade. Not only were the regions separated, but operating systems, infrastructures, and even corporate subsidiaries all worked differently depending upon the region.

One unintended consequence of separation was a drop in resource demand worldwide. Costs were still high, but due to the expense of developing, defending, and transporting the resources rather than any lack of supply. In Asia, for instance, in order to manage the equality and demands of 3 billion people, the regional cartel returned to state planning. In 2040, 750 million Chinese owned a car—but they all owned the same make, same model, same color. You could have any Geely you wanted as long as it was the CK-40. In red.

The Arctic reflected the same fixations and neuroses as the south. As the Arctic Ocean became more ice-free each summer, “rustbuckets” would occasionally move through. Single-ship companies took some daring chances, fully prepared to walk (or swim) away after any major incident. Independent—and unregulated—shipping efforts were often attempted, but the results were so mixed that no real attention resulted. The Arctic itself fell further down the pressing priority lists of most nations, leaving a patchwork of misunderstandings, unreported accidents, and missed opportunities.

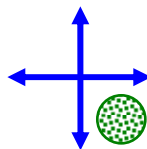
This cycle drove more nations to focus on land routes out of the Arctic rather than marine transport routes through the Arctic Ocean. Following the experience with Russia in the early 2000s, each region chose to build out its own pipeline operating parallel to others rather than run the risk of interference or unexpected “taxes” on a common pipeline. As one might imagine, the forces required to secure the pipelines were massive, and workers in the Arctic were always in high demand—and well compensated. As a result, indigenous populations became increasingly involved in security, as well as other related development opportunities around liquid natural gas heading to Asia and crude oil bound for Europe.

By 2050, many historians and commentators felt that the world had changed little in the past century. The world remained divided and tense, with no foreseeable hope for broader cooperation and alignment. Region after region was mired in a cycle of posturing for territory, dominance, and control. The Arctic’s 15 minutes of fame had peaked back in 2010.

“Polar Preserve”

Quadrant Endpoints

- ↓ **Less Demand** for Resources and Trade
- **More Stable** Governance



The Beginning: 2009-2020

Following sovereign claims to portions of the Arctic seabed made before 2010, various nations moved quickly to put in place some initial infrastructure to start pulling the rich resources from the region. Several major oil companies were given the green light to drill, along with financial incentives that encouraged them to drill sooner rather than later. Social and environmental concerns were largely set aside, and transportation bottlenecks proved trickier than expected. By 2014, the early results were in—and most considered them mixed or even disappointing. Apparently, scientific assessments that had indicated vast reservoirs were contradicted by reality. Meanwhile, shortcuts that were taken in both planning and execution, along with minor drilling and shipping mishaps, went largely unreported—but some could not be ignored.

In 2016, two major accidents occurred within a month of each other. An aging oil tanker, steaming from Murmansk to the Chesapeake Bay, foundered on sea ice floating farther south than expected, spilling nearly 500,000 barrels of crude (80 million liters; 21 million U.S. gallons) off the coast of Iceland. Skimmer ships had to be outfitted to work where they were needed, but even basic absorbent pads took weeks to arrive. Sea currents moved the spill through Iceland’s major fisheries. Response to this disaster was all too slow, highlighting both the remoteness of Arctic marine locations and how deeply unprepared nations of the north were for accidents and their outcomes.

The second accident, though less severe in immediate impact, served as a spark on the now-combustible slick of public attention focused on the Arctic: a cargo of reprocessed nuclear fuel went down in the Chukchi Sea near the U.S.-Russia boundary. The pinpointed site of the accident, and an acceptable surrounding radius, were quarantined until further notice. An *Economist* cartoon showed polar bears feasting on three-headed seals from the area. The combined effect of these two travesties drove a general pushback against the rapid development of Arctic resources. The International Maritime Organization created special committees for the future of Arctic standards. In the end, they concluded that while improved regulations and equipment could minimize the possibility of more accidents, the only way to guarantee that there would be none in the future would be to strictly control marine traffic in the Arctic.

Meanwhile, concerns about climate change gripped the world’s attention. Annual floods in Europe and Asia set new records, and heat waves and drought ripped across Africa and South America. Although the Chinese manufacturing miracle made it through the journalistic scrutiny of the Beijing Olympics, the serious long-term impacts of pollution hit with a vengeance a decade later. The cost of healthcare in China grew out of control, and health problems slashed worker productivity. Public outcry became outrage, and Party officials had no choice but to respond with new standards that increased costs and cooled the economy.

In the face of this worldwide environmental backlash, Shell pulled out of the Arctic completely in 2018, citing sustainable corporate citizenship as the reason. The company’s stock price rose on the news. Following suit, and aiming to make good on promises to be more green, Russia put further development of the Shtokman gas field on hold “indefinitely.” The next year, Arctic states held the first round meetings to lay out the initial framework for near-term, targeted environmental protection agreements. Arctic indigenous groups, supported by global NGOs, proved integral in bringing all the parties to the table, setting a tone that elevated regional cooperation over national claims.

The Middle: 2020-2035

The slowing of China's growth dragged the global economy into a general slowdown in 2021. One unexpected result was that without the previously intense demand for oil and gas, a number of countries took this drop in opportunity cost as a golden chance to double up on the development of alternatives. Brazil's exports of ethanol saw 150 percent year-on-year growth from 2021 to 2026 and then continued to climb steadily for the following decade; new-generation nuclear power plants became France's primary export; and experimental wind farms and tidal installations cropped up in the Canadian and Russian Arctic. The 2020s proved to be the "green" decade, as the people of the planet sensed both the edge of survival and, importantly, positive solutions. Countries adjusted to the new costs of sustainability, and government economists characterized rapid rates of growth as "cancerous" rather than "healthy."

A number of marine ecological parks popped up around the world. So did sustainable business practices that brought consistent, if flatter, revenues and profits. One of the largest, called "The Polar Project," opened in 2029 with sponsorship by Coca-Cola and Disney (of course, with a polar bear as its mascot). Building upon its "High North" political platform, Norway launched the Northern Biotech Initiative, showcasing a Svalbard biotech facility to focus on Arctic fauna and flora. Canada and Greenland expanded their Nares Strait Marine Protection agreement to prohibit passage outright.

In 2030, nearly four-fifths of the world's nations—including all the Arctic states—ratified the Swedish-led Arctic Preservation Treaty. The treaty took an ecosystems-based management approach, drew clear boundaries, and established an enforcement arm, which was quickly nicknamed the "Polar Police" with the motto "To Protect and Preserve." Part of the success of the treaty was that marine activity was not completely banned; instead, it was severely controlled, allowing passage to a limited number of vessels. In theory, these vessels could be of any type, but the only ones that could make it economically worthwhile were government-sponsored scientific expeditions and high-end tour boats. Eco-tourists were willing to pay premiums to visit what the brochures described as "the last and largest pristine piece of the planet." With the region now patrolled by the equivalent of armed park rangers, the Arctic actually did feel more natural than it had a decade and a half earlier. Commercial companies saw opportunity to leverage the "Arctic Friendly" label, and came up with offerings from northern fish to indigenous crafts, facilitating traditional ways of life while capitalizing on the preservation movement.

The End: 2035-2050

With continued climatic warming and a burgeoning middle class, both India and China faced potentially severe water shortages, a worry echoed across the Middle East, Africa, and other parts of Asia. By the early 2040s, environmentalism and sustainability were generally accepted as built-in features of the economy, with exciting venture areas continuing in water treatment and reclamation, air re-conditioning, and alternative energy sources utilizing natural wave and current motion. Demand for food began to plateau; agri-business concentrated more on efficiency, particularly for fish farming.

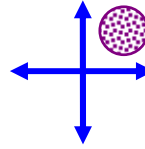
Having made it through the near crisis of the "green adjustment" period and then the elevated investments and updating costs for solutions, competitive forces began to return. With eco-friendly design a part of all maritime vessels now, and summer ice melting to levels that allowed an ease of navigation that would have been seen as ludicrous science fiction only a century earlier, some companies started to question the restrictions placed on the Arctic region. After all, most of the more accessible resources had been used, and new technologies would likely enable the discovery of more in the north. Debates reheated. Some pushed for a greater emphasis on land-based transportation systems, for example, longer pipelines and heavier railroads for minerals and timber. Some wondered if Shtokman would be re-opened.

2050 marked the twentieth anniversary of the Arctic Preservation Treaty. This time around, Shell outfitted the iconoclastic polar bear image with snow shoes that left the imprint, “Helping you tread more carefully in the Arctic.” This would be the phrase used to lobby for temporary rollback of parts of the Arctic Preservation Treaty. It would be expensive with all the new regulations, but still worth it. Now that global economic attention had returned to the Arctic, observers noted that public opinion about activities in the Arctic had seemingly come full circle back to 2010—but this time development activities were to be done with greater foresight, restraint, and responsibility.

“Arctic Saga”

Quadrant Endpoints

- ↑ **More Demand** for Resources and Trade
- **More Stable** Governance



The Beginning: 2009-2020

After the recessionary hiccup caused by the U.S. mortgage debacle in 2008, the global economy grew steadily, with intermittent recessions. Following fuel price spikes in the 2000s, fuel demand continued to mount and competition for resources became more contentious. As conflicts arose, new cartels for natural gas and other resources formed along the OPEC model. “Stability for Currency” became the rallying cry across oil and gas fields worldwide. China expanded its reach out to Africa and in early 2011 began to build out its blue water navy to secure fuel transport routes. At the same time, Russia, Norway, Canada and Denmark vied for ownership of the Arctic seabed through increasingly high-profile “exploratory” trips along the extended continental shelf. In 2009, the U.S., wanting a seat at the bargaining table for extended jurisdiction in a resource-rich area, ratified UNCLOS.

While the countries bickered about ownership and territory, fuel exploration and production continued as all of the oil and gas majors transitioned from exploration to production mode. As technology improved and the ice continued to melt, oil companies made increasingly rapid strides toward their goal of continuous production in the north. In 2015, a multinational research team, including members of the U.S. Geological Survey, confirmed unequivocally that the Arctic held 31 percent of the global reserves of natural gas and crude oil. That same year, the Panama Canal expansion was completed—and proved hugely insufficient. Globalization had sent both South and North American economies to new heights with a constant flow of imports and exports. But tankers and cargo vessels lined up for miles, waiting idle for days at both entrances of the Panama Canal’s massive locks. The greatly increased number of large tankers sailing out of the Barents region bound for North America forced Iceland to expand its marine safety zone around the island.

As resource demands climbed over the course of the 2010s, all of the Arctic states began new infrastructure projects—such as the construction of deepwater harbors—to handle more traffic. The rush of resources and manpower called to mind the rush to China in the late 1990s, as populations migrated northward to find opportunity in one of the few regions of the world that did not require a college degree, English proficiency, or a stringent background check. Although the oil majors still dominated the region, many of their skilled crews, managers, and engineers left to start their own entrepreneurial ventures. Although officially the ports bore names like Nanisivik, Kirkenes, and Murmansk, the throngs of construction crews, sailors, and oilmen drawn to the region—along with a growing number of indigenous youth—dubbed them “Zinc City,” “Cargo Town,” and “Petro-burg” to mimic the main interests in each port.

In lockstep with the port developments came new ice-class fleets. Led by Finland, shipyards around the world worked overtime to produce new ice-breakers and ice-capable tankers. Profits ballooned as shipbuilders ran lines at full capacity. Adding to the boom were breakthroughs in ice-breaking technology and materials science that allowed builders to construct larger ice-class vessels that moved faster through the ice. Such advances did not, however, put ice-experienced crews out of work; on the contrary, they were in very high demand. In response, Iceland took advantage of its love for education, high-tech infrastructure, and inexpensive energy by establishing the first state-of-the-art ice navigation school for Arctic crews and pilots.

These new fleets were not alone in the north, however, as independent tugs and long-mothballed ice breakers were re-commissioned by enterprising amateurs in an attempt to cash in on regional attention. Across the board, additional resources funneled into the region were stoked by governments, corporations, and pirates alike—all

of whom realized that the additional competition would drive prices down. Fee structures in formerly strict regions, like the Russian Barents and Kara Seas, began to fall as free-market influences took hold.

The Middle: 2020-2035

Across the globe, a stabilizing, and increasingly urbanized, population aided resource efficiency. Measured growth in the developed world provided an economic stimulus to temper hyperinflation in the emerging markets as China and India experienced an explosion in middle-class consumerism.

By early 2025, the traffic along the coast of Norway from the northwest of Russia was 20 times the volume of 2005. Although many of the independent outfits rampant in the previous decade had disappeared, there were still many companies providing shipping, ice breaking, and other services. In 2028, an unregistered ice breaker, the *Ice King*, collided with a Norwegian Cruise Line ship, the *Norwegian Spirit*, off the coast of Finmark. Ill-equipped for the Arctic, 347 tourists perished in the frigid waters while survivors were hauled onto passing tankers and cargo ships. A study revealed that not only was the cruise liner itself insufficient for the colder climate and conditions, but save for a handful of crew most had recently been transferred from a Mediterranean route with no prior Arctic Ocean experience.

In 2030, the film “Icebound” was released and caused a worldwide uproar. Initially posted as a tele-novella by Benoy Bhusan on a Second Life writer’s workshop, the film told the story of Benoy, a Bengali refugee who fled his native Bangladesh as the rising waters of climate change inundated his home village. It charted his journey from a doomed refugee raft off the coast of Dubai to his rescue by a slave-trading ship and his eventual indentured servitude as a crewman on the *Ice King* up to and after its collision with the *Norwegian Spirit*. The film spun a harrowing tale of ramshackle boats, piracy, and organized crime syndicates in the North Sea, and a “wild west” mentality toward profiteering and transport. More than anything, “Icebound” illustrated the untamed nature of the commerce that had developed as the north blossomed.

Worldwide reaction to “Icebound” led to a reevaluation of UNCLOS and the structure of Arctic regulation and oversight. A 10-year process of negotiations resulted in the creation of four supranational governing bodies for the jointly controlled territory: the Arctic Commerce Commission (located in Helsinki, Finland); the Arctic Development and Protection Commission (based in Ottawa, Canada); the Arctic Marine Safety Commission (in Washington, D.C.); and the Arctic Transportation Management Commission (in Moscow, Russia). This team of agencies oversaw the Northwest Passage, the Northern Sea Route, and all points in between. Standardized fines, taxes, and route management were all enacted just as the first open-water drilling rigs were brought online. And none too soon, as the increased regional attention put huge pressure on the indigenous populations: cultural integration and homogenization sped up with the influx of people and capital to the Arctic, and of course also brought the expected new string of vices, crime, and social challenges. In collaboration with UNESCO and the Permanent Participants of the Arctic Council, the Arctic Development and Protection Commission undertook a heritage preservation project throughout the region, establishing a network of landmarks and cultural centers designed to maintain the sanctity of indigenous Arctic societies.

The End: 2035-2050

“What Is Petrol Ice?” Advertisements posing the question sprang up on the visual displays of cars from New York to Istanbul. On the internet, on city streets, on planes—for nearly the whole of 2036 it was if the world was deluged by a new life form, and for all intents and purposes, it was. The brainchild of a Madison Avenue advertising agency and well funded by a consortium of oil and gas majors, Petrol Ice was the marketing push to differentiate Arctic petroleum from that found in other regions, particularly the Middle East. At the macro-level it was a bid to decouple the dominance of regional oil cartels and resource nationalism—a move to bring market efficiency to the world’s most highly contested commodity. It succeeded to grand effect.

Coupled with the latest additives for efficiency and clean combustion, Petrol Ice became the product launch of the 2030s. The advertisements eventually led to lines of cars, motorcycles, and jets optimized to run on “Ice.” In 2040, responding to the tremendous marketing potential for fuel and Arctic resources, NASDAQ partnered with the Helsinki Commodities Exchange to form XICE, the primary global exchange for the trade of Arctic resources. Investment banks, mutual funds, and speculators flocked to the region to trade the “new new thing.” As with any financial market, booms and busts rocked “Sval Street” based on ice movements, glacial melting, and the occasional summer typhoon, but increasing production and extraction activity in the region gradually stabilized the market through sheer volume.

Backed by sound industry and regulation, the establishment of XICE set off a wave of Arctic business consolidation that cleared away underperforming companies. With their paths cleared, large regional conglomerates began to form and expand their market share. By 2048, Arctic-related companies were 10 percent of the Global Fortune 500 by numbers—but 35 percent by revenues. In the same year, as Arctic petroleum production reached 25 million barrels per day, the Nunavut Anti-Trust Act was passed to ensure competitive fees and pricing among the regional competitors.

Entering 2050, the Arctic had become a hub of activity for both transportation and resource development. Although the pressures on the local environment and population were not small, the international community created—through a transparent process of trial and error—a structure for development, safety, and oversight that promoted the prudent management of growth in the region. The overall result was one with significantly more ships in the ice than many would have guessed, all coordinated through more cooperative governance, policy, and regulations than any would have imagined at the outset of the century.

“Wildcards”

Wildcards are “what if?” events that have a low probability but a high impact. Some of them may fit within the logic of a scenario but push the limits of plausibility. Others may fall outside the set of scenarios and yet are still worth consideration.

Environmental Challenges

- ❖ A large earthquake in Alaska or Russia
- ❖ Acidification of oceans and collapse of the food chain
- ❖ Abrupt climate change
- ❖ Extraterrestrial events, e.g., meteor strike

Political Tensions

- ❖ Global war on terror spills over into the region
- ❖ Destabilization of the U.S., e.g., secession of Alaska
- ❖ Realignment of the Northwest Territories
- ❖ Federation of States of the Inuit
- ❖ Greenland independence
- ❖ Breakup of Russia Federation
- ❖ China and Russia skirmish over pipeline shutdown
- ❖ North Korea plays a role in the Arctic
- ❖ Parts of Bangladesh underwater due to climate change, and ensuing migration and political pressures

The Ice

- ❖ Ice melts even faster than expected
- ❖ (More) accelerated melting of the Greenland Ice Sheet
- ❖ Severe summer weather generated by melting ice
- ❖ Ice melts slower than expected
- ❖ Instead of increased global warming, ice conditions return to the Arctic
- ❖ Geo-engineering of the Earth’s climate makes possible regional cooling to re-grow Arctic ice

Technology Breakthroughs

- ❖ Major bioengineering discovery in the Arctic Ocean
- ❖ Sooner than expected technology allows year-round shipping with Ultra-Arctic Ice Breaking ships
- ❖ Science changes the freezing point of water
- ❖ Dirigible transportation
- ❖ Bering Sea Tunnel (“The Bunnel”), coupled with increased rail traffic, displaces shipping

Positive Potentials

- ❖ Peace in the Middle East
- ❖ Charismatic leader champions the Arctic
- ❖ U.S., Canada, Russia lead a new tri-lateral arrangement in the region
- ❖ Agreement among Arctic States (due to climate change) to establish a massive aqua-culture fish farm
- ❖ Dramatically increased cooperation and transparency among all Arctic nations

Areas and Issues for Research

At the end of both scenario workshops, participants were asked to look across the set of possible futures on Arctic marine navigation in mid-century, and to make a few recommendations for areas and issues to focus research. The summarized results, listed below, represent an initial set of ideas for further consideration, debate, investigation, and—ideally—prioritization and action.

- Better communication and cooperation among all the global stakeholders
- Collation and understanding of pan-Arctic maritime legislation, regulation, and policies
- Transition from voluntary to mandatory regime of International Arctic Shipping Standards, e.g., construction, manning/crewing, operation, and pollution
- Importance of right of “innocent” passage
- Regional approach (and/or other innovative mechanisms) to Arctic jurisdictional dispute resolution
- Consider an “Arctic Convention”

- Increase and improve circumpolar telecommunication links and systems
- Create regional Arctic “ICS” (Incident Command System) for emergency preparedness to search-and-rescue needs in cold conditions (especially for cruise ships), oil spill response and clean-up, etc.
- Arctic “VTS” (vessel traffic system, with surveillance, navigation aids, and shipping database)

- Improve the understanding and systems of navigating and working in ice: detection, interpretation and management techniques, ship design and routing, ship-platform transfer systems, etc.
- Address the lack of trained and experienced ice/Arctic marine personnel
- Assessment of ship technology in 2050 (environmentally friendly “white” Arctic ships, new hull materials for economically feasible Arctic ice operations, etc.)
- How the ice conditions will develop during winter (i.e., after period of ice-free Arctic summer)

- General marine navigation infrastructure requirements (according to level of activity)
- National ice-breaking capabilities
- Wide-ranging modeling of possible flows and types of cargo
- Status of sub-sea production R&D for Arctic basin deep water drilling
- Research into “mari-culture,” i.e., evolving from fishing to “farming” of the sea

- Nature and change of Large Marine Ecosystems (LMEs) in Arctic ... for management of fisheries, biologically sensitive areas, particularly relative to changes in climate, ice cover, and permafrost
- Evolution of marine protected areas—unilateral vs. collaborative?
- Noise pollution impacts of shipping, oil and gas development, fishing, etc.
- Impact of all-source vessel emissions on cold weather and climate change, e.g., alternative fuel sources
- Impact of tourist activity on wildlife

- Assess and address socio-economic, political, and environmental impacts of increased marine access by multiple users of Arctic waterways
- Balance indigenous rights and needs, while also permitting sharing of Arctic riches
- Impacts of increased Arctic shipping on non-Arctic areas

- Creation of a new Arctic State institution (with “harder” power than current “soft” Arctic Council)

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