



WWF

REPORT

2018



**GETTING IT RIGHT IN A NEW OCEAN:  
BRINGING SUSTAINABLE  
BLUE ECONOMY  
PRINCIPLES TO THE ARCTIC**



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**Editor:** Leanne Clare

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# INTRODUCTION



**UP TO US\$1 TRILLION**

COULD BE INVESTED IN THE ARCTIC IN THE COMING DECADES.

If future development takes a science-based approach to cooperatively managing the region, life in the Arctic – and on the rest of the planet – will benefit.



Included with this report is a “SWOT” (strengths, weaknesses, opportunities and threats) analysis of the Arctic Blue Economy.

Increasingly, the world is looking to the seas as a new source of economic opportunity. As climate change reveals a “new ocean” in the Arctic, the world’s interest in exploring and exploiting the valuable resources it contains is growing.

It is estimated that up to US\$1 trillion could be invested in the Arctic in the coming decades. Such large-scale investment could have an enormous impact on the region’s vulnerable ecosystems. Without proper policies in place, marine species such as fish, seals and whales will increasingly come into conflict with industrial activities – such as shipping and seismic exploration – and may be harmed by underwater noise and oil spills.

**If future development takes a science-based approach to cooperatively managing the region, life in the Arctic – and on the rest of the planet – will benefit. This is our chance to get it right from the outset.**

Lessons learned from applying Blue Economy Principles in other parts of the world demonstrate that sustainable growth in the Arctic must be built upon:

- Long-term social and economic benefits
- Valuing and protecting nature
- Circular and renewable technologies
- Ecosystem-based management
- Inclusive governance processes

This report describes what we know about the current “Blue Economy” in the Arctic – that is, the economic resources, issues and trends associated with its oceans and seas. It also outlines the concept of a sustainable Blue Economy for the Arctic – an Arctic marine economy founded on the principles of ecosystem-based management, circular and renewable technologies, and inclusive governance processes. It explores how those principles apply to the unique circumstances of the Arctic, especially given the rapid change that is happening.

Included in this report is a “SWOT” (strengths, weaknesses, opportunities and threats) analysis of the Arctic Blue Economy. This analysis is aligned with the WWF’s new “Principles for a Sustainable Blue Economy” (developed through a global consultation process) and the UN Sustainable Development Goals adopted by 192 Member States of the United Nations.

WWF recommends that to achieve a sustainable Arctic Blue Economy, investors, financial institutions, governments, industry, Indigenous Peoples and Arctic communities should:

1. **Carefully consider and prioritize** climate change risks when investing.
2. **Preserve biodiversity** in a warmer Arctic.
3. **Fully integrate** Arctic research and Indigenous knowledge into decision-making processes.
4. **Focus on renewable resources** to diversify Arctic economies.
5. **Apply ecosystems-based management** in the Arctic marine environment.
6. **Improve Arctic governance** to ensure sustainable development.

WWF stands ready to work with all stakeholders, landowners and governments to pursue these recommendations and create common ground for a sustainable future in this unique region.

# BUILDING A SUSTAINABLE ARCTIC ECONOMY

What can people inside and outside the Arctic do to make sure any new economic development in the Arctic follows the principles of sustainable development?

## “The World Has Discovered a New Ocean”

The rapid changes taking place in the Arctic have caused investors to eye the region’s potential opportunities. Scott Miner, chief investment officer of US-based investment firm Guggenheim Partners, has said: “From an investment standpoint, the average economic rate of growth in the Arctic region is the highest in the world, relative to any country, or any continent.” In other venues, he has also called the Arctic the “best investment opportunity of the last 12,000 years.”

The investment money that is expected to flow into the melting Arctic is enormous. Guggenheim Partners has estimated the new infrastructure development alone to be not just billions, but over US\$1 trillion dollars. Projects already planned total over \$600 billion in investments, according to data gathered by the firm.

But any investment opportunity comes with risks, particularly in the Arctic. Making the world aware of the investment needs and opportunities is only one part of the equation in creating a sustainable Blue Economy. The world should also be made aware of the social and environmental risks.

A major challenge in analysing the potential for a sustainable Blue Economy in the Arctic is the fragmentary economic data available and the different national and sub-national methods of collecting and reporting that data. But the stream of data is growing and has already been sufficient to convince a prominent investment firm that the economic opportunity presented by the Arctic surpasses that of every other place on Earth. That’s why it is imperative that countries and Arctic communities anticipate these investments in a way that mitigates the risks and learn from what has been done in other regions. We must get it right from the beginning.



Scott Miner, Chief Investment Officer of Guggenheim Partners, has called the Arctic, “the best investment opportunity of the last 12,000 years.”

**OVER US\$  
600 BILLION**

**IN INVESTMENTS ARE  
ALREADY PLANNED FOR  
THE REGION’S FUTURE,  
ACCORDING TO DATA  
GATHERED BY GUGGENHEIM  
PARTNERS.**



The concept of a 'Blue Economy' (and its companion concept 'Blue Growth') has spread rapidly since it was first introduced at the 'Rio+20' UN summit meeting of 2012.

### Describing the Arctic Blue Economy

The concept of a "Blue Economy" (and its companion concept, "Blue Growth") has spread rapidly since it was first introduced at the "Rio+20" UN summit of 2012 (see box page 7, "What is a Sustainable Blue Economy?"). The Arctic is no exception to this global trend. Virtually all of the billions of dollars in Arctic opportunity now being discussed by investors depend on the Arctic Ocean.

This report focuses on the marine part of the Arctic (see map) and the primary economic activities associated with it: shipping, fishing, tourism, extractive industries and the smaller-scale – but vitally important – subsistence activities of the Indigenous Peoples who have populated the region for thousands of years (see box page 9, "The Arctic's Peoples").

The report also looks at emerging marine-based economic activities, such as the development and harvesting of bio-resources (such as algae with pharmaceutical properties) from marine environments – the "Blue Bio-Economy." This analysis also considers economic activities on land, such as mining and energy resource extraction, that drive growing coastal infrastructure development, shipping and other sectors that are more formally considered "Blue" or marine in nature.

It should be emphasized from the outset that this report does not draw a firm boundary between the Arctic's Blue Economy and its land-based economy. Many Arctic industries depend on shipping and coastal infrastructure. Most of the Arctic's peoples are coastal. Many obtain significant portions of their food through a combination of land-based and sea-based hunting.

### The Arctic Economy is Mostly Blue

#### Boundaries of the Arctic

- AMAP (Arctic Monitoring and Assessment Programme)
- Arctic Circle

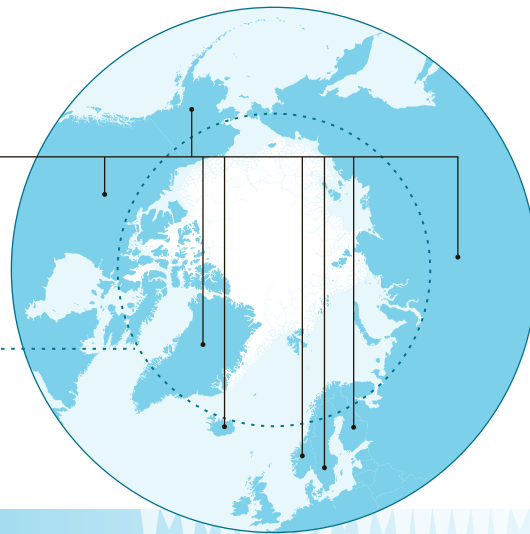


The region's many islands and enormous coastlines mean that much of the land-based economic activity is also directly dependent on the sea in some way.

## POPULATION

**530**  
MILLION  
IN EIGHT ARCTIC STATES

**4**  
MILLION  
INSIDE THE ARCTIC CIRCLE



GROSS REGIONAL PRODUCT <sup>1</sup>  
**\$443 BILLION**

**34** SPECIES OF MARINE MAMMALS **633** SPECIES OF FISH

26 WHALES, 7 SEALS INCLUDING WALRUS, AND POLAR BEARS



**LARGER THAN AFRICA**

THE ARCTIC REGION  
TOTAL SIZE  
32.2 MILLION KM<sup>2</sup>

**2-3 METERS** AVERAGE THICKNESS OF ARCTIC OCEAN SEA ICE IN WINTER

## LARGEST ECONOMIC SECTORS



It should be emphasized from the outset that this report does not draw a firm boundary between the 'Blue' economy in the Arctic, and its land-based economy.

As an example, consider the tourism sector. What percentage of Arctic tourism should be considered "Blue?" Should we factor in only the passengers on cruise ships? Or should we add the people who fly into coastal cities and then go whale watching? What do we do with those who never get on a boat, but may observe marine animals from shore?

**Focusing on firm boundaries in these cases** is impractical and unimportant when the big story is that tourism throughout the Arctic is expanding. In this report, we adopt certain conventions and definitions of convenience about Blue Economy resources and economic sectors to make the analysis clear, comparable and transparent. But when in doubt, we take the position that the land-based Arctic economy, by virtue of being strongly tied to this vast "new ocean" that is emerging, is highly dependent on and interlinked with the area's Blue Economy.

**The concept of a Blue Economy** is closely related to other similar and complementary concepts, such as a green economy that improves human well-being and builds social equity while reducing environmental risks and scarcities. It also includes principles of a circular economy: e.g., maximizing the recycling and reuse of materials is necessary but cannot be a cure-all. While technical changes can lower the per-unit impact, overall, the environmental benefit is largely offset by economic growth. Therefore, the Arctic Blue Economy must be developed carefully to ensure its sustainability.

## WHAT IS A "SUSTAINABLE BLUE ECONOMY"?

The "Blue" part of any economy is the part directly dependent on large bodies of water: oceans, seas and large inland lakes. For smaller island nations, most of their economies are inevitably "Blue" – dependent on fishing, shipping, marine-based tourism, other marine-based economic activity (such as aquaculture), but also, increasingly on the extraction of resources such as oil, gas or minerals from the sea floor. In the Arctic, the interior portions of some islands are covered by ice sheets and therefore not accessible for most economic purposes.

For countries with coastlines, whose land-based resources are increasingly seen as becoming scarce or depleted, the resources located in or under the water look increasingly attractive to governments and commercial interests around the world. That is why nearly every country with a coastline now has some form of Blue Economy or Blue Growth policy, program or declaration.

**FOR  
1,000s OF  
YEARS**

**TRADITIONAL INDIGENOUS  
ECONOMIES HAVE BEEN  
FUNCTIONING SUSTAINABLY  
AND ARE CENTERED ON  
NATURAL RESOURCES.**

### There Are Many Arctics

The Blue Economies of the Arctic vary with culture, bathymetry, politics, geology, currents and several other variables. These variables create different levels of importance of economic activities. The roles of fishing, shipping, marine and coastal tourism, and mineral or energy extraction are distinct and different in the Arctic regions for the five states (Canada, Denmark [Greenland], Norway, Russia, United States) that have Arctic Ocean coastlines, and for Iceland, whose coastline is just short of the Arctic Ocean. (See table, “Arctic Blue Economies at a Glance.”) The two remaining Arctic countries – Finland and Sweden – do not have Arctic coastlines, and the economy of freshwater lakes is not fully developed in these countries (e.g., it is limited to small-scale fishing and tourism). However, it is important to note that Finland and Sweden have concrete contributions to make toward the development of an Arctic sustainable Blue Economy. Sweden is exporting minerals through a rail link to Narvik, and Finnish and Swedish expertise regarding icebreakers often supports Arctic marine operations.

Many Indigenous cultures and economies stretch across national boundaries. The territories of Saami herders predate modern national boundaries in Northwest Europe, and until the last century, Inuit travelled freely across land, waters and sea ice regardless of national borders or economies. Traditional Indigenous economies have been functioning sustainably for thousands of years and are centred on natural resources. Modern Indigenous economies typically still include natural resources, but have expanded in some regions to encompass the management of large corporate enterprises.

All of these areas, and all of these economies, are often referred to simply as “the Arctic.” But in fact, there are many “Arctics” or Arctic sub-regions. Nonetheless, this report attempts to reflect an Arctic-wide perspective, keeping in mind the reality of this profound sub-regional differentiation.







## The Arctic's Peoples

There are more than 40 Indigenous Peoples in the Arctic. They occupy the northern coastline of every country bordering the Arctic Ocean, and many of the major islands. The only Arctic state without an Indigenous population is Iceland, which was uninhabited by people until late in the first millennium.

Since much of the Arctic coast was covered in ice sheets during the last ice age, it was likely not habitable during that time, but was colonized soon after by various Indigenous Peoples. Indigenous Peoples spread across the Arctic over thousands of years.

Of the Arctic coastal peoples, the most widely spread are the Inuit, who occupy coastlines from Arctic Russia to Greenland, a span of thousands of kilometres. In some Arctic states and

regional political units, Indigenous People are comparatively small minorities. In Alaska, Alaskan Native peoples are estimated to comprise 15 per cent of the population, while in Greenland, Indigenous People make up about 88 per cent of the population (including persons of mixed origin).

How many Arctic Indigenous People are there? That is a difficult question. The Arctic Council estimates the Arctic's Indigenous population to be about 10 per cent of a total Arctic population of roughly 4 million. Not all Arctic countries ask people to identify their ethnicity in Census questions, so Census information is uneven. In Russia, there is no such status as "Indigenous" under state legislation; instead, Russia has legislation covering "minority peoples," who must number less than 50,000 to qualify.

The Arctic's Indigenous Peoples once had complete control over the resources in the areas they occupied. That control began to diminish as new arrivals pushed north. In northwestern Europe, that process began many hundreds of years ago, while in parts of Canada, the large-scale arrival of non-Indigenous People is comparatively recent.

Many of the Arctic's Indigenous Peoples are beginning to regain control over their traditional lands and waters, whether through land claim (modern treaty) processes, or through changes in regional governance that are returning more decision-making powers. This process is underpinned internationally by the UN Declaration on the Rights of Indigenous Peoples, which most of the Arctic states have endorsed.

# 1. Building a Sustainable Arctic Economy

## Three Factors That Are Transforming the Arctic

The Arctic is changing with astonishing speed – thanks to climate change, technological advances and the forces of economic development.

### FACTOR #1: CLIMATE CHANGE

The Arctic is warming more than twice as quickly as the rest of the planet. Such rapid change comes with inherent risks.

In the winters of 2016 and 2017, temperatures in many parts of the Arctic were up to 20 degrees C higher than average. On some days, the temperature at the North Pole itself was above freezing – nearly 25 degrees higher than normal on the Celsius scale.<sup>2, 3, 4, 5</sup>

The thaw temperatures in early winter at the North Pole are a symbol of the overall, systemic trend in the Arctic: it is warming, the ice is melting, and the Arctic Ocean is becoming increasingly accessible, with shocking speed. As the 2017 Snow, Water, Ice, Permafrost in the Arctic (SWIPA) report notes, “the average number of days with sea ice cover in the Arctic declined at a rate of 10–20 days per decade over the period 1979–2013, with some areas seeing much larger declines.”<sup>6</sup>

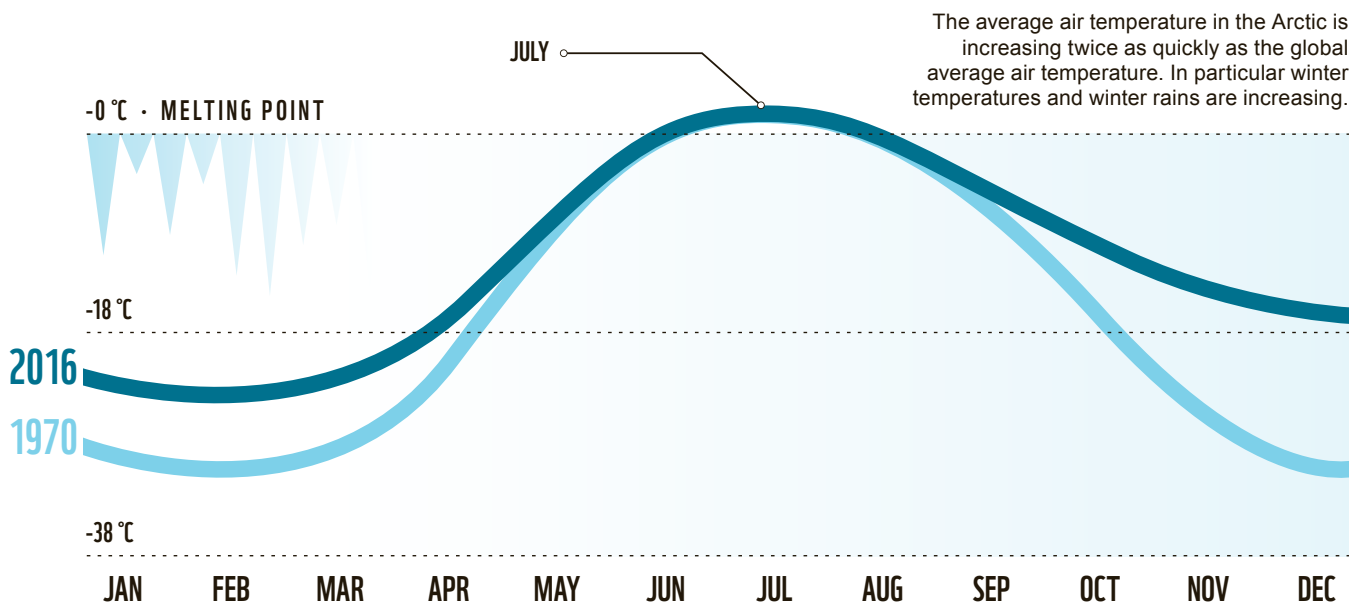
It takes several unusual years in a row to establish an “anomaly” as a new trend. These several unusual years in a row have already occurred. The Arctic is warming at a rate of more than half a degree per decade and summer sea ice extent is decreasing. The latest projections suggest the Arctic Ocean could effectively be ice-free in the summer by 2040.<sup>7</sup>



Faced with collapsing houses, roads, schools and clinics, entire communities, such as Shishmaref in Alaska, are having to be relocated.



### Daily Temperatures in the Arctic





## FACTOR #2: TECHNOLOGY

**As the ice retreats, technology advances.** Icebreakers are getting larger and more powerful. Some new ships that are not yet intended for Arctic use are nonetheless being designed to meet polar standards so they can go there eventually. New drone technology is helping existing ships navigate the maze of ice chunks by flying above and relaying information that helps chart a safe course. This extends the season of navigability.<sup>8</sup> Remotely operated underwater vehicles (ROVs) are already in use to support mapping and intelligence-gathering activity. Internet cables are being laid through Arctic waters. Arctic oil, exploration and drilling and related technology capacity is in continuous development, making more and more of the region theoretically accessible (although larger scale implementation is at the mercy of global market prices.) It is worth noting that technology advances have not yet reached a level where oil-spill response technologies can effectively clean up a spill in the Arctic.

## FACTOR #3: GLOBAL ECONOMIC DEMAND

**Lubricating and facilitating all these technological advances** are the push for investment and the pull of global markets. For example, the melting edges of Greenland are making mining for rare minerals more affordable just as some of those minerals are becoming scarce in the rest of the world. The world's appetite for fish continues to grow, and much of that increased demand is expected to be met by Arctic fisheries.<sup>9</sup> Tourists, driven by a search for new and exotic experiences, find the Arctic increasingly attractive. All these activities need infrastructure, such as bigger and better ports, airports, roads and buildings.

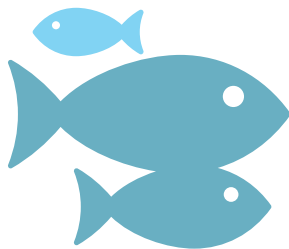
Transformation is value-neutral. Although these factors individually and in combination are set to change the Arctic, whether that change is perceived positively or negatively depends on the values and the levels of awareness and education held by the people observing and affected by the change. Several of these changes are likely to be perceived both positively and negatively. For instance, increased marine accessibility may reduce the cost of living in some communities at the same time as increased shipping compromises local living resources.

Researchers at the United States' National Oceanographic and Atmospheric Administration (NOAA) have calculated that losses – driven by “rapid, if not unprecedented, rates of change” – should be counted in the trillions of dollars. Losses include the damage to existing coastal infrastructure caused by melting permafrost, erosion and changing climatic conditions. Faced with collapsing houses, roads, schools and clinics, entire communities, such as Shishmareff in Alaska, are having to be relocated.

Ecological losses include the arrival of new fish species in Arctic waters. This may help sustain fisheries, but may also affect the balance in ecosystems in unpredictable ways.<sup>10</sup>

Fishermen investing in new gear are exposed to greater economic risks when their gear needs to be replaced to accommodate the harvest of different and new species.

The threat to Indigenous and local cultures and lifestyles cannot be measured in dollars, but the factors above pose real threats to cultures and lifestyles of inestimable value.



The world's appetite for fish continues to grow, and much of that increased demand is expected to be met by Arctic fisheries.



### ARE ARCTIC VISITORS “EXTINCTION TOURISTS”?

**As the Arctic melts and becomes more accessible**, thousands of people are packing themselves into ships to go see it. The most famous recent example was the voyage of the *Crystal Serenity*, a luxury cruise vessel carrying 1,200 passengers and 400 crew members. As of 2017 it had traversed the Northwest Passage twice. It was the first commercial cruise ship to make the journey, and made global headlines.

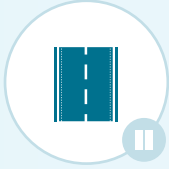
**While tourism like this brings income to some Indigenous communities**, it also exerts a powerful transformational pressure all its own. At times, the *Crystal Serenity* tourists who went ashore to visit Indigenous villages outnumbered the Inuit living there by a factor of more than two to one. These temporary invasions awakened fears that the ship was enabling a form of “extinction tourism” – people hastening to see vanishing ecosystems and accelerating their destruction in the process.<sup>11</sup>

# 1. Building a Sustainable Arctic Economy - Investment Trends in the Arctic Region

## ALASKA USA



Declining interest in energy investment



Freeze on infrastructure development

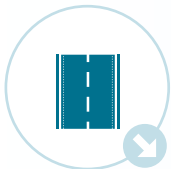


Moratorium on new licenses for drilling has been lifted



Port development plans still under way

## CANADA



Lower investment in large infrastructure



Moratorium on new drilling leases

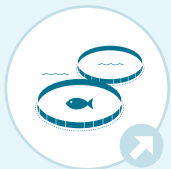


Deep-water Arctic port plans are under way



New coastguard and navy ships planned

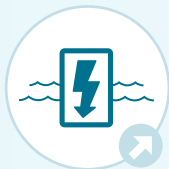
## GREENLAND DENMARK



Still investing in fisheries and MSC certification



Expanding ports and airports



Planning new hydropower facilities



Planning to open new coastal mines



Getting ready for expanded tourism



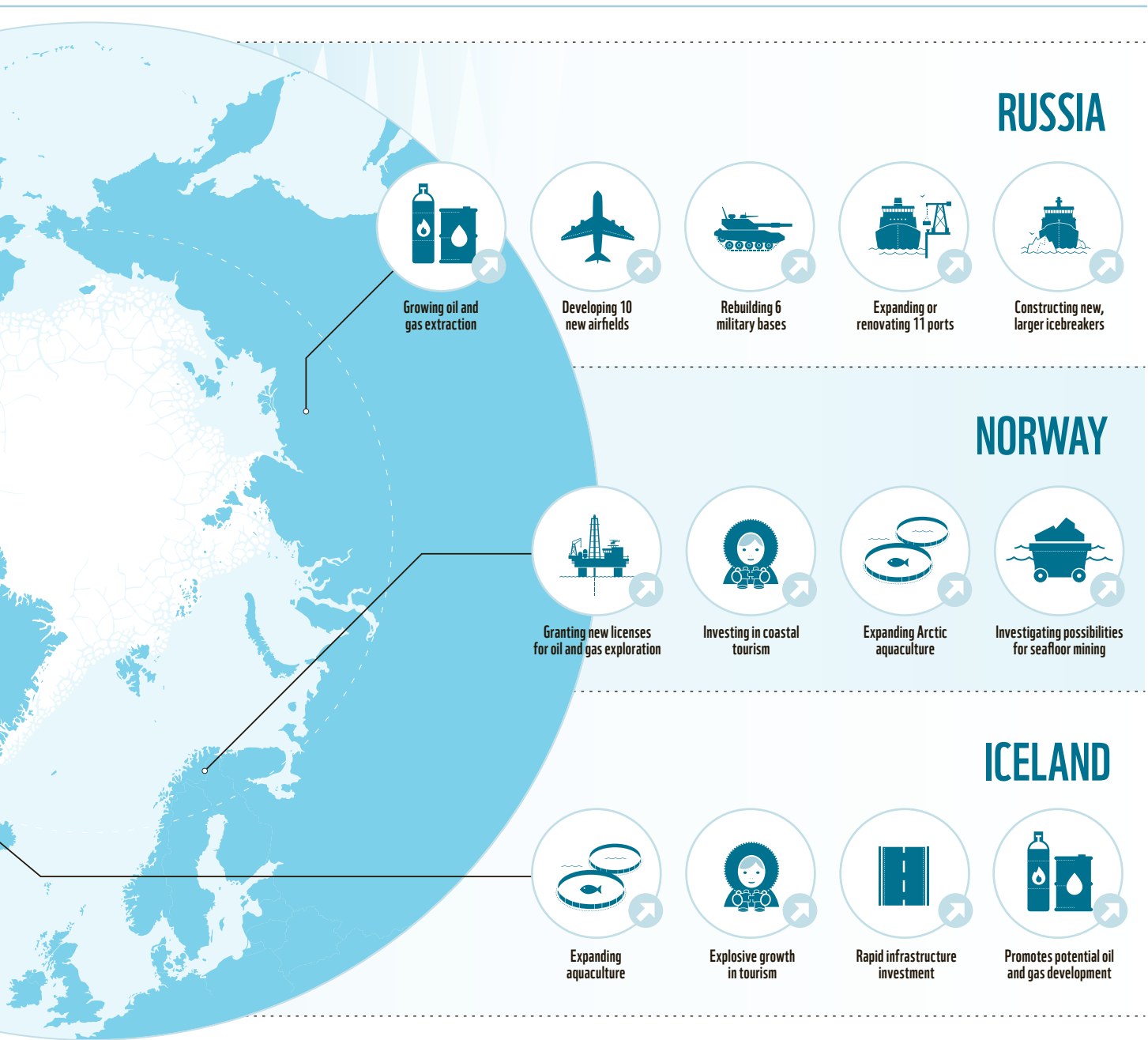
The Diavik diamond mine is located on a small island in Lac de Gras, 220 km south of the Arctic Circle, in a remote region of Canada's Northwest Territories.

## Investment is Coming to the Arctic - Despite Risks and Setbacks

The estimated US\$1 trillion dollars' worth of investment needed in the Arctic, as described earlier, is not yet being matched by trillion-dollar financial flows. Significant money is coming into the Arctic, but the pattern is uneven. The governments of Russia, Norway, Iceland and Greenland (Kingdom of Denmark) are moving forward briskly while the US and Canada are holding onto their wallets. (See "A summary of investment trends.")

These trends may be due in part to the different political and economic philosophies of the Arctic states. Russia has a long history of state investment in Arctic development, from the diamond mines of Mirny to the recent Murmansk port upgrades. Diamond mines and a new port to ship iron ore from Arctic Canada were both developed by corporate interests.

The above graphic shows a summary of investment trends that are affecting the Arctic Blue Economy<sup>12</sup>. Russia, Canada, the United States, Kingdom of Denmark (Greenland) and Norway are called the "Arctic Five" because their coastlines face the Arctic Ocean. Iceland, while not technically bordered by the Arctic Ocean, nonetheless occupies a strategically



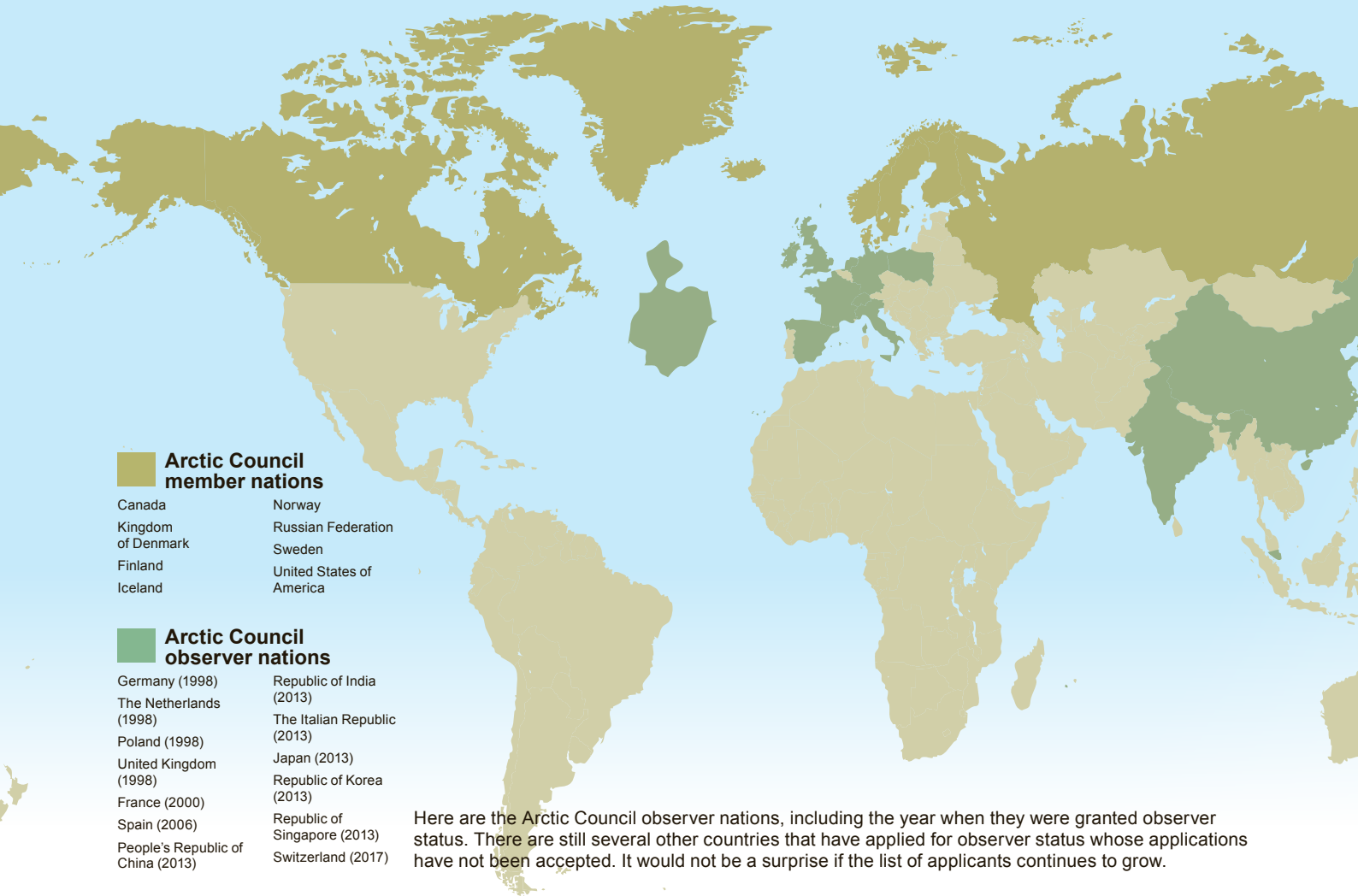
important position geographically and economically. These six countries set the tone for development of the Arctic Blue Economy – but they are far from the whole story.

First, two other countries have geographic ties to the Arctic. Sweden may not have an Arctic coastline, but the ores from its rich iron mines in the Arctic north have been shipped out of Norwegian ports for more than a century. Similarly, Finland may lack an Arctic Ocean port, but it is certainly an Arctic nation. Both Sweden and Finland operate icebreakers in Arctic waters. Together with Arctic Five and Iceland, they round out the eight voting states of the Arctic Council. (See box, “A Brief Guide to Arctic Governance.”)

Overall, while development of the Blue Economy may look mixed in the near term – that is, slower in some places, faster in others – investors nonetheless expect growth to accelerate dramatically throughout the region in the medium to long term. The Alaska-based investment firm Pt Capital has estimated that the Arctic economy will generate \$500 billion, in gross domestic product (GDP) terms, by the year 2030, even when Russia is not included. Since so much of the economic activity in the Arctic involves coasts, ports, ships, boats and marine drilling platforms, the Blue Economy is likely to account for a significant portion of that growth.

To achieve responsible investment in the context of rapid Arctic climate change, the Sustainable Blue Economy Finance Principles developed by the European Investment Bank, European Commission, the Prince of Wales’ International Sustainability Unit and WWF are a great tool. The ambition of the Principles<sup>13</sup> is to build an international coalition of financial institutions that voluntarily endorses the Sustainable Blue Economy Finance Principles and in so doing, demonstrates investor support for healthy oceans.

# 1. Building a Sustainable Arctic Economy



## Arctic Council member nations

Canada	Norway
Kingdom of Denmark	Russian Federation
Finland	Sweden
Iceland	United States of America

## Arctic Council observer nations

Germany (1998)	Republic of India (2013)
The Netherlands (1998)	The Italian Republic (2013)
Poland (1998)	Japan (2013)
United Kingdom (1998)	Republic of Korea (2013)
France (2000)	Republic of Singapore (2017)
Spain (2006)	Switzerland (2017)
People's Republic of China (2013)	

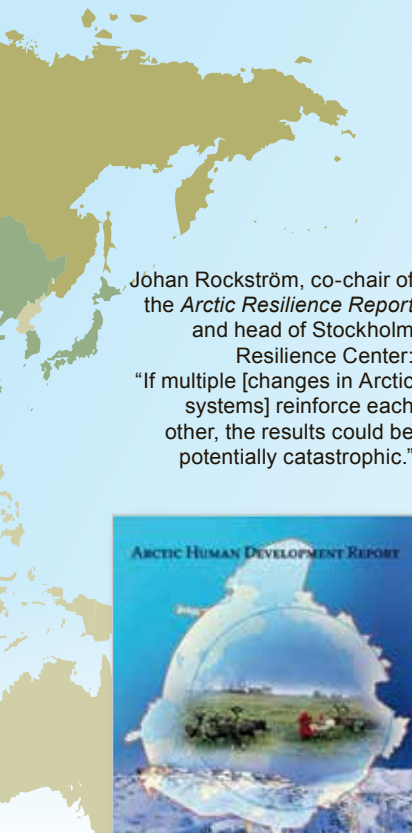
Here are the Arctic Council observer nations, including the year when they were granted observer status. There are still several other countries that have applied for observer status whose applications have not been accepted. It would not be a surprise if the list of applicants continues to grow.

## Arctic Researchers Are Ringing the Alarm Bells

As the ice retreats and the investment wave builds, another group has also been growing its presence in the Arctic: researchers (see box, “Ramping Up Arctic Research”). Scientific interest in the Arctic is growing rapidly. Particularly where research into the living and human environments of the region are concerned, there are warnings that the current trajectory of change poses challenges for sustainability.

Because the Arctic's many systems are relatively fragile, there is little built-in redundancy, which makes them particularly vulnerable to perturbations.

**One factor that comes up repeatedly** is the risk of unpredictable trophic cascade events in many Arctic systems, and their interdependence. The Arctic's many systems – sea ice, unique plant and animal life, human economies and cultures – are tightly interlinked: disturb one, and you can disturb them all. Because the systems are relatively fragile, there is little built-in redundancy, which makes them particularly vulnerable to perturbations. For instance, in more southerly ecosystems, it is common for a multiplicity of animals to fill an ecological niche. If one of these species is affected by a new disease, or is less resilient to changes in temperature, chances are that another species will pick up the slack, and the ecosystem will continue to function much as before. But in Arctic ecosystems, the loss of any given species could disrupt the entire ecosystem because there are not enough other species fulfilling the role of the affected species. The linkages are also global, because the Arctic plays a definitive role in global climate and ocean ecosystems, affecting global weather, temperatures, ocean currents, the distribution of fish species, migratory birds and much more.



Johan Rockström, co-chair of the *Arctic Resilience Report* and head of Stockholm Resilience Center:  
 “If multiple [changes in Arctic systems] reinforce each other, the results could be potentially catastrophic.”



The *Arctic Human Development Report* warns in its conclusion that the future is unpredictable at best.

**As Johan Rockström**, co-chair of the *Arctic Resilience Report* and head of Stockholm Resilience Center, recently told ABC News (the US television network):

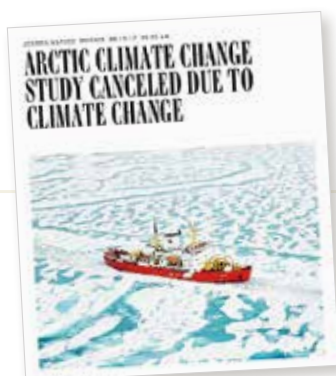
“If multiple [changes in Arctic systems] reinforce each other, the results could be potentially catastrophic. The variety of effects that we could see means that Arctic people and policies must prepare for surprise. We also expect that some of those changes will destabilize the regional and global climate, with potentially major impacts.”<sup>15</sup>

While the Arctic Human Development Report struck a more positive tone overall and noted that warming and change are already bringing some economic benefits to Arctic people, its conclusion warned that the future is unpredictable at best.

While warming may open the Arctic seas to transportation and the continental shelf to development, the sea ice will be unpredictable. The increase in flooding and the reduction in permafrost and snow cover will increase production costs even in areas with significant current resource activity; warming may shorten the period during which ice roads allow exploration and development activity on the tundra; and thawing ground may destabilize existing systems of roads, pipelines and other industrial infrastructure.<sup>16</sup>

Climate, environmental and socio-economic drivers may interact and amplify the difficulty of making decisions in an unpredictable and rapidly changing Arctic. Cumulative changes may increase existing pressures. In the face of those complex interactions of different drivers, scientists and policy experts are developing adaptation strategies. As an initial step toward a new type of integrated assessment designed to inform options for adaptation measures, the Arctic Council released a set of reports entitled “Adaptation Actions for a Changing Arctic.” Resilience and adaptation measures must be put in place regionally and locally to address the existing social and economic vulnerabilities of Indigenous Peoples by preserving biodiversity.

These warnings lead to a key question: how can the inevitable growth and rapid development happening in the Arctic Blue Economy happen in a sustainable way – in a way that helps ensure ecosystem resilience, human well-being, social stability and economic prosperity in the long term?



This article, from the publication *Wired*, originally appeared in *Newsweek*. The melting ice made it too dangerous to fulfill the planned research voyage.

### RAMPING UP ARCTIC RESEARCH

**Many countries have increased their Arctic science research budgets** over the past decade, prompted by a coordinated international effort in 2006 and 2007 called the “International Polar Year.” While the overall increase has so far tracked with global increases in science activity generally, there are important differences at the country level. China, for example, increased its polar research by more than 250 per cent between 2006 and 2015. Russia also more than doubled its spending on research in this area over the same period.<sup>17</sup>

**As political and research interest in the Arctic grow**, global media are also showing more interest. For instance, an Arctic Council study called the *Arctic Resilience Report*, which looks at how the region’s social and ecological systems are linked, was covered by many major news outlets, including newspapers, television news and even speciality publications like *Wired*.<sup>18</sup>



## Arctic Tipping Points Are a Source of Concern

A “tipping point” is a point of no return. It is reached when conditions in a system get pushed or stressed and a physical or social threshold is crossed, resulting in a transformative change. The system “switches” from its previous stable pattern to a new pattern in a process that scientists call a “regime shift.” The shift from the old normal to the new normal – which can take decades or centuries – is usually accompanied by a lot of turbulence.

The most well-known example of a tipping point in the Arctic context is sea ice. Once the warming and melting process passes a certain point, there will be no stopping it; Arctic summer sea ice will largely disappear. Some recent research suggests that even if the world manages to stop global warming at a global average increase in temperature of 2 degrees C, we will cross that tipping point. However, attaining the 1.5-degree goal of the Paris Climate Agreement would allow a small area of summer sea ice to survive.

Sea ice is just one of the Arctic systems that appear to be nearing tipping points. The *Arctic Resilience Report* identified 19 tipping points or regime shifts that were at risk of undermining stability in the Arctic in systems as diverse as the Greenland ice sheet, human mobility systems, and the biological productivity of fisheries – even the productivity of the ocean itself.

All 19 of these processes interact. In many cases, one regime shift could trigger another, in a domino effect. Therefore, any plans to increase Blue Economy activity in the Arctic must consider three questions: Will this activity push the region closer to any tipping points? For tipping points that may already have been reached, will this activity be adaptable to the resulting new conditions – and help us achieve a new, more sustainable Blue Economy in the future? And finally, could this activity help foster greater resilience in the face of the changes that are already occurring?



The Arctic, being a mostly marine area, figures strongly in SDG 14: “Conserve and sustainably use the oceans, seas and marine resources for sustainable development.”



## A Sustainable Blue Economy: Key to the Arctic’s Future

In 2012, starting in areas far from the Arctic Circle, an idea was born that has since taken the field of marine-based development by storm: the “Blue Economy.” It was originally proposed by Pacific island nations as a concept that was more appropriate for them than the widely promoted term “Green Economy” because, they emphasized, island economies depended on the sea. The phrase Blue Economy has since been adopted, in some form, by essentially every nation on Earth with a coastline. Many high-level conferences, government declarations, development policies and investment programs are now framed around the Blue Economy.

However, the concept of Blue Economy was initially poorly defined and was at risk of simply accelerating the environmental destruction of the 70% of our planet that is covered by water. Policies about the Blue Economy (and the companion term “Blue Growth”) generally included reference to sustainability, but in vague terms.

In 2015, WWF came up with its **Principles for a Sustainable Blue Economy** (see Annex 1, page 69). Meanwhile, the world reached agreement at the United Nations on a much larger and more ambitious agenda: the Sustainable Development Goals. As a mostly marine area, the Arctic figures strongly in SDG 14: “Conserve and sustainably use the oceans, seas and marine resources for sustainable development.” SDG 14 is linked to other relevant SDGs covering domains like climate, poverty and biodiversity. The WWF principles are increasingly seen as a key governance tool for achieving the ocean-related SDGs.



### IN 2015

WWF DEFINED A SET OF PRINCIPLES FOR A SUSTAINABLE BLUE ECONOMY.

#### APPLYING UNIVERSAL PRINCIPLES TO A UNIQUE REGION

The **WWF Principles for a Sustainable Blue Economy**, created through a global consultation process, are a systemic framework anchored in the best available science and global policy consensus on the Sustainable Development Goals. The principles help guide decision-makers to create solutions that maximize both the economic value and the ecosystem health of our oceans in the long term.

The Principles define a sustainable Blue Economy as one that:

- **Provides social and economic benefits** for current and future generations by contributing to food security, poverty eradication, livelihoods, income, employment, health, safety, equity and political stability;
- **Restores, protects and maintains** the diversity, productivity, resilience, core functions and intrinsic value of marine ecosystems (the natural capital upon which its prosperity depends);
- **Is based on** clean technologies, renewable energy and circular material flows to secure economic and social stability over time while respecting the limits of one planet.

See Annex 1 of this report for the complete text of the *Principles for a Sustainable Blue Economy*.

# 1. Building a Sustainable Arctic Economy

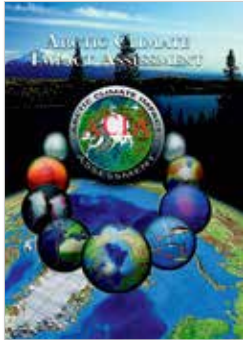


## Reports from the Arctic Council and Nordic Council of Ministers

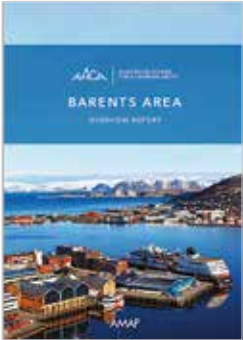
The Arctic Council and Nordic Council of Ministers have published many high-quality reports on the status of the Arctic, but there is no report that summarizes and interlinks the different findings.



Arctic Biodiversity Assessment



Arctic Climate Impact Assessment



AACA Barents Area (overview)



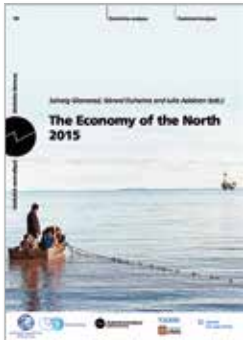
AMAP Assessment 2013: Arctic Ocean Acidification



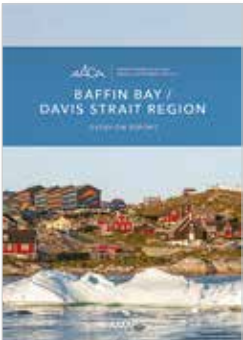
Arctic Human Development Report



Snow, Water, Ice and Permafrost in the Arctic (SWIPA) 2017



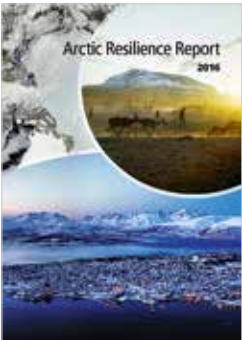
The Economy of the North 2015



AACA Baffin Bay/Davis Strait Region



AACA Bering, Chukchi, Beaufort Region



Arctic Resilience Report



The Arctic Council consists of the eight Arctic countries and representatives of the Arctic's Indigenous Peoples' organisations. It is also open to government and non-government observers by invitation.



## A BRIEF GUIDE TO ARCTIC GOVERNANCE

**Arctic governance is complex** because there are many actors, policies and overlapping processes at play. This report focuses on three key processes: national governments, the United Nations and the Arctic Council.

**National governments control their own territories**, of course, including their coastlines and territorial waters, extending 12 nautical miles (22.2 km) out to sea.

**The rest of the Arctic**, as ocean, comes under the jurisdiction of the United Nations Convention on the Law of the Sea (UNCLOS). The terms of UNCLOS determine what parts of the Arctic Ocean (as well as what parts of the Atlantic and Pacific oceans bordering the Arctic) come under the control of specific national governments and what parts are treated as commonly owned international waters. Under UNCLOS, countries have complete control over the resources in their Exclusive Economic Zones ("EEZs"), which stretch 200 nautical miles (371 km) from their coastlines. That control can be extended to 350 nautical miles if a country can prove that those additional areas are an extension of its continental shelf.

**To put it simply**, on their lands, in their territorial waters, and in their EEZs, national governments decide what happens in the Arctic.

**Beyond areas of national jurisdiction are the Arctic Ocean's high seas.** Access to mineral resources under and on the sea floor in Areas Beyond National Jurisdiction is controlled by the International Seabed Authority (ISA). Global shipping rules are set by the International Maritime Organization (IMO). Fish and other living marine resources in international waters fall under various international mechanisms, such as the United Nations Fish Stocks Agreement, and the purview of Regional Fisheries Management Organisations which provide a framework for regional cooperation, though not in most of the Arctic region.

**In 2018 officials from the so-called Arctic Five** – Canada, Norway, Russia, Kingdom of Denmark (Greenland and the Faroe Islands) and the United States – signed an agreement with officials from major fishing powers (Iceland, Japan, South Korea, China and the European Union) restricting fishing in the Central Arctic Ocean. All parties agreed that no commercial fishing will take place for a period of 16 years to allow for science to gain a better understanding of the area's ecosystems and appropriate conservation and management measures to be established.<sup>19</sup>

**This brings us to the Arctic Council.** Created in 1996, the Council provides an international forum for discussion among its recognized member states and representatives of the Arctic's Indigenous Peoples. It also admits other nations, as well as some prominent intergovernmental and non-governmental organizations, as formal observers (WWF is one). The principal focus of discussions at the Arctic Council is the sustainable development of the Arctic and the protection of its unique ecology.

**While the Council has grown in perceived importance** over the years, it is important to bear in mind that the vast majority of Arctic Council direction is not binding. What the Council can do is commission research (such as the *Arctic Resilience Report* cited earlier) and adopt policy recommendations, action plans and guidelines. States can and do commit to joint or coordinated actions arising from recommendations generated by Arctic Council reports and assessments. WWF addresses implementation by member states of those commitments on conservation issues in its Arctic Council Conservation Scorecard.<sup>20</sup>

**The Council and its working groups also create projects** and facilitate the dialogue of member governments. So far, three binding international agreements have been negotiated through this dialogue process: one on search and rescue, another on marine oil pollution response, and a third on scientific cooperation.

# UNDERSTANDING THE ARCTIC BLUE ECONOMY: RESOURCES, TRENDS AND VALUATION

Valuation is the challenge of assessing the worth of an entire region when so many of the things that make it special cannot be measured in monetary terms.

This section explores three key aspects of the Arctic Blue Economy: the region's resources, which are attracting increasing investor attention; trends, which are driven by the world's interest in those resources and by larger trends in the global economy; and valuation – the challenge of assessing the worth of an entire region when so many of the things that make it special cannot be measured in monetary terms.



Offshore ice-resistant stationary platform *Prirazlomnaya* being towed to an oil-field, Russia.

# Resource Types and Trends

The Arctic – with its “new ocean” emerging from under the ice – has special appeal because so few of its resources have been tapped, or even explored and quantified.

A key driver of interest in the Blue Economy generally is the perception among governments, investors and private sector actors that many of humanity’s land-based resources are becoming scarce. Whether the issue is having enough space to grow or harvest food, finding minable sources of rare metals, or identifying new sources of genetic material for the biotech industry, the Earth’s oceans appear to have in abundance what countries are increasingly experiencing as a current or projected future deficit.

With the world looking to the seas as a new source of resources and economic opportunities, the Arctic – with its “new ocean” emerging from under the ice – has special appeal because so few of its resources have been tapped, or even explored and quantified. A key consideration in any future investment in the industrial development of resources in the Arctic must be how such extraction and use can be done in a way that ensures long-term benefits and sustainability of the Blue Economy for communities and nature.

To explore this complex topic, we cluster Arctic marine-based resources and opportunities into five general categories:

## Extractive



### Oil, gas and minerals

This category includes non-renewable resources such as oil, natural gas and minerals extracted from the sea floor. We also consider land-based extractives because they are so closely interlinked with the Blue Economy in the Arctic due to their frequent reliance on marine transportation links.

## Renewable



### Water, wind and sun

These are material and energy resources that continuously replenish themselves through natural processes, such as the wind, sun, water flows and fresh water itself.

## Biological



### Marine plants and animals

This includes the harvesting of fish and other living creatures for food and other uses. It also includes aquacultures, seaweeds, algae and other sources of biotic material used for industry or food.

## Connective



### Transport and communications channels

This category includes shipping and other transport as well as the use of Arctic spaces for the establishment of fibre-optic cable and communications infrastructure.

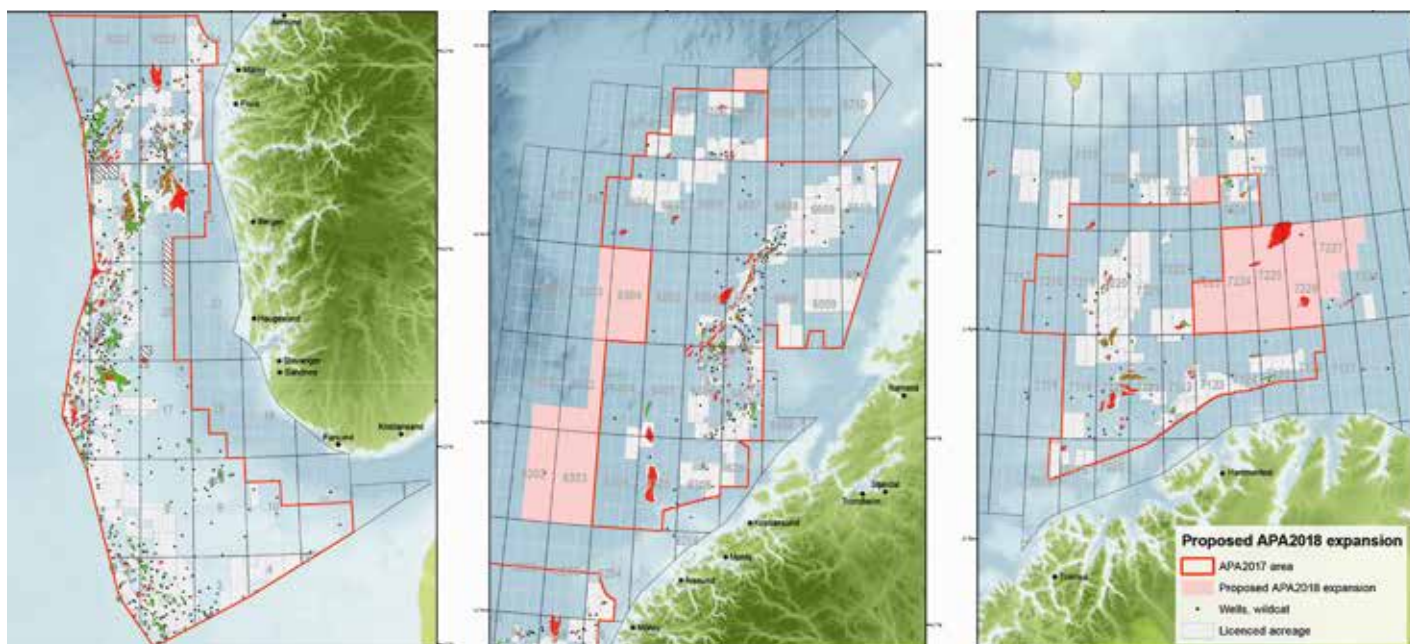
## Experiential



### Opportunities to observe the Arctic

This category includes all forms of tourism, research and everything in between – any activity that brings humans into the Arctic marine and cultural environment simply to experience it, whether for pleasure, adventure, the advancement of knowledge, or some mixture of motivations. (Note again that the Arctic’s largely coastal geography means some experiential resources that are technically land-based – including much of Arctic tourism – are considered relevant to our analysis.)

## 2. Understanding the Arctic Blue Economy



Source: The Norwegian Oil Directorate

In 2015, Norway's Ministry of Petroleum and Energy announced the awards in pre-defined areas (APA) 2015 licencing round, comprising the predefined areas with blocks in the North Sea, the Norwegian Sea and the Barents Sea. Many of them are situated in the Arctic.



### EXTRACTIVE RESOURCES

**Arctic oil and natural gas, despite their high costs of extraction,** attract the most attention and generate the biggest economic headlines.<sup>21</sup> The Arctic already supplies the world with roughly 10 per cent of its oil and 25 per cent of its natural gas, mostly from onshore sources.<sup>22</sup> But it is also estimated to hold 22 per cent of the Earth's undiscovered oil and natural gas reserves – and about 85 per cent of those resources are not on land, but “offshore,” under the sea floor. The majority are gas reserves on the Russian shelf.<sup>23, 24</sup>

When it comes to mining, Arctic lands are already a major source of a wide variety of minerals, from iron and nickel to the much rarer palladium, platinum and even diamonds. Greenland's melting coastline is emerging as an attractive destination (at least in theory) for mining operators from China and Australia.<sup>25</sup> Known deposits of minerals near the coast across the Arctic could suddenly become exploitable with the development of marine infrastructure. These land-based mining operations are not technically part of the Blue Economy, but ships and port infrastructure are often needed to transport ores for smelting and refining and to bring in essential supplies.

Large-scale undersea mining is yet to be undertaken anywhere, and in the Arctic, it presents special challenges. While small-scale operations do exist in Alaska, and exploratory projects to scope larger initiatives are under way (Norway, for example, has a significant research program assessing the prospects for mining in its waters), the industry is likely to be slow to ramp up.

The presence of so many proven and assumed extractive resources, both onshore and offshore, is one of the major drivers of Arctic economic development. This wealth of resources drives the coastal infrastructure development and shipping necessary to bring those resources to market, such as the Gray's Bay road and port proposal in Nunavut and the construction of a liquefied natural gas terminal on the Yamal peninsula. These infrastructure developments may trigger other unforeseen developments.

### Trends in Extractive Industries

**Most future expansion in the oil and gas sector** will almost certainly come from undersea sources, as most of the undiscovered reserves in the Arctic are projected to be offshore.<sup>26</sup> Norway, for example, opened new areas of the Barents Sea to oil and gas exploration in 2016 over the strenuous objections of environmental advocates in that country.<sup>27</sup>

The Arctic is estimated to hold 22 per cent of the Earth's undiscovered oil and natural gas reserves – and about 85 per cent of those resources are not on land, but are 'offshore,' under the sea floor.

As the Arctic melts, industry is increasingly encroaching on critical habitats. Here is a look at the places where wildlife and humans are colliding.

— Route of the *USCGC Healy*, July 2015

### Critical Bird and Mammal Habitat

- Audubon and BirdLife International Circumpolar Global Important Bird Areas/Alaska State and Continental Important Bird Areas
- Areas identified as being of heightened ecological significance to birds by the Arctic Monitoring and Assessment Programme and the Institute of Marine Research
- Marine mammal migration corridors

### Human Activity

#### Shipping

- Northern Sea Route
- Northwest Passage\*
- ⋯ Potential trans-Arctic route

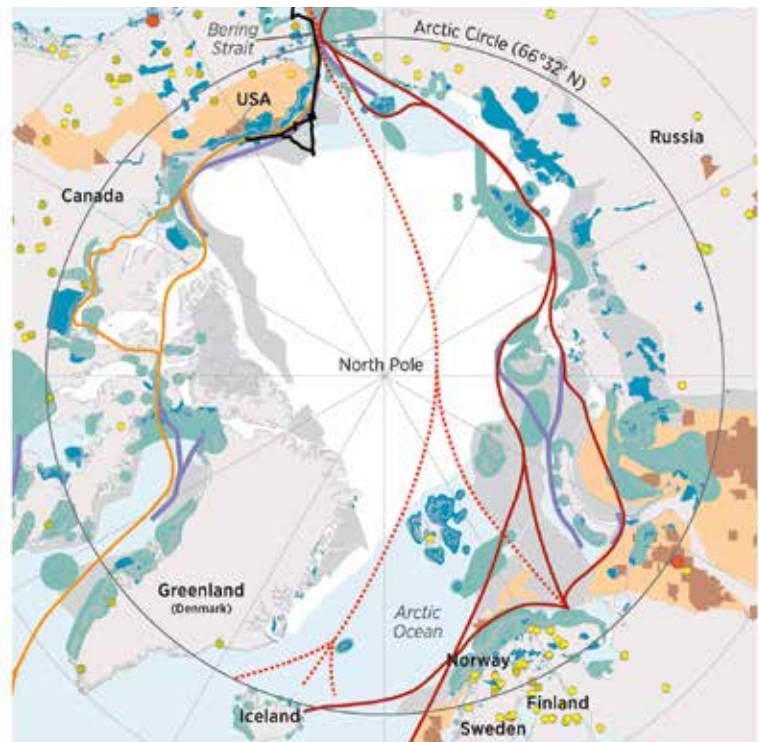
#### Oil and Gas

- Production areas
- Petroleum basins/provinces in which production is occurring
- Major oil spills
- Areas with a 50% or greater chance of holding significant reserves of undiscovered oil and gas

#### Mineral Mining

- Producing mines
- Potential mines in exploration/development

\*The first full transit by an unescorted cargo ship occurred in 2014.



## US\$10,000 PER WEEK

IS THE AMOUNT SOME MINERS WERE NETTING FROM UNDERSEA GOLD MINING EFFORTS OFF THE COAST OF NOME, ALASKA.

**A record number of wells were drilled in Norwegian waters in 2017**, despite low oil prices, due to a combination of Norwegian subsidies, increased efficiency and the enabling presence of existing marine infrastructure.<sup>28</sup>

Recently, the Trump administration reversed a joint moratorium with Canada on drilling licenses for a huge area of the Arctic Ocean. A similar reversal is expected in Canada following a government review.

The Canadian government's moratorium was deeply unpopular with some political leaders in Nunavut and the Northwest Territories, who noted the link between resource extraction and their future prospects. "I really think [this decision to ban drilling is] just going to keep our people on social assistance," said an Inuit political leader from a region that has historically been the focus of hydrocarbon exploration.<sup>29</sup> However, the extent to which offshore oil and gas operations contribute to wealth generation in northern communities remains unclear.

With regard to mining, both onshore and seabed mining are being promoted by some interests as important to the future development of the Arctic. Onshore mining itself is technically not considered part of the Blue Economy, but significant percentages of the ores that are dug from the ground in Canada, Greenland, Svalbard or even northern Sweden (which has no Arctic coast of its own) must travel to their destinations by ship. Furthermore, Arctic mining tends to cluster on the coast because of the absence of other infrastructure.

Onshore mining remains a significant driver of economic activity throughout the Arctic, with impacts especially on shipping. It is difficult to say just how big a piece of the economic pie mining is – or will be – in the Arctic. News agencies report mines opening and closing, but recent comprehensive analyses of mining in the Arctic are hard to come by. Even counting the jobs that depend on mining is a challenge: "The eight Arctic countries each use different definitions of employment and different methodologies to collect the data. Furthermore, many countries do not report employment by county and industry, so the Arctic share of mining employment cannot be identified."<sup>30</sup>

Looking to the future and under the water, seabed mining is currently being explored in the EEZ of Norway. Russia is also developing new technologies to access minerals under the sea floor. There have been successful underwater mining operations in Alaska as far back as the 1970s, and undersea gold mining efforts off the coast of Nome were recently netting some miners as much as US\$10,000 per week (they even had their own television show, *Bering Sea Gold*).<sup>31</sup>

## 2. Understanding the Arctic Blue Economy

It is important to note that when it comes to resources extracted from the Arctic, nearly all of them – energy and minerals – are given a one-way ticket south, along with much of the revenue they generate.



Finland is establishing its first-ever commercial offshore wind farm in the Gulf of Bothnia.

**So far, however, these national initiatives are very small in scale.** The undersea mining industry is organized globally (the Arctic is very much part of its regular conferences)<sup>32</sup> but seabed mining on a large scale has yet to prove commercial viability. Strong concerns have also been raised about its potential environmental impacts and governance. Seabed mining in Arctic Areas Beyond National Jurisdiction are governed by the International Seabed Authority (ISA). But the ISA has not yet issued licences for exploration there.

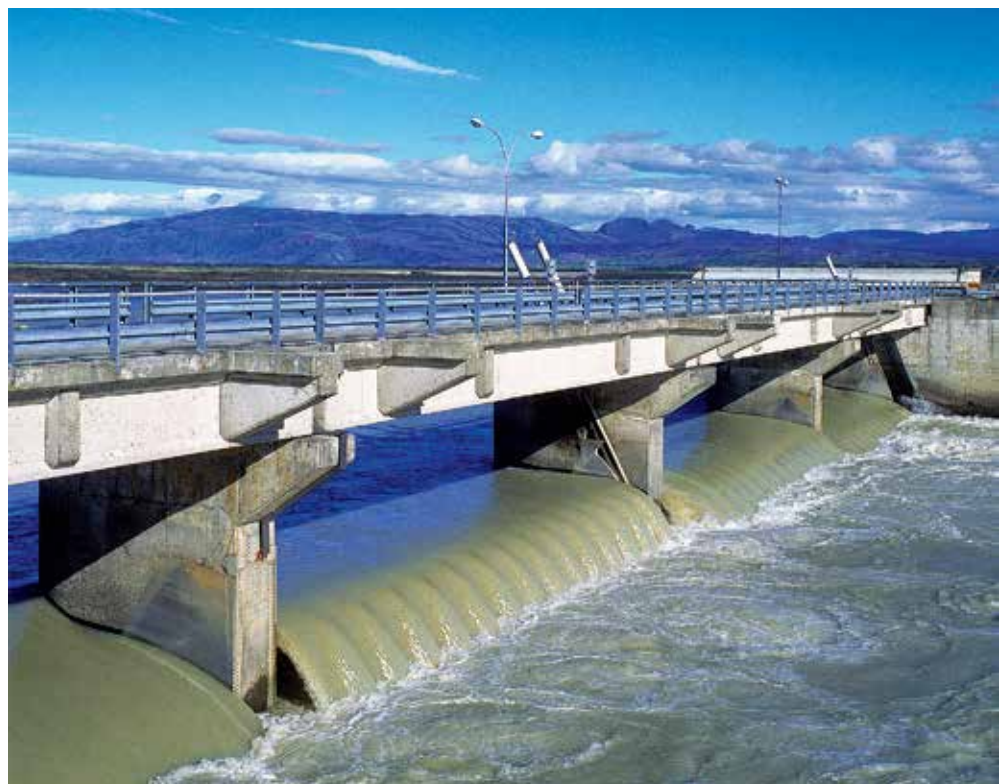
**Finally, it is important to note that when it comes to resources extracted from the Arctic, nearly all of them – energy and minerals – are given a one-way ticket south along with much of the revenue they generate. As the *Arctic Human Development Report (2004)* observed, “A comparison of outflows in the form of profits and rents and inflows in the form of transfer payments shows that the Arctic as a whole is a net exporter of wealth.”**

### RENEWABLE RESOURCES Trends in Renewable Energy

**Perhaps the most well-known source of renewable energy** in the Arctic is Iceland’s geothermal system, which produces 25% of the nation’s electricity.<sup>33</sup> But in the Arctic as a whole, hydropower – driven by rivers and ice melt – is the most prominent renewable energy source. Hydropower provides 72 per cent of Iceland’s energy, for example, and has rapidly grown in Greenland to the point where it provides nearly 70 per cent of that nation’s electricity.<sup>34</sup>

**From a Blue Economy perspective,** renewables are a very minor part of the Arctic picture, not only for the moment, but for the foreseeable future. Finland is establishing its first-ever commercial offshore wind farm in the Gulf of Bothnia (the northern part of the Baltic Sea) in typically brutal ice conditions. Presumably, this installation will provide a “proof of concept” for Arctic wind energy for other nations as well.<sup>35</sup> In Norway, an electric fishing boat – powered by Norway’s 99 per cent renewable energy grid – is now plying the seas off Trondheim.<sup>36</sup> But otherwise, renewable energy resources are not generally a driver of marine economic development in the region.

Hydropower provides 72 per cent of Iceland’s energy and has rapidly grown in Greenland to the point where it provides nearly 70 per cent of that nation’s electricity.







**FULLY 90%**  
**OF GREENLAND'S EXPORT**  
**EARNINGS COME FROM SELLING**  
**FISH, CHIEFLY TO EUROPE**

Most of the fish caught in the Arctic are destined for export to markets elsewhere. This makes fish an exceptionally valuable resource for Arctic national economies.



The residents of some Alaskan islands in the Bering Sea recently required emergency assistance when the weather disrupted walrus hunts, depriving the communities of the walrus meat on which they traditionally relied.

## BIOLOGICAL RESOURCES

### Trends in Biological Resources

**From the perspective of the subsistence hunter** – dependent on catching fish, whale or seal to provide a major part of a household's economy for the year – the Arctic's biological resources are not just important: they are an essential part of life. The residents of some Alaskan islands in the Bering Sea recently required emergency assistance when the weather disrupted walrus hunts, depriving the communities of the walrus meat on which they traditionally rely.

From a global economic perspective, the region's biological resource use might be described as small yet significant. Take fish, for example: the Arctic has typically provided just more than 6 per cent of the global total fish catch (on average) by weight.<sup>37</sup> While this figure is not that significant globally, the fisheries are extremely important to some regional economies.

Most of the fish caught in the Arctic are destined for export to markets elsewhere. This makes fish an exceptionally valuable resource for Arctic national economies. Fully 90 per cent of Greenland's export earnings come from selling fish, chiefly to Europe. For Iceland, the figure is 33 per cent. Even Norway still gets 6 per cent of its export revenues from its fishing industry.<sup>38</sup>

Meanwhile, aquaculture is already a significant and growing piece of the Blue Economy. It may not seem like a big line item compared with other economic activities, but Arctic aquaculture accounts for 2 per cent of the world's total activity in that sector – an amount equal to the aquaculture activity of the entire European Union.<sup>39</sup>

Operating on a much smaller scale—but increasingly attractive to economic development planners and investors—is the subset of biological resources that are not used for food. Said to belong to the “Blue Bio-Economy,” these resources include fishing residues that are increasingly used for purposes with higher value than animal feed or fish oil (such as feed stocks in industrial processes, including road-building in Iceland). They also include macroalgae, like seaweed and microalgae, which are sources of everything from cosmetics to biofuel.

## 2. Understanding the Arctic Blue Economy

### Trends in Fishing, Aquaculture and the Blue Bio-Economy

**The Arctic fishing industry is undergoing a process of transformation** driven by climate change, the global market's continuously increasing demand for fish, and the fact that most fisheries elsewhere are depleted and/or being fished at full capacity.

In recent years, Arctic industrial fisheries production has remained relatively stable at about 5 million tonnes per year.<sup>40</sup> By comparison, the global annual total has consistently averaged about 80 million tonnes since 2003.<sup>41</sup> (However, if reconstructions of under-reported catches are included, the average is likely closer to 120 million.)<sup>42</sup>

However, the economic value of Arctic fish on the global market has been declining steadily for reasons that are not entirely clear. As the types of fish caught in the Arctic change, their value also changes. But other economic factors may be playing a role. "These variances may be the result of local prices and exchange rates or differences in catch species," say analysts at the Center for a Blue Economy at the Monterey Institute.<sup>43</sup> But without further analysis – which is hampered by the chronic lack of complete data in the Arctic – identifying what causes fluctuation and overall decline in fish values is just speculation.<sup>44</sup>

These figures cover industrial fishing, which accounts for more than 90 per cent of the Arctic fish catch. Smaller-scale, artisanal fishing represents about 5 to 7 per cent of the total. Subsistence fishing represents just 1 to 2 per cent. And recreational fishing, although it has grown dramatically (from 0.0014 per cent of the total to 0.3 per cent in the period from 1975 to 2010), is still an extremely small piece of the total. Industrial fishing is the activity to watch in terms of understanding the overall development of the Blue Economy in the Arctic and the impacts of that development.<sup>45</sup>

As the ice retreats and warmer waters drive commercially harvested species northward, industrial fishing is following. By 2014 in the Barents Sea, for example, Norwegian fishing boats were catching more than 11 per cent of their annual quota in waters that were previously inaccessible to them (the Barents accounted for only 2 per cent of their annual catch in 2011). Greenpeace, after sifting through 18 million satellite location signals, reported that more than 100 fishing boats had moved into waters previously covered by ice.<sup>46</sup>

However, some progress can be reported. The "Arctic Five" – Russia, Canada, Norway, Greenland/Denmark, and the United States – agreed to a joint declaration on fishing in

The 'Arctic Five' – Russia, Canada, Norway, Greenland/Denmark, and the United States – agreed to a joint declaration on fishing in Arctic international waters ('high seas') that halts commercial exploitation of the area for at least 16 years.



Salmon farming is increasing in Arctic waters. However, there are many questions about its environmental sustainability.



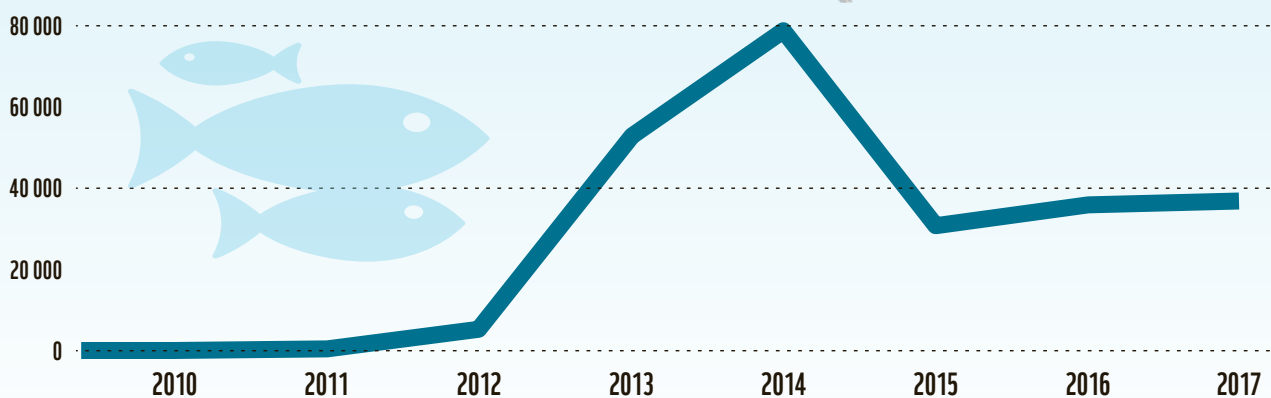
Arctic international waters that halts commercial exploitation of the area<sup>47</sup> for at least 16 years. They have also engaged other fishing nations that are active in the Arctic in an effort to reach an agreement that would regulate fishing.<sup>48</sup>

**Meanwhile, warmer waters are changing the composition** of fish stocks. Some are estimated to be moving at a pace of 15 to 26 kilometres a decade.<sup>49</sup> Mackerel – unknown in Arctic waters before about 2006 – is now a major part of Greenland’s fishing revenue.<sup>50</sup> Fisheries researchers do not necessarily see the arrival of new fish in the Arctic as a blessing. Many are worried about the environmental bust that could well follow the economic “boom” from newly enriched northern fisheries. Researchers are partly concerned about disruptions to the balance of Arctic ecosystems; in part, they are concerned about impacts to fisheries from other industries that, like fish species, have moved northward. Another concern is that increased shipping in the Arctic dramatically increased the risk of spreading invasive species via ballast water and biofouling. Increased water temperatures due to climate change have removed thermal barriers which also increases the risk of invasive species finding a new home in the Arctic.

## MACKEREL

WAS UNKNOWN IN ARCTIC WATERS BEFORE ABOUT 2006 BUT IS NOW A MAJOR PART OF GREENLAND’S FISHING REVENUE.

### Mackerel Caught in Greenland (Tonnes)



In a very short time, the Atlantic mackerel has expanded its distribution to Arctic waters, as shown in Greenland fisheries statistics. Atlantic mackerel are found in the Gulf of St. Lawrence and Strait of Belle Isle as well as in northern Europe.

## 2. Understanding the Arctic Blue Economy

# MORE THAN 90%

OF THE ARCTIC FISH CATCH IS ACCOUNTED FOR BY INDUSTRIAL FISHING.

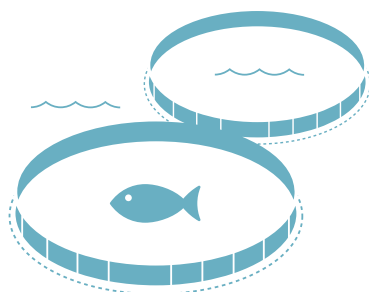




## 2. Understanding the Arctic Blue Economy



Increasing attention is being paid to the potential of the Blue Bio-Economy, which involves using living marine resources – including fish processing residues, microalgae and more – in more high-value ways.



Norway, for example, grew its salmon aquaculture revenues by more than 500 per cent between 1997 and 2016; the increase was 31 per cent between 2015 and 2016 alone.

In general, fisheries researchers warn that our knowledge of what is happening in Arctic fisheries is woefully inadequate. Only a small fraction of Arctic species are even evaluated for sustainability, according to the International Union for Conservation of Nature’s “Red List” criteria. This argues for a strongly precautionary approach: “scientific uncertainty is a hallmark in Arctic marine biodiversity assessments,” according to a recent assessment of our knowledge of Arctic fisheries. This means that while the temptation to reap this new bonanza of fishing opportunity is powerful, the risks of ultimately causing more harm than good are also great.<sup>51</sup>

With catch levels at maximum, the world is increasingly turning to aquaculture/mariculture (including shrimp, molluscs and seaweed) to provide the growth it seeks in seafood production. The trend is accentuated in parts of the Arctic: Norway, for example, grew its salmon aquaculture revenues by more than 500 per cent between 1997 and 2016; the increase was 31 per cent between 2015 and 2016 alone.<sup>52</sup>

Increasing attention is being paid to the potential of the Blue Bio-Economy, which involves using living marine resources – including fish processing residues, microalgae and more – in more high value ways. Focus areas include:

- **Using marine biomass**, including fish processing residues, as raw material for the chemical industry (e.g., as a replacement for mineral oil) instead of in low-value products, such as fish meal or fish oil;
- **Harvesting and farming microalgae** to produce biofuel, electricity, soil fertilizers and food;
- **Using integrated “multi-trophic” aquaculture** (mixing species from different levels of the food chain) to reduce environmental impacts;
- **Developing sustainable sources** of dietary supplements and cosmetics, such as through sustainable aquaculture or algae farming.

The push for a Blue Bio-Economy in the Arctic is driven, at least on paper, by governments seeking new growth opportunities while also promoting the practice of environmental responsibility. As a recent report by the Nordic Council of Ministers describes it, the Blue Bio-Economy “ensures that countries can obtain the highest possible level of economic growth while conserving the natural resource base upon which that growth depends.”<sup>53</sup>

# THE NORTHERN SEA ROUTE

WILL REDUCE THE SHIPPING DISTANCE BETWEEN EAST ASIA AND NORTHERN EUROPE BY 9,000 KM.

## CONNECTIVE RESOURCES

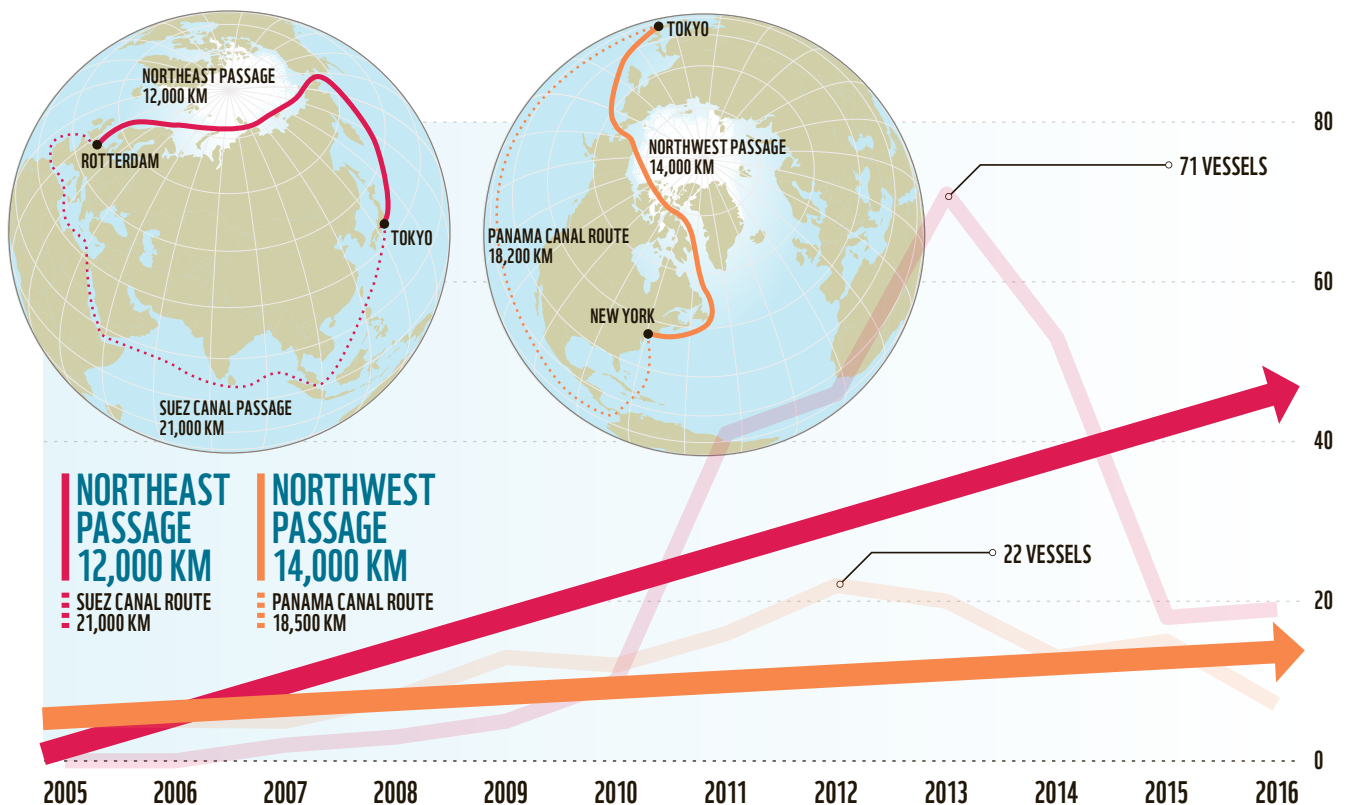
Shipping is the lifeblood of commerce within the Arctic, but inter-continental or “trans-Arctic” shipping is a very small part of the Blue Economy – so far. There are four routes of principal interest:

- **The Northeast Passage (or Northern Sea Route [NSR])** runs the length of Russia’s Arctic coast and reduces the shipping distance between East Asia and northern Europe from nearly 21,000 km (taking the Suez Canal route) to just 12,000 km.
- **The Northwest Passage (NWP)** winds through the Canadian archipelago, reducing the distance from Asia to Europe by 4,000 km compared with a trip through the Panama Canal.
- **The Transpolar Sea Route (TSP)** runs right through the middle of the Arctic Ocean between the Bering Strait and the Greenland or Barents Sea, and is the shortest of the three, at only 2,000 km long.
- **The Atlantic Bridge Route (ABR)** runs between Murmansk in Russia and Churchill in Canada by way of Iceland, bypassing the St. Lawrence Seaway and cutting nine days off the trip between Eurasia and North America.

Only the NSR and NWP are in commercial use at present. Multi-year Arctic sea ice makes the TSP route unviable in the near term – but that does not stop the world’s big shipping nations from eyeing this short route over the top of the world for the future, since it is expected to be ice-free in the summer by mid-century and open to shipping traffic as soon as perhaps 2030.

Shipping is not the only industry to see the economic potential in using the Arctic’s geography as a connecting link between continents. Plans and projects for laying trans-Arctic fibre-optic cable (e.g., linking Tokyo and London) are already under way.<sup>54</sup> Since this use of the Arctic’s ability to connect remains in the planning stages, this report concentrates on trends in shipping.

## Trans-Arctic Shipping Routes



## 2. Understanding the Arctic Blue Economy



**MORE  
THAN 11,000  
VESSELS**

**WERE COUNTED IN ARCTIC  
WATERS IN 2014.  
NEARLY 2,000 OF THEM  
WERE FISHING BOATS.**

### Trends in Arctic Shipping

The *Arctic Marine Shipping Assessment* reported that 6,000 separate vessels were operating in Arctic waters in 2009, including 1,600 fishing boats – though it conceded that this may have been a conservative figure because of uneven national reporting. Just five years later, a study using satellite data (which records each vessel's unique identifier) counted more than 11,000 vessels, nearly 2,000 of them fishing boats of varying sizes.<sup>55</sup>

But these studies also used different methodologies. To get a sense of long-term trends and developments in Arctic shipping, we used a proxy indicator that is somewhat more certain: transits through the Northwest Passage and NSR. We also looked at the economic value of the cargo that ships in the Arctic are carrying, and what trends insurers are seeing in terms of accidents involving ships in Arctic waters.

#### 1. As the Arctic melts, shipping traffic is increasing.

After complete transits through the NSR collapsed from a high of 71 in 2013 to just 18 in 2015<sup>56</sup>, some analysts began to say that Arctic shipping would not expand as expected. Observers identified problems such as the complexity of navigating through different jurisdictions, the absence of deep-water ports, the presence of relatively shallow seas, and the lack of search-and-rescue services and good-quality hydrographic data – not to mention unpredictable ice and weather conditions (recent years have seen icier conditions).<sup>57</sup> One recent study predicts that the NSR will not be truly commercially viable before 2040.<sup>58</sup>





Certain Asian shipping giants see the Arctic passages as “new trunk route[s] connecting Asia and Europe,” shaving up to 10 days off the Panama Canal (above) or Suez routes.



**That view is disputed by some elements** of the shipping business and by Russia itself. Speaking at the 2016 Arctic Circle conference in Iceland, shipping leaders from China, Japan and Republic of Korea made it clear that they expected the NSR to expand in importance much more quickly than that, and that they are investing in growth.

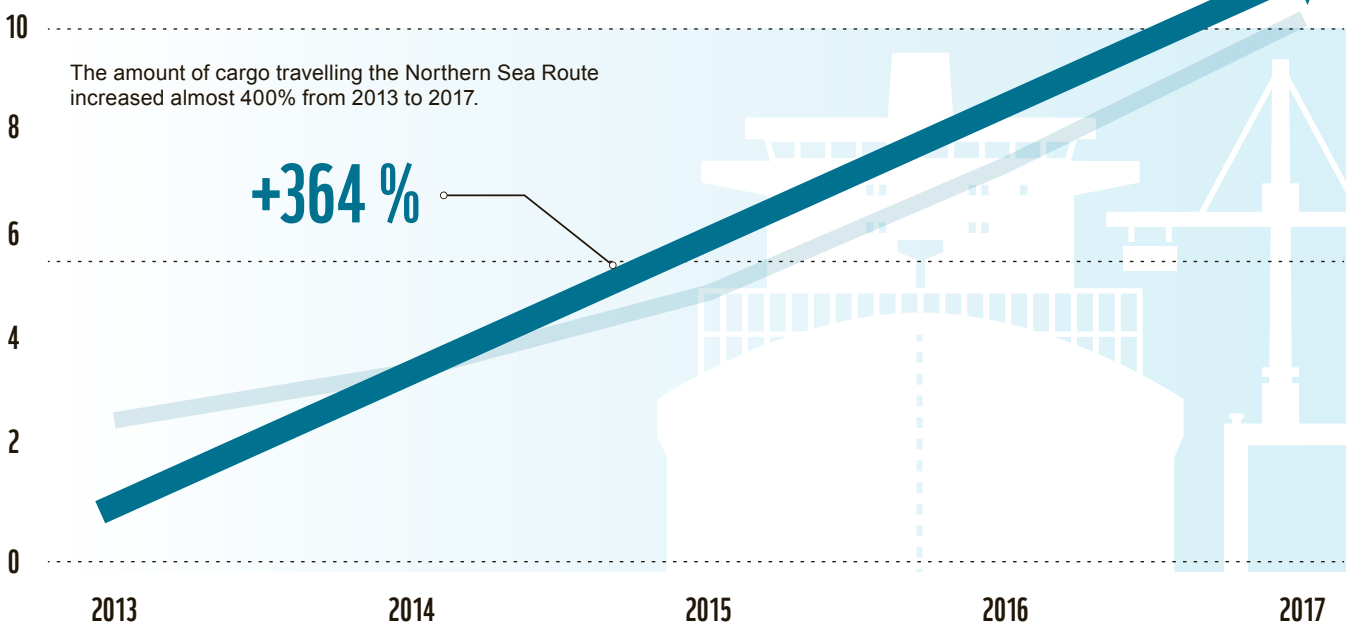
China’s largest shipping firm, COSCO, sent five ships through the NSR in 2016. Meanwhile, 15 Chinese ships went through the Northwest Passage.<sup>59</sup> These Asian shipping giants see the Arctic passages as “new trunk route[s] connecting Asia and Europe,” shaving up to 10 days off the Panama Canal or Suez routes. This is a long-term strategy for these shippers; they are investing in the ships and icebreakers to make it possible.<sup>60, 61</sup>

Arctic investors are similarly bullish. The president of Alaska-based Pt Capital noted in a recent briefing to the International Economic Development Council that by the year 2020, he expects as much as 5 to 15 per cent of China’s total trade value to pass through the Arctic.<sup>62</sup>

A 2015 Dutch study predicted that up to two-thirds of the ship traffic now going through the Suez Canal (which itself accounts for 8 per cent of all shipping traffic) would eventually be rerouted through the Arctic via the much shorter NSR – affecting not only the ports along that route, but also the ports that currently service such traffic in Singapore and Egypt.<sup>63</sup>

Whether or not one believes in these growth scenarios, shipping companies are building new ships designed to meet the demanding classification required for passage through Arctic ice year-round – without icebreaker assistance – even if they are not intended for immediate use.<sup>64</sup>

## Indications of Expansion - Total Cargo Volume on the Northern Sea Route (Tonnes)



## 2. Understanding the Arctic Blue Economy



# MORE THAN 10 MILLION

TONNES OF CARGO WERE  
MOVED THROUGH THE  
NORTHERN SEA ROUTE  
FROM RUSSIA.

### 2. The value of cargo being shipped through the Arctic is increasing – and is expected to increase dramatically by 2030.

In early 2017, Russia reported that despite the icy conditions, the amount of cargo moving through the NSR had hit a record of more than 10 million tonnes. Norway's northern ports have also reported steadily increasing cargo volumes.<sup>65</sup>

But the volumes are still small compared with what is expected in the future. Russian officials expect volumes to grow to as much as 80 million tonnes by 2030. Most of that tonnage will be in the form of oil and gas from large energy developments on the Yamal Peninsula in Western Siberia. (Construction of the new liquid natural gas plant in Yamal accounts for much of today's current tonnage in the NSR.)<sup>66</sup> While the growth in shipping tonnage (and its value) will be dramatic, it should also be put into global perspective: 80 million tonnes is still less than 10 per cent of the amount of cargo traversing the Suez Canal in 2015.<sup>67</sup>



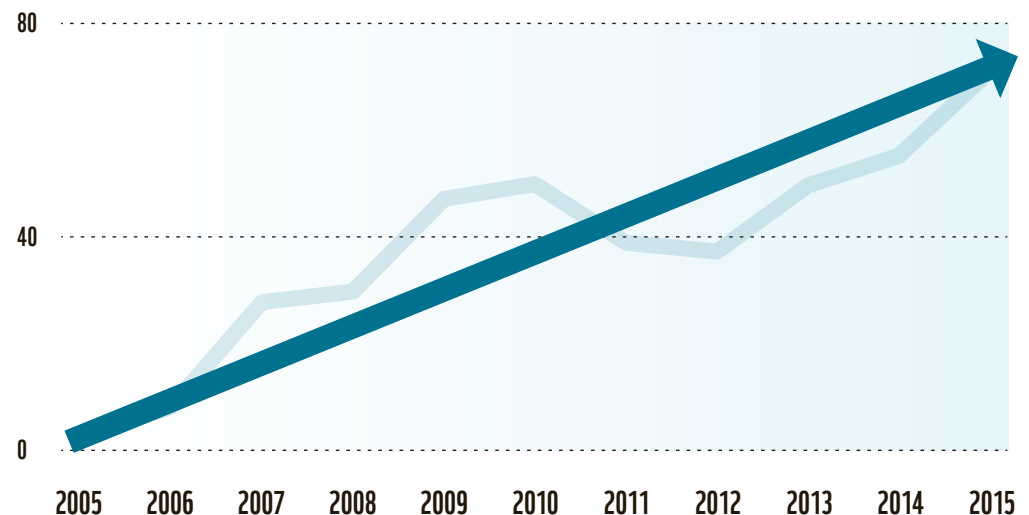
### 3. The number of accidents involving ships in the Arctic is increasing.

With an increase in shipping activity comes an increase in accidents. Reported ship casualties in Arctic waters – “casualties” include wrecks, strandings, collisions, fires, hull damage etc. – increased more than tenfold between 2005 and 2014, according to global insurance giant Allianz. The increase from 2015 to 2016 alone was 29 per cent.<sup>68</sup>

Note that casualties are usually under-reported as well: much like car owners, to avoid spikes in their insurance premiums, ship owners sometimes do not make claims for small accidents.

### Shipping Insurance Casualties in Arctic Waters

Reported ship casualties in Arctic waters increased tenfold between 2005 and 2014, according to global insurance giant Allianz. The increase from 2015 to 2016 alone was 29 per cent.



# Full Steam Ahead – Despite the Risks

Throughout recent history, the Arctic has been a dangerous and unpredictable place to work even at the best of times. Shipwrecks “litter the Arctic Ocean,” as one expedition tourism company puts it.<sup>69</sup> The dangers of the Arctic can even reach far to the south: the Titanic famously struck an iceberg originating from the west coast of Greenland but sank in waters well over a thousand kilometres from the Arctic Circle.<sup>70</sup>

Given the prevalence of ice, storm, darkness, severe cold and many other risk factors, there is a lot that can go wrong in the Arctic. The risk is compounded by the absence of infrastructure, such as port facilities and rescue vessels. Insurers are only now beginning to learn how to put a price on that risk.

The first ship to travel the Northwest Passage commercially was a US tanker, the *Manhattan*, in 1969, but that voyage was not entirely based on purely commercial considerations. The first voyage of that sort took place in 2014, when the *Nordic Orion* planned to take its load of Canadian coal south from Vancouver to the Panama Canal and on to Finland. The unusually light sea ice that year made the NWP navigable and led to a decision to head north instead.

This marked the first time that a decision to use the Northwest Passage was based solely on economic factors. These factors included shorter distance, reduced travel time and US\$80,000 in fuel savings. The efficiency gains also made it possible for the *Nordic Orion* to increase its freight load of Canadian coal; the ship was able to take 25 per cent more coal to Finland than usual. But getting insurance was a problem: at the commercial equivalent of a moment's

notice, insurers had to come up with a price tag covering a novel set of risks. Planes flew over the proposed route to survey it. Multiple companies had to get involved to cover hull damage from ice, liability for fuel spills in Arctic waters, and other possible problems. The *Nordic Orion* did finally find a group of insurers willing to underwrite the voyage. While the price tag on the premium has never been revealed, experts estimate that it was probably 30 per cent higher than on other routes.<sup>71</sup>

That single number – a published estimate of 30 per cent – constitutes the best existing market data point on the additional insurance cost for a ship travelling the NWP. The data are not likely to get better: an earlier comprehensive study of shipping costs for the NSR described insurance cost estimation as “one of the most difficult task[s] to achieve” because insurers do not release information publicly.

The study also concluded that based on available indications, the cost of insurance for travelling through the Arctic did not negatively affect the cost of travelling that route – especially when compared with the risk of piracy when travelling past Somalia (in connection with a Suez Canal transit). In fact, comparative cost assessments have declined steadily over time to the point where transiting the Arctic is considered “realistically feasible in any scenario,” at least in economic terms.<sup>72</sup>

While we still have a great deal to learn about how to calculate the risks of doing business in Arctic waters, it appears the shipping industry is ready to go, and is just waiting for the ice to recede.



## 2. Understanding the Arctic Blue Economy



Increasing numbers of people want to see the Arctic with their own eyes, either to experience its unparalleled wonders, beauties and unique cultures or to gather data and information about what is happening there.

### EXPERIENTIAL RESOURCES

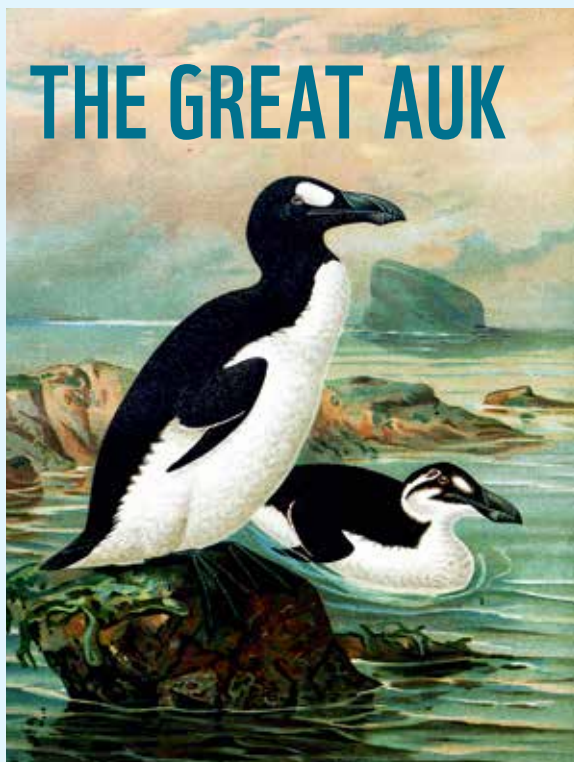
**The Arctic provides a resource to the world** that is non-material: its uniqueness. Increasing numbers of people want to see the Arctic with their own eyes, either to experience its unparalleled wonders, beauties and unique cultures or to gather data and information about what is happening there – or sometimes both.

Tourists are the largest group of visitors to the Arctic. As noted earlier, most tourism in the Arctic region, since it happens in coastal zones and involves marine and coastal environments, can be considered “Blue” (marine-related). Comfortable cruise ships ply Arctic waters, as does a growing fleet of more rustic (but usually equally comfortable) “expedition” boats and pleasure craft. Airlines bring people into coastal and island tourism hubs, where they fan out in tour buses, rental cars, whale-watching boats and other vehicles to experience the Northern Lights, see the natural wildness and observe how life continues to flourish where ocean (or ice) and land meet in cold northern latitudes.

While their numbers are considerably smaller, researchers are also a growing presence in the Arctic, because the Arctic presents them with a priceless “resource”: the unknown. Not only is the Arctic still understudied; it is constantly changing, which means its “unknownness” – and thus its attractiveness to professors and graduate students – is constantly being regenerated.

And then there are the hybrids. For example, researchers are often paid to serve as nature or culture guides for tourists who want to feel they are doing more than just looking at the Arctic. The researchers get a chance to gather data while the tourists get a chance to learn from seasoned professionals.

These experience-based Arctic resources are often at odds with other types of economic resources: a traditional Inuit village is generally more interesting to tourists than a mining operation, for example. And as more and more people become interested in the Arctic, conflicts between people interested in promoting different categories of economic resources are becoming increasingly common, e.g., whale watching versus whaling.



### REMEMBERING A TIME WHEN THE COST OF BLUE ECONOMIC GROWTH WAS EXTINCTION

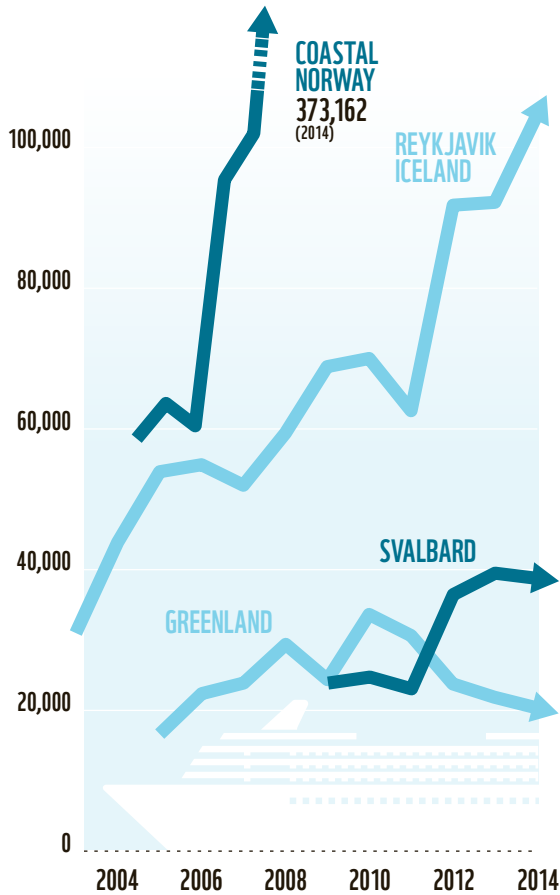
**As the Arctic heats up, both literally and in economic terms,** it is useful to remember that it is not untouched territory. People have been coming to the Arctic from elsewhere for centuries and have left indelible marks of damage on its natural ecosystems.

**Consider the story of the great auk,** a flightless bird nearly one metre in height. The great auk was once common to the Atlantic Arctic and sub-Arctic waters, from the top of the British Isles to as far north as the middle of Greenland and the top of Scandinavia.

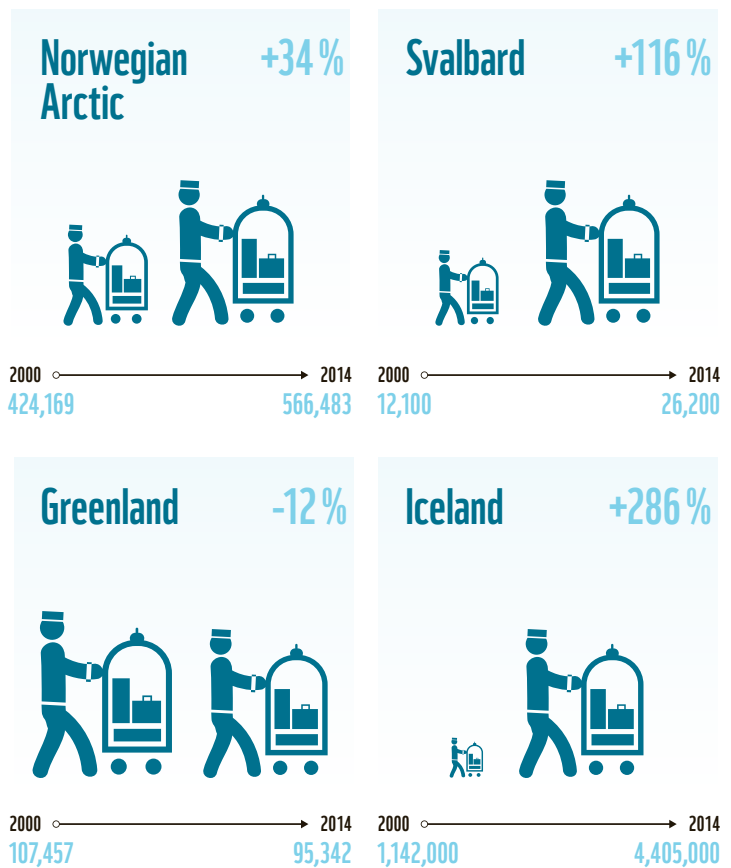
**When serious maritime activity began in the 1500s,** the great auk became an easy target. Sailors herded the birds from their rookeries onto ships by the hundreds, like chickens, to be eaten as meat. Industrial hunters used the auk as a source of feathers, fat, oil and down. The auk was extinct by 1844, when fishermen hunted the last breeding pair on their nesting grounds near Iceland.

**Today, the threats to the Arctic environment from the expansion of its economy are more systemic.** But the lessons of history are clear: unless we act swiftly to limit marine (and other) economic activity in the region, we risk losing precious natural resources, or even entire species, before we have even understood their value.

## CRUISE TOURISM PASSENGERS



## OVERNIGHT STAYS BY TOURISTS



### EXCERPT FROM WWF'S 10 PRINCIPLES FOR LINKING TOURISM AND CONSERVATION IN THE ARCTIC\*

#### 1. Make Tourism and Conservation Compatible

Like any other use of the environment, tourism should be compatible with and a part of international, national, regional and local conservation plans.

#### 2. Support the Preservation of Wilderness and Biodiversity

Vast areas of wilderness without roads or other traces of development are a unique characteristic of the Arctic. These areas are both environmentally valuable and one of the main reasons why tourists come to the Arctic.

#### 3. Use Natural Resources in a Sustainable Way

Conservation and the use of natural resources in a sustainable way are essential to the long-term health of the environment. Undeveloped areas in the Arctic are a non-renewable resource. Once developed, it is impossible to return them to their original states.

#### 4. Minimise Consumption, Waste and Pollution

Reducing pollution and consumption also reduces environmental damage. This improves the tourism experience and reduces the high cost of cleaning up the environment.

#### 5. Respect Local Cultures

Tourism should not change the lifestyles of peoples and communities unless they want it to do so.

#### 6. Respect Historic and Scientific Sites

Archaeological, historic, prehistoric and scientific sites and remains are important to local heritage and science. Disturbing them diminishes their value and is often illegal.

#### 7. Communities Should Benefit from Tourism

Local involvement in the planning of tourism helps ensure that tourism addresses environmental and cultural concerns. This should maximize benefits and minimize damage to communities. It should also enhance the quality of the tourism experience.

#### 8. Trained Staff Are the Key to Responsible Tourism

Staff education and training should integrate environmental, cultural, social and legal issues. This type of training increases the quality of tourism. Staff should be role models for tourists.

#### 9. Make Your Trip an Opportunity to Learn About the Arctic

Tourism provides the most benefits and does the least damage when tourists learn about communities and the environment. Knowledge and a positive experience enable tourists to act as ambassadors for Arctic environmental protection.

#### 10. Follow Safety Rules

The Arctic can be a treacherous environment, and everyone involved in Arctic tourism needs to exercise caution and follow safety rules and practices. Failure to do so can result in serious injury and costly rescue or medical intervention that burdens communities.

\* FOR MORE INFORMATION: [http://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf\\_tourism\\_conservation.pdf](http://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf_tourism_conservation.pdf)

## 2. Understanding the Arctic Blue Economy

In August 2016, the Schwoerer family of Switzerland – all seven of them, including four children and a baby – sailed their unheated sailboat through Canada’s Northwest Passage, from Nome, Alaska in the west to Nova Scotia in the east.



### CREW & 1,800 PASSENGERS

ON BOARD THE LUXURY CRUISE LINER 'CRYSTAL SERENITY' BEGAN THEIR TRIP THROUGH THE NORTHWEST PASSAGE FROM ALASKA TO NEW YORK.



### Tourism Trends

**In August 2016, the Schwoerer family of Switzerland** – all seven of them, including four children and a baby – sailed their unheated sailboat through Canada’s Northwest Passage, from Nome, Alaska in the west to Nova Scotia in the east. They became the first travelers ever to make the trip by way of the newly ice-free Fury and Hecla Straits near Hudson Bay.<sup>73</sup>

But the Schwoerer family are far from unique in having traversed the Northwest Passage as tourists. Also in August of 2016, the luxury cruise liner *Crystal Serenity* began its own trip through the Northwest Passage, from Alaska to New York, via a route through the Canadian archipelago, carrying 1,800 passengers and crew. The news service Bloomberg called it “Apocalypse tourism,” since the cruise ship’s passage was made possible by the advance of global warming.<sup>74</sup>

# UP TO 90,000 VISITORS

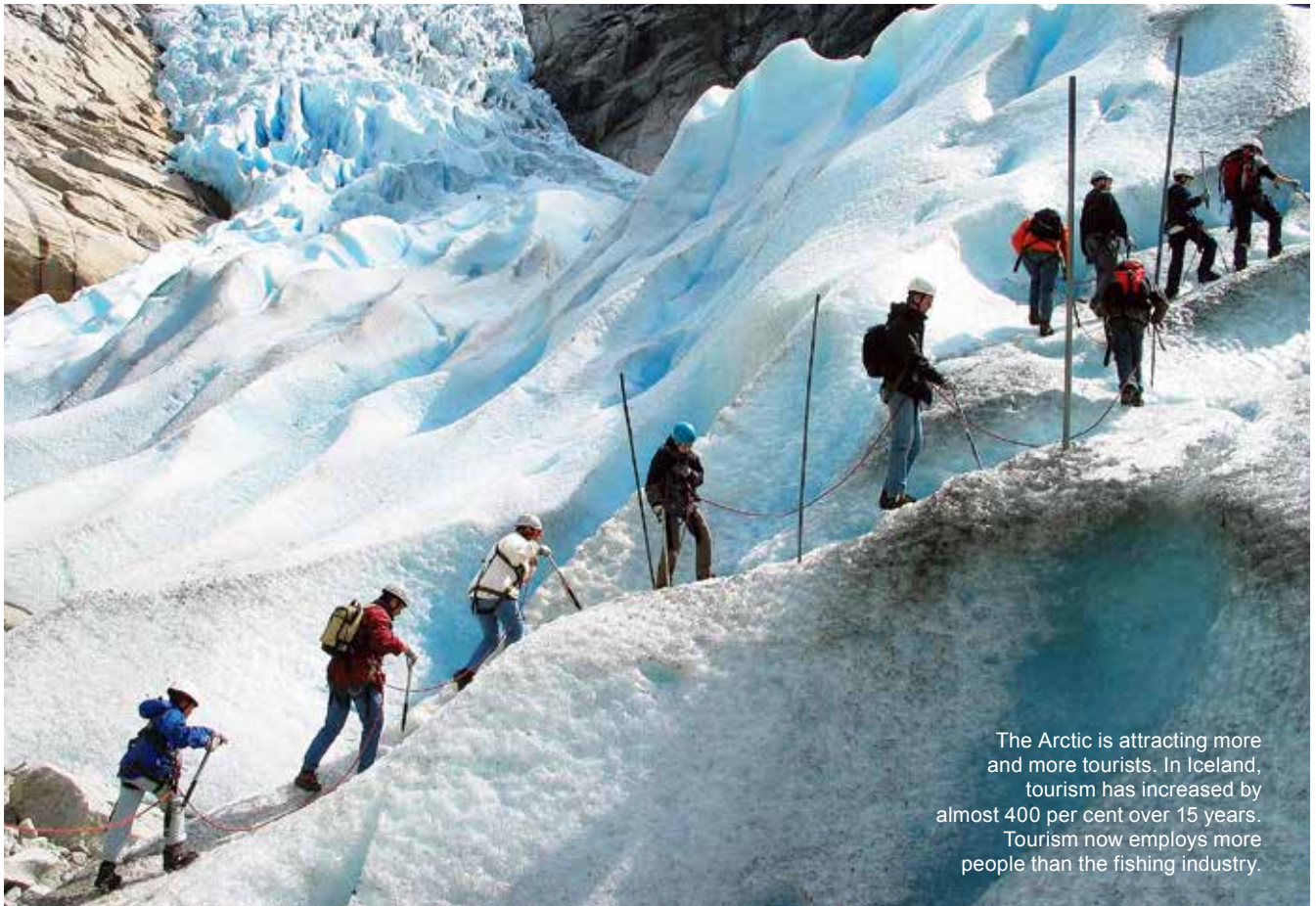
ARE EXPECTED IN GREENLAND BY 2027, NOT INCLUDING CRUISE SHIP PASSENGERS.

**Arctic tourism – most of which is linked to the ocean and coast** in some way, which makes it relevant to the Blue Economy – is exploding, at least in some places. Iceland is experiencing the most dramatic increases, with an increase in tourism of nearly 400 per cent in just 10 years (as measured by overnight stays, which grew from 1.5 million to 5.5 million); most of that increase happened in just the last three years. Northern Norway and Svalbard have reported increases as well, including nearly 100 per cent for Svalbard over the past decade.<sup>75</sup>

Industry sources expect this trend to grow based on longer-term indicators, such as rapidly growing investment in Arctic expeditionary tour boats as well as trends in tourism itself as more and more Asian tourists seek novel destinations that are also perceived as relatively safe from terrorism or disease. Even Arctic surfing has emerged as a tourism growth industry in Norway.<sup>76</sup>

But not all aspects of Arctic tourism, Blue or otherwise, are growing so quickly. Greenland has so far missed the tourism boom, owing partly to a lack of developed tourism infrastructure (which it is trying to rectify, as noted earlier). In fact, tourism numbers in Greenland have slightly declined in recent years.<sup>77</sup> In the Canadian Arctic, the overall trend appears to be “no change” in the relatively low levels of tourism for several years running. The same appears to be true for Arctic Alaska and Russia. Greenland, Canada, Alaska and all measure their tourism numbers in the thousands or tens of thousands (using cruise ship tourism as well as onshore overnight stays as the best available indicators). Norway and Iceland measure cruise ship tourism passengers in the hundreds of thousands. Iceland measures overnight stays in the millions.<sup>78</sup>

While growth in Blue Economy tourism may be uneven across the Arctic, one thing is certain: everyone expects it to continue increasing. Russian tour operators are offering cruises from Murmansk to the West coast of Greenland; at least five departures were planned for travellers wanting to visit the North Pole by cruise ship in 2016. Greenland expects its airport expansions and other projects to boost current tourism levels by 100 per cent and anticipates up to 90,000 visitors by 2027 (not including cruise ship passengers).<sup>79</sup>



The Arctic is attracting more and more tourists. In Iceland, tourism has increased by almost 400 per cent over 15 years. Tourism now employs more people than the fishing industry.

## 2. Understanding the Arctic Blue Economy







There are many remote settlements in the Arctic, and when a ship arrives with supplies or tourists during summer, most inhabitants gather along the shore. Some villages only have one or a few visits a year from supply ships, but in the future, large cruise ships with more than 2,000 passengers may turn up and go ashore. How will that effect the culture and living conditions for local and Indigenous People? The picture shows a visit to a Dolgan village in the Laptev Sea, Russian Arctic.

# WHAT IS THE VALUE

OF THE ARCTIC? HOW SHOULD WE MEASURE IT? IS PUTTING A MONETARY VALUE ON A NATURAL RESOURCE ALWAYS A GOOD IDEA?

Interdisciplinary science is required to understand how management and investment decisions affect ecosystems and how this environmental change in turn affects human well-being.



News stories increasingly tell of sled dogs being put down (i.e., euthanized) by their owners because of lack of sea ice.

## Valuing the Arctic

Having surveyed the resources and trends, we now turn our attention to a more central question related to the Blue Economy, and to economics generally: what is the value of the Arctic? How should we measure it? Is putting a monetary value on a natural resource always a good idea?

### THE METHODOLOGY OF VALUATION: WHAT WE KNOW (AND DON'T KNOW) ABOUT HOW TO DO IT

Around the world, **robust and practical approaches** are rapidly emerging to value the “benefits nature provides to people.”<sup>80</sup> There have been advances in the interdisciplinary science required.<sup>81</sup> These combine disciplines, such as ecology, coastal engineering, hydrology, decision science, economics and demography, among others. Such truly interdisciplinary science is required to understand how management and investment decisions affect ecosystems and how this environmental change in turn affects human well-being. These science advances have been generated by a growing global “natural capital” community of practice that is co-developing and applying this knowledge with local stakeholders and decision-makers. Such approaches are often referred to as natural capital, ecosystem service or valuing nature. They are being applied to ecosystem-based management in variety of decision-making contexts, such as development planning, spatial planning, coastal zone management and investment decisions.<sup>82</sup> Important lessons have been learned about the importance of co-developing such knowledge to ensure its legitimacy, as well as about the need for assessments to reflect local development priorities and policy questions.<sup>83</sup>

At their best, such approaches go beyond simply assigning monetary values. They do not need to use market-based mechanisms, commodification or pricing of nature’s benefits. Instead, they map the locally approved expressions of social, cultural, spiritual, health and economic dimensions of human well-being affected by ecosystem health and functioning. And they inform a variety of policy and planning decisions that do not involve putting a price on or privatizing natural assets.

**However, the world’s experience in applying these approaches in the Arctic is in its infancy.** There are important opportunities to transfer global best practice and lessons learned to these approaches to the Arctic region. Four main adaptations will be required to fit global best practices in valuing natural assets to the Arctic context:

- **First, natural capital assessments and valuations** will need to reflect rapid climate change in the region. This may entail going beyond simple assumptions of predictable, linear change, reflecting through scenarios the possibilities of tipping points, thresholds and regime shifts.
- **Second, in the Arctic, such approaches will also need to reflect the world views** and deep, long-held interactions of Indigenous Peoples with nature, which embody cultural and spiritual values. This may require, for example, using group deliberation rather than interviews with individuals.
- **Third, approaches will need to continue to improve** ecosystem service valuation methods. They must deal with ecosystem complexity as well as ecosystem and socio-economic impacts at multiple scales and across sectors.
- **Fourth and finally, it will require a recognition** that not all benefits are amenable to simple cost-benefit analyses to compare trade-offs, and that a more nuanced approach to comparing natural capital values across market and non-market economies will also be required.

There is plenty of further innovation – both in science and practical application – needed to incorporate these factors systematically into emerging initiatives on valuing nature. But the opportunity and potential to use these approaches in the Arctic is huge. Data and assessments can be used to encourage and help implement ecosystem-based management; integrated, cross-sectoral and multi-stakeholder decision-making; and strong governance with real accountability for improving interlinked cultural, social, economic and environmental outcomes.



## PRIORITIZE THE KNOWLEDGE, VALUES AND WORLD VIEWS OF INDIGENOUS PEOPLES AND THEIR ECONOMIES

**Many of the Arctic's Indigenous peoples** are sustained by economies that are neither wholly market-based nor wholly traditional. Such economies may blend “traditional activities and cash employment, the mixed economy of the Arctic.”<sup>84</sup>

It is possible to calculate cash values of locally harvested foods (part of the traditional economy) by substituting the cost of equivalent amounts of food bought in stores. When this was done for Nunavut, the resulting figure was \$30 million.<sup>85</sup> But monetary value only captures a portion of the value of locally harvested foods. Cultural and social values are also deeply embedded in the harvest and may constitute the main part of the value assigned.

There is an important distinction between pricing nature compared with asserting and illuminating the importance of nature's many benefits to people. The phrase “the economies of Arctic Indigenous Peoples” covers an extraordinary range of activities and economic philosophies. Greenland, for example, has a long history of selling locally harvested foods on the open market. Just across Baffin Bay, the Greenlanders' Canadian cousins are conflicted by the idea of selling what was recently freely shared.

Traditional and Indigenous ways of life have an incalculable value to those who need them or choose to preserve them. Indigenous cultures define the concept of “value” very differently from those who think in market economic terms. Whether it should or not, the rest of the world does attempt to value many aspects of traditional lifestyles in monetary terms. Valuation in purely economic terms ranges from statistical offices calculating the monetary value in existing markets of the “country foods” being harvested (fish, seal meat, caribou and the like) to the tourism companies that sell the experience of visiting an Inuit village.

There is an important distinction between pricing nature compared to asserting and illuminating the importance of nature's many benefits to people. The phrase “the economies of Arctic Indigenous Peoples” covers an extraordinary range of activities and economic philosophies.

## 2. Understanding the Arctic Blue Economy

In a half-century of working Arctic waters to feed Arctic families, these fisheries landed less than one million tonnes of fish, total, throughout the Arctic.

One million tons is equal to the amount of just one fish species, the northeast Atlantic herring, that is caught every year in Arctic and sub-Arctic waters.



Salmon is traditionally dried by the Iñupiat, who live along Alaska's shores.

### THE NON-MONETIZED ARCTIC BLUE ECONOMY

**Consider a multi-generational Inuit family** that sustains itself from a combination of hunting for seal and narwhal, fishing, and paid work in a local industry. One family member has a job working for a mining company and another has a part-time position in local government. These jobs result in monetary payments that are counted, reported and taxed as income in faraway capitals. But the hunting and fishing – which may in fact account for half of their livelihood and well-being – often goes straight to the dinner table and may never be translated into money. In fact, it may never be counted at all.

**That is a typical example** of what is involved in trying to describe recent trends and developments in the parts of the Blue Economy that are non-monetized, traditional, tied to the subsistence of the people living there, and thousands of years old. There are some scientific data, and there are many journalistic reports and anecdotes (see box, p. 47). But attempts to quantify the non-monetized Arctic Blue Economy immediately run up against two significant problems:

- **The lack of any comprehensive study**, covering the Arctic region as a whole and based on a standardized methodology;
- **The larger ethical question** of whether it is a good idea to monetize these traditional, small-scale ways of making a living, especially if it is not embedded in a larger analysis that accurately describes non-monetary cultural, social and spiritual values.

**This traditional and cultural dimension** of the Arctic Blue Economy is minuscule in comparison with the industrial processes we have described above. “Subsistence” fishing, for example, is no more than 2 per cent of the total for the Arctic, by weight. In a half-century of working Arctic waters to feed Arctic families, these fisheries landed less than one million tonnes of fish, total, throughout the Arctic. One million tonnes is equal to the amount of just one fish species, the northeast Atlantic herring, that is caught every year in Arctic and sub-Arctic waters.<sup>86</sup> In addition, the negative environmental impact of hanging a fishing line through a hole in the ice is negligible compared with the destruction left behind by a fleet of industrial bottom trawlers.

**This enormous difference in scale** means that making comparisons between the monetized and non-monetized Blue Economy is an exercise that is very likely to distract the observer from the most important issues. As the Conservation of Arctic Flora and Fauna (CAFF) study – which assessed the prospects for setting a value of Arctic ecosystems – put it in 2015: “There is a persistent risk that social and cultural attributes of ecosystem services are neglected while the monetized economic benefits and ecological causes of ecosystem service change are over-emphasized.”<sup>87</sup> “Social and cultural attributes of ecosystem services” is a formal way of describing thousands of years of knowledge about how to survive and thrive sustainably in the Arctic environment.

**We use phrases like “non-monetized” or “non-market”** to describe these Blue Economy activities because applying words like “traditional” or “Indigenous” would be inaccurate in this context. Some non-market activities are recent innovations; thus, they are not “traditional.” An example is scientific observation of species. Many “Indigenous economies” are deeply involved with driving the monetized market economy activities of mining, tourism, fishing and other industrial developments as well, as described earlier.

**Consider Greenland:** while news stories increasingly report on sled dogs being euthanized by their owners because of the lack of sea ice, it is also a mistake to assume that all Inuit and other Indigenous Peoples universally mourn the changes in lifestyle brought by a warming climate.

**“Greenlanders are very good at seeing the new opportunities.** We have simply refused to be victimized due to climate change,” said Greenland’s first female premiere, Aleqa Hammond, in 2016. (Hammond is one of two Greenlanders elected to the Danish parliament.) Even a manager of “KNAPK,” Greenland’s hunters and fishers association, calls giving up dog teams “no disaster.” The country is also gaining new species of fish, access to new ice-free mining areas, airports and tourism prospects. From the perspective of some Greenlanders, the new opportunities could provide the financial basis for the economic independence Greenland needs if it wants to declare full political independence from the Kingdom of Denmark.<sup>88</sup>

It is also useful to remember that Inuit political leaders had a mixed reaction to Canada's decision to the moratorium on oil and gas development in Arctic waters. They were not celebrating the protection of their waters and ecosystems; they were slamming a decision by a distant authority to take one of their potential sources of income off the table.<sup>89</sup> This did not mean they unreservedly supported offshore oil drilling, but that they wanted the decisions on how to balance traditional and market economies to be theirs.

## Poverty in Arctic Communities: A Troubling Indicator

The citizens of Nunavut, the vast Canadian territory created in 1999 and granted a large degree of autonomy, have good reason to be deeply worried about their economic future. Nunavut has “the highest documented rate of food insecurity for any Indigenous population living in a developed country.” Well over half of all children in Nunavut, 57 per cent, live in food-insecure households. A majority of these children occasionally go an entire day with nothing at all to eat.

Is this a function of the inability of traditional food sources to keep up with demand? This may be part of the story. There is a steep decline in most Arctic

caribou populations, and there have been applications for disaster relief by some Bering Strait island communities after walrus harvests failed. Accessibility, declining resources and rising costs of harvest may all play some part in a declining traditional food supply.

But even where traditional food supplies are dwindling, the decline does not necessarily tell the full story of food insecurity. Part of the value of the mixed economy is its ability to confer on Arctic peoples a greater degree of resilience. When such a high level of food insecurity exists, it is evident that both sectors of the economy may be to blame.



## 2. Understanding the Arctic Blue Economy

China has a vision for a “Polar Silk Road” across the Arctic. It is part of President Xi Jinping’s signature “Belt and Road Initiative to the Arctic” that will develop shipping lanes in the region as the Arctic Ocean opens due to climate change.



### OUTSIDE INTERESTS: CHINA’S ARCTIC POLICY

**Countries outside the Arctic states are showing a growing interest in Arctic resources.**

China is a key actor: it became a member of the Arctic Council in 2013, and in early 2018, the Chinese government published a white paper laying out its Arctic policy for the coming years. “The future of the Arctic,” the paper concludes, “concerns the interests of the Arctic States, the well-being of non-Arctic States and that of the humanity as a whole.” China was also very clear in its expectation that it will play a major role in the Arctic’s future:

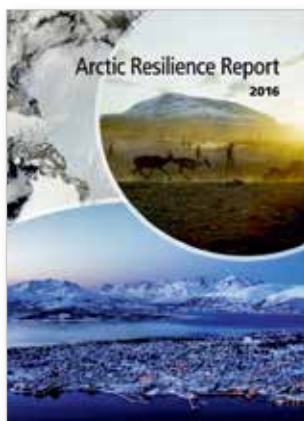
“The governance of the Arctic requires the participation and contribution of all stakeholders. On the basis of the principles of ‘respect, cooperation, win-win result and sustainability’, China, as a responsible major country, is ready to cooperate with all relevant parties to seize the historic opportunity in the development of the Arctic, to address the challenges brought by the changes in the region, to jointly understand, protect, develop and participate in the governance of the Arctic, and advance Arctic-related cooperation under the Belt and Road Initiative, so as to build a community with a shared future for mankind and contribute to peace, stability and sustainable development in the Arctic.”<sup>90</sup>

The white paper goes on to underscore that the melting ice and gradually changing conditions in the Arctic will encourage “the commercial use of sea routes and development of resources in the region.” It also explicitly makes the link between China’s “Belt and Road Initiative” – a massive international development process with a special focus on infrastructure – and the Arctic shipping routes, noting the “opportunities for parties concerned to jointly build a ‘Polar Silk Road’, and facilitate connectivity and sustainable economic and social development of the Arctic.” The paper calls for “multi-level, omnidimensional and wide-ranging cooperation in this area,” through all appropriate channels, engaging all stakeholders in the stimulation of Blue Economy activity.

China is not the only non-Arctic state to vocalize its interest in further developing the region. Many countries, such as the Netherlands, the United Kingdom and France, have published polar or Arctic strategies during the last decade asserting their will to play a role in the governance of the region. Arctic states must strengthen the Arctic Council to accommodate these outside pressures and aid the integrated stimulation of the Blue Economic activity.<sup>91</sup>

China has been very clear in its expectation that it will play a major role in the Arctic’s future.

## SUMMARIZING OUR KNOWLEDGE OF THE ARCTIC BLUE ECONOMY



The Arctic is changing fast, but we have limited information about what is actually happening or – more importantly – what is likely to happen in the future.

This scan of **Blue Economy resources**, trends and valuation processes underscores a critical point: the Arctic is changing fast, but we have limited information about what is actually happening or – more importantly – what is likely to happen in the future.

Data that focus on the Blue Economy are limited, uneven in methodology and quality, and dispersed among a wide variety of sources, ranging from national statistical bureaus to regional development websites in multiple languages. Even when it comes to basic measurements, such as how many ships are transiting through polar sea routes or how many fish are being captured in polar seas, it is usually possible to find at least two highly credible data sources that do not agree with each other.<sup>92</sup>

Meanwhile, the intensifying pressures to grow the Arctic Blue Economy (and the Arctic economy generally) are already bumping up against the physical limits of the ecosystems there – and those ecosystems are themselves changing, often in sudden and unpredictable ways. Recent multi-year studies, such as the *Arctic Resilience Report*, while vastly increasing our understanding of change in the region, have nonetheless concluded that we need a great deal more knowledge and a greater understanding of how to put that knowledge to use in a decision-making context. Without a solid knowledge base – of all kinds, from the traditional knowledge of Indigenous Peoples to the data from satellites peering down from space – managing the complex politics of the Arctic becomes very difficult indeed.

The legitimacy of the assessment processes and their links to policy processes are crucial and point to the central role of reflecting on how the relationships between basic knowledge production, assessments and policy processes are managed.

When it comes to managing the development of the Arctic Blue Economy in a sustainable way – addressing the serious and growing challenges, making the most of the emerging opportunities – there is a great deal more that we need to learn, and quickly.<sup>93</sup>

### QUANTIFYING THE NON-QUANTIFIABLE IN THE ARCTIC BLUE ECONOMY

**While reviewing the non-monetized, subsistence Blue Economy for this report**, we scanned extensive government databases that, in some cases, attempt to document every fish caught and every individual animal hunted. For example, it is recorded that 415 narwhals were harvested in Greenland in 2014.<sup>94</sup> In Alaska, between 2002 and 2011, approximately 12 pounds of bearded seal were harvested per household, and 14 per cent of that seal meat, on average, was “given away.”<sup>95</sup>

**These numbers fluctuated over the past decade**, but by and large, the levels of reported subsistence hunting and fishing have remained remarkably stable on a regional scale, at least according to official statistics.

**Turning numbers like this into dollars, kronor or roubles is certainly possible.** Using the “total economic valuation” method, for example, a Canadian study published in 2011 put the value of all subsistence hunting (onshore and offshore) in that country at CDN\$0.6 million, or just under US\$ half a million. The polar bear population was deemed worth about US\$500 per Canadian household, based on a different methodology: calculating how much people spent on travelling to observe polar bears in their native habitat, and inferring from that how much they might be willing to pay to preserve them. (The polar bear study was widely reported in Canadian news media even before it had started.)

**But researchers also considered the income** that Inuit hunters seemed willing to forego because they were not shooting

every polar bear they could. The authors of the study noted that this “foregone income” resulting from self-restraint in hunting – about US\$6,000 per person – “may be an indication of the importance of other values [associated with polar bears] such as preserving cultural, spiritual and traditional values.”<sup>96</sup>

**These examples highlight the challenges of quantifying and monetizing** the complex and inter-related elements of our natural world and the human cultures that have evolved to live within them. Nevertheless, given that economics and finance drive so many of the world’s policy decisions, efforts to assign credible numbers to the value of Arctic ecosystems are moving forward. Why?

**Because without such numbers, the value of Arctic nature** and culture remains almost completely invisible to global markets and policy processes.

**A 2015 scoping study** on “The Economics of Ecosystems and Biodiversity in the Arctic (TEEB),” co-sponsored by the Arctic Council and the WWF Global Arctic Program (among others), concluded that the effort was both possible and worthwhile – as well as necessary, if the value of protecting ecosystems is to be accurately included in economic development decisions. With a strong focus on stakeholder engagement and participation, and by being very attentive to the diverse ways in which Arctic Indigenous Peoples value nature, a “TEEB” for the Arctic was needed to “help define and balance societal needs and priorities in the rapidly changing Arctic policy landscape.”<sup>97</sup>

## 2. Understanding the Arctic Blue Economy



After the dissolution of Soviet Union in 1991, many Arctic communities in Russia lost their importance. The military presence decreased dramatically, and large quantities of equipment and infrastructure (e.g., ships, cranes, buses and houses) were abandoned. The Russian settlement Khatanga is one of many examples around the Arctic where the cost to remove unused equipment is perceived to be too high. The equipment is left on the beach to rust.





# A SUSTAINABLE ARCTIC BLUE ECONOMY: ASSESSING THE PROSPECTS

Our review of the Arctic Blue Economy suggests there is a lot to do if we are to make sure that developments in this unique region contribute to the most sustainable future possible. To identify priorities for action going forward, we have used a “SWOT” (Strengths, Weaknesses, Opportunities and Threats) analysis.

In order to end on a positive note, we have reorganized ‘SWOT’ as follows: Threats, Weaknesses, Strengths, and Opportunities.

We used the WWF Principles for a Sustainable Blue Economy (Annex 1) to set the criteria for what should be considered as a Strength, Weakness, Opportunity or Threat (risk) in the context of Arctic marine and coastal areas. In order to end on a positive note, we have reorganized “SWOT” and present the components in the following order: Threats, Weaknesses, Strengths and Opportunities.

As scientists keep stressing, Arctic ecosystems are complex and relatively fragile webs of interconnection: breaking one or two strands can cause cascading destructive changes.



## THREATS

- Rapid climate change
- Ecosystem decline and collapse/cascading “regime shifts”
- Tensions in regional geopolitics
- Economic growth model based on extraction and exploitation
- Indigenous Peoples’ poverty and vulnerability

## WEAKNESSES

- Lack of basic knowledge and data
- Regional governance processes are not strong enough to manage development in a sustainable direction
- Under-developed accountability mechanisms
- Lack of adequate preparedness for major accidents or disasters

## STRENGTHS

- Foundations exist for more effective regional government
- Knowledge is growing (as is investment in knowledge creation and diffusion)
- Good models of inclusive decision-making processes exist (e.g., the Arctic Waterway Safety Commission)
- Adaptive and resilient people

## OPPORTUNITIES

- A warming Arctic can create economic benefits - if managed correctly
- The Blue Bio-Economy creates new, sustainable economic opportunities
- Investments in infrastructure have not yet been locked in: “get it right the first time”
- Ecosystem-based management can still inform key decisions (before they are made)
- The world is paying greater attention

# Summarizing the Prospects for a Sustainable Blue Economy

## THREATS

### 1. Climate change is transforming the Arctic more rapidly than anyone expected.

While climate change is the driver of many other processes described throughout this SWOT analysis, it is also a threat all by itself. Infrastructure is already being lost to thawing permafrost and coastal erosion. Habitats are disappearing, species are shifting northward and livelihoods are being lost. The list of impacts is growing, as is their magnitude. More importantly, the changes are coming with increasing speed to the point where communities, decision-makers and even researchers are being caught unprepared when events that seemed like tomorrow’s risks are suddenly today’s realities.

### 2. Arctic ecosystems are in serious trouble.

The Arctic Council’s recent landmark assessments and reports, including the *Arctic Biodiversity Assessment*, *Snow, Water, Ice and Permafrost in the Arctic*, the *Arctic Resilience Report*, and the three regional *Adaptation Actions for a Changing Arctic* reports make it clear that the risk of ecological collapse in many parts of the Arctic is real and growing.



### 3. A Sustainable Arctic Blue Economy: Assessing the Prospects



It is not at all clear how the region would react to a cascade of 'regime shifts' that included collapsing fisheries, coastal eutrophication, or an exploding population of jellyfish.



A very grave threat to the region – and indeed a threat to civilization globally – is the fact that the Arctic is perceived to be economically dependent on the extraction of fossil fuels.

**Disappearing sea ice and ocean acidification are problems** that are mostly not created in the Arctic (with the exception of the significant fossil fuels that are extracted there). Ecosystem decline is exacerbated by increased harvesting pressures, which can put species into a rapidly narrowing clamp (less habitat combined with more harvesting), causing sudden population collapses. As scientists keep stressing, Arctic ecosystems are complex and relatively fragile webs of interconnection: breaking one or two strands can cause cascading effects of destructive change.

Some efforts to save the Arctic's unique ecosystems are already focusing on last-ditch efforts to preserve Arctic species in the remnants of long-term sea ice that are expected to survive global warming, such as the "Last Ice Area."<sup>98, 99</sup> It is not at all clear how the region would react to a cascade of "regime shifts" that included collapsing fisheries, coastal eutrophication or an exploding population of jellyfish – all of which are all too possible under current scenarios.

#### 3. Current economic development in the Arctic region is not on a sustainable path.

**This general statement about economic development is true** whether seen from a traditional GDP-growth perspective or from a more modern sustainability perspective. From a traditional perspective, too much of the Arctic's future prospects currently depend on resources, extractive industries and commodities. This puts the Arctic at the mercy of global oil, gas and commodity markets, which are notoriously volatile. The Arctic needs a more diverse approach and a focus on biological and renewable resources as the foundation of economic development.

From a more modern, sustainability perspective, a very grave threat to the region – and indeed a threat to civilization globally – is the fact that the Arctic is perceived to be economically dependent on the extraction of fossil fuels. These are fast becoming seen as "stranded assets" because of the threat of climate change and the need to leave those carbon-rich substances in the ground. The recent closures to offshore drilling in the Arctic are an example of what stranded assets look like in practice: if drilling is forbidden, those oil and gas fields lose their value. Many argue that oil and gas will eventually lose their value anyway as renewable energy prices become increasingly competitive with those of fossil fuels.

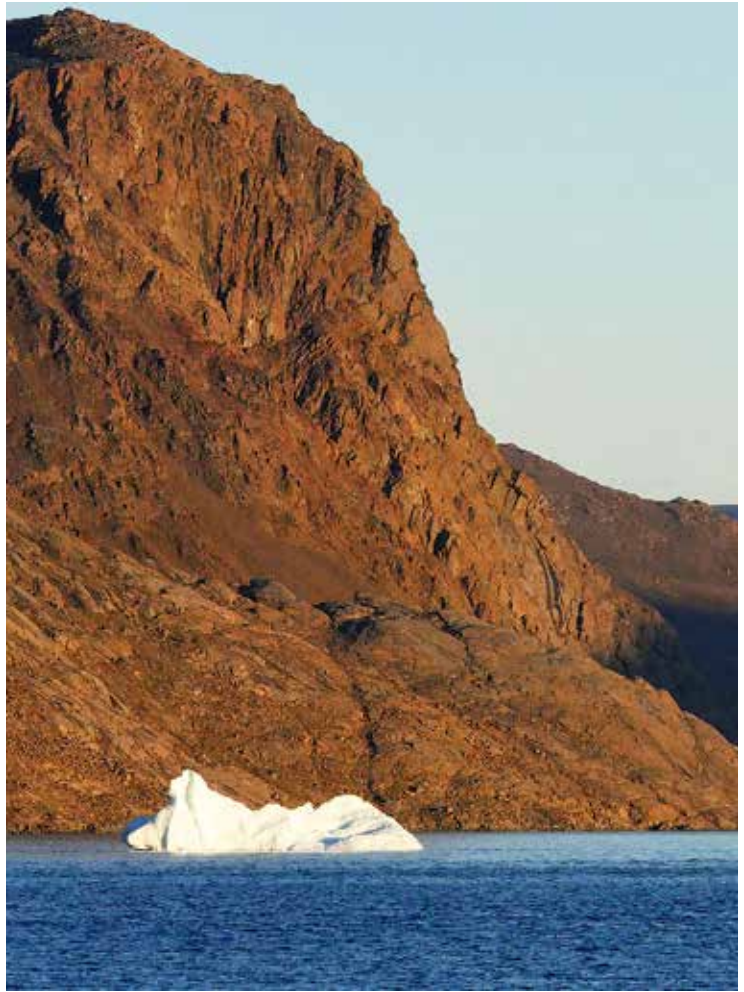
In sum, the Arctic needs a different economic model and different development priorities if it is to achieve economic growth that aligns with the new global understanding of the imperative for sustainability, not exploitation.

#### 4. Many of the Arctic's Indigenous Peoples are suffering the worst impacts of current development trends, and there is insufficient investment in remediating those impacts.

**High poverty rates in Nunavut**, shifts in traditional lifestyles everywhere, and high suicide rates in many parts of the far north bear witness to the level of threat that current Arctic economic, social and environmental trends present to Indigenous Peoples. Arctic peoples have a history of strength and resilience, but they will have trouble constructing and playing an effective role in a sustainable Blue Economy if their basic needs are not being met.

#### 5. Powerful actors do not want "sustainable change."

**Some political and economic leaders** locally and globally either have a vested interest in, or do not see an alternative to, the "status quo" of resource exploitation in Arctic marine and coastal areas, and actively oppose environmental protection and the regulation of economic activity.



Diminishing sea ice, glaciers and snow cover are exposing the Arctic to development. Areas that were once considered unsuitable for shipping, mining or tourism are now wide open for exploitation. Unfortunately, Indigenous People with traditional lifestyles are bearing witness to new threats from economic, social, and environmental trends in the Arctic.

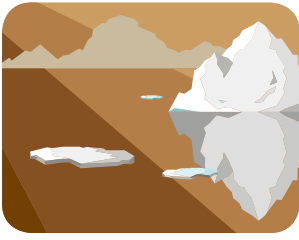


### 3. A Sustainable Arctic Blue Economy: Assessing the Prospects



A serious accident or natural disaster could have enormous consequences. While steps have been taken to improve regional search and rescue and emergency preparedness, the Arctic's ability to respond to worst-case scenarios remains weak, especially as traffic increases.





## WEAKNESSES

### 1. We know far too little about what is happening in the Arctic Blue Economy.

**We often lack even basic data about many critical trends** in the Arctic. We understand even less about how those trends will interact with one another in the future.

### 2. Regional governance is not yet up to the task of managing development in a sustainable direction.

**Regional governance processes do not make good use** of the experience of the people who have lived in the region the longest and know it best. “An Arctic Council survey found that Indigenous knowledge and value systems are not adequately integrated into policy making.”<sup>100</sup>

Most of the critical decisions affecting the Arctic Blue Economy and the Arctic region generally are still made by national governments in far off national capitals and by multinational investors and corporations. The Arctic Council is a tremendous and growing asset for the promotion of regional governance, but for now, it lacks the muscle to steer regional development onto a sustainable path.<sup>101</sup> This leaves important aspects of Blue Economy development more or less unregulated beyond minimum global standards, which are often inadequate to protect the fragile Arctic marine environment. As noted in the 2015 CAFF scoping study, *The Economics of Ecosystems and Biodiversity (TEEB) for the Arctic & Scoping Study*, “... the Council does not by itself implement policies and is therefore dependent on other bodies, especially national governments, for the move from agenda setting to getting specific policies in place that might affect behavior. The pace of change in the Arctic, particularly the opening of the region to increased levels of economic activities and the increasing international interest in the region, have raised concern about whether the pace of policy implementation can keep up.”<sup>102</sup>

This combination of factors makes the policy process affecting the Arctic Blue Economy reactive, slow and non-inclusive at a time when the Arctic needs proactive engagement with long-term sustainability issues, quick action to respond to rapidly changing conditions, and the engagement of local communities and traditional knowledge.<sup>103</sup>

### 3. Accountability mechanisms are very underdeveloped or non-existent.

**Poor data make for weak goal-setting and even weaker accountability.** When it comes to fishing, for example, Arctic nations have yet to agree even on how to report to each other or hold each other accountable – much less whether to set limits and cooperate to achieve common goals. Because of the Arctic’s low population densities, people who operate outside the few regulatory structures that do exist rarely face any consequences. In most Blue Economic sectors, the Arctic’s remoteness and vastness make it easy to hide the facts, misreport them or simply skip over accountability processes.

### 4. The region is not adequately prepared for large accidents or disasters.

**In many parts of the coastal and marine Arctic, resilience – both social and ecological – is low.** A serious accident, natural disaster or social catastrophe would have enormous consequences. While steps have been taken to improve regional search-and-rescue and emergency preparedness, Arctic preparedness for worst-case scenarios remains a weakness, especially as traffic into the Arctic increases. Experienced tour companies are worried about newcomers who underestimate the risk of sea ice and other dangers. And recent decisions by governments and private sector actors not to drill for offshore fossil fuels has a downside. As the mayor of Nome, Alaska noted recently, Shell’s decision to pull out of the region means “there [will] be no vessels in Nome to respond to emergencies at sea.”<sup>104</sup>

Yet the administration in the United States has revoked the moratorium on offshore drilling established by the previous administration.

Disaster preparedness and accident prevention are areas where the Arctic Council can and must play an even stronger role than it does now, building on its success with binding search-and-rescue and marine oil-spill response agreements.



The Arctic Council is a tremendous and growing asset for the promotion of regional governance, but for now, it lacks the muscle to steer regional development onto a sustainable path.

### 3. A Sustainable Arctic Blue Economy: Assessing the Prospects



## STRENGTHS

### 1. The foundation for a more integrated and inclusive approach to regional governance exists.

**As the *Arctic Resilience Report* notes**, the Arctic Council “provides a robust basis for coherence in multi-level, multi-sectoral decision-making. Its permanent members coordinate long-term working groups as well as responsive, shorter-lived task forces ... and it has close associations with international and non-governmental organizations. These information-sharing connections can enhance the Arctic Council’s ability to influence policy, both within and beyond the Arctic region.”<sup>105</sup> This foundation must be enhanced toward more robust forms of governance.

But the Arctic Council, while essential, is also not the only game in town. A variety of formal international governance processes – such as UNCLOS, the IMO, the International Seabed Authority, the Convention on Biological Diversity, the European Union, and the Convention on Migratory Species – are working in the Arctic, but those processes need to be enhanced as well. The IMO is playing an especially important role on shipping issues, but the Polar Code needs to be improved. The “Arctic 5” have driven increasingly successful negotiations with other global players on how to regulate fishing in international waters, but the agreement needs to be ratified and complemented by a science body to oversee implementation, such as in the International Council for the Exploration of the Sea (ICES) framework. Indigenous Peoples are increasingly regaining autonomy and authority to make their own governance decisions and participate in international forums as empowered partners in the dialogue. Informal but influential discussion forums, such as the Arctic Circle and Arctic Frontiers conferences, are helping to advance a sense of regional identity and cement ties that also build a stronger basis for regional governance. Numerous bilateral agreements, such as the resolution of Russia and Norway’s maritime border, also contribute to building confidence and regional trust.<sup>106</sup>



The Arctic Council, while essential, is not the only game in town. A variety of formal international governance processes are working in the Arctic, but those processes need to be enhanced as well.

### 2. The development of new knowledge is accelerating.

**While our knowledge of the Arctic marine environment is relatively limited**, one of the crucial strengths on which to build is the extensive research focus this region has begun receiving. Reports are being published on the state of Arctic ecosystems, social development and economic progress with increasing regularity. Websites powered by satellite data make it possible for anyone to monitor Arctic conditions – such as sea ice extent or vessel traffic – in real time.<sup>107</sup> One recent study noted that more than half of all the scientific papers published on the impact of climate change on marine mammals focus on the Arctic because of the rapid pace of change there.<sup>108</sup> While the lack of data, knowledge and systemic understanding of the Arctic is a weakness, the region’s fast-changing nature has enhanced its attractiveness as a place to do research, and this is in the process of becoming a strength.

**The development of new knowledge is very positive for the prospects of the Arctic Blue Economy.** At the same time, it is important to identify the type of research needed to reach the long-term goals of this new framework and answer the question: “What science needs to be done?” WWF outlined<sup>109</sup> a vision for Arctic science policy that is strategic, coherent and policy-relevant. The regional scientific agenda should aim to better understand human impacts by assembling baseline data and constantly recreate and revisit measures to avoid those impacts based on risks assessments. There is a need to commission new research to answer pressing implementation questions raised in the Arctic Council’s assessments and reports, such as how to manage rapid change. Arctic science should aim to guide the development of the Blue Economy by supporting sound management of rapid climate-driven change. Arctic actors must also clearly communicate how this change will affect the rest of the world.



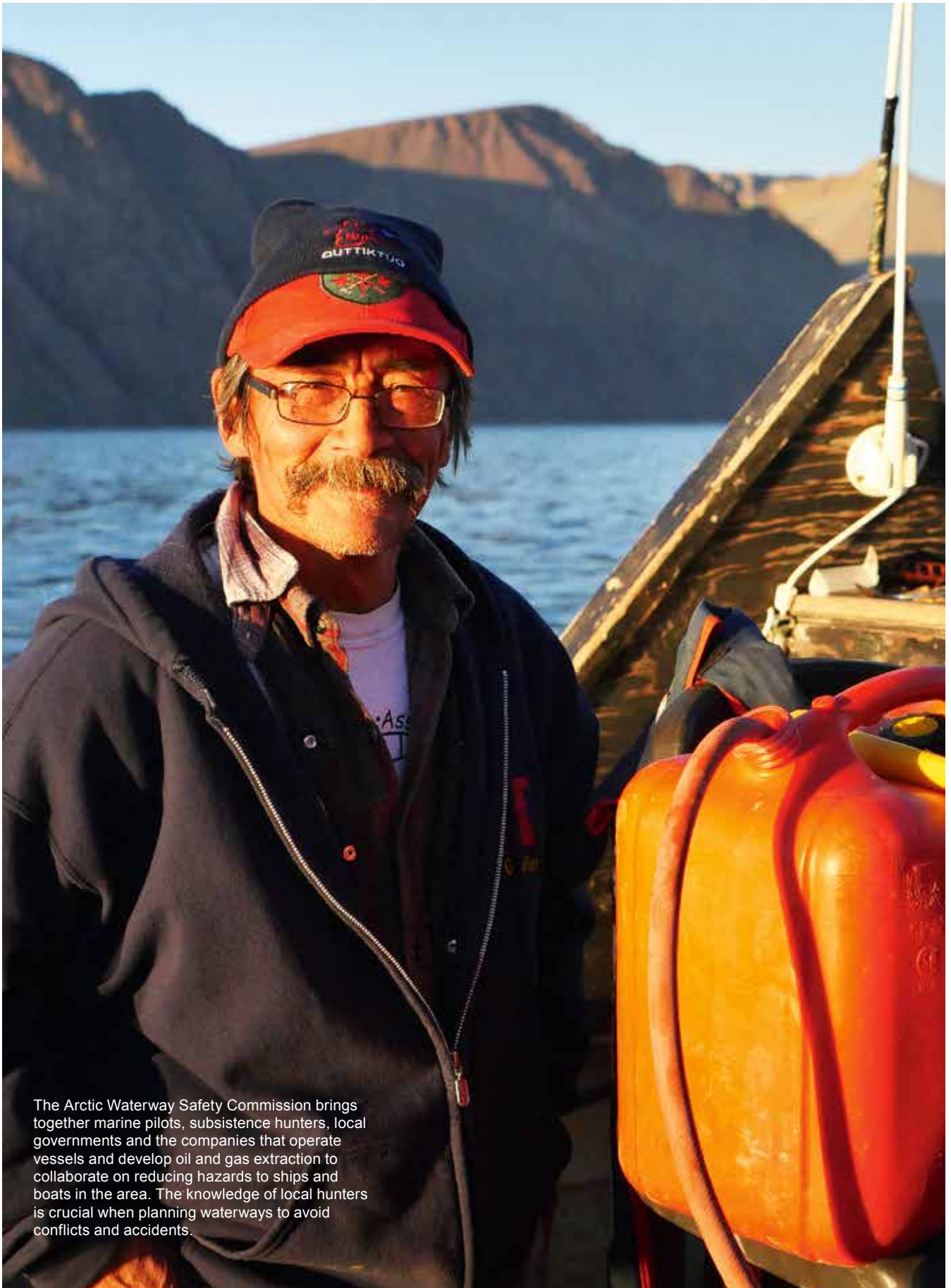
Even though summer sea ice in the Arctic is decreasing, the need for icebreakers remains vital for local and commercial shipping.





Websites powered by satellite data make it possible for anyone to monitor conditions in the Arctic – such as sea ice extent, vessel traffic or scientific work – in real time. More than half of all the scientific papers published on the impact of climate change on marine mammals focus on the Arctic because of the rapid pace of change there. In this photo, Tom Arnbom, an Arctic expert with WWF Sweden, is transmitting images from a 2014 Svalbard expedition.

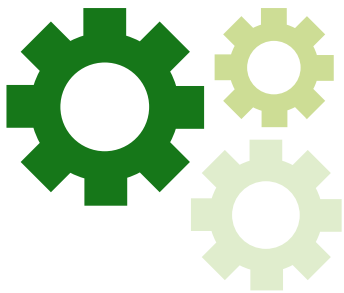
### 3. A Sustainable Arctic Blue Economy: Assessing the Prospects



The Arctic Waterway Safety Commission brings together marine pilots, subsistence hunters, local governments and the companies that operate vessels and develop oil and gas extraction to collaborate on reducing hazards to ships and boats in the area. The knowledge of local hunters is crucial when planning waterways to avoid conflicts and accidents.



Scientists have been tagging Greenland sharks to get further information about their migration behaviours and distribution.



### 3. Existing small-scale models demonstrate inclusive governance processes that work.

**There are several examples of participatory governance** that also take an integrated, long-term view of the Blue Economy. The Alaska Eskimo Whaling Commission meets regularly with oil and gas companies operating in the region to manage a joint Conflict Avoidance Agreement that ensures subsistence hunting activities can co-exist with energy extraction. The Arctic Waterway Safety Commission brings together marine pilots, subsistence hunters, local governments and the companies that operate vessels and conduct oil and gas extraction to collaborate on reducing the hazards to ships and boats operating in the area. Both examples involve integrating science and technology with Indigenous knowledge.<sup>110</sup>

The Alaska Eskimo Whaling Commission meets regularly with oil and gas companies operating in the region to manage a joint Conflict Avoidance Agreement that ensures subsistence hunting activities can co-exist with energy extraction.

### 4. The people who live in the Arctic are exceptionally adaptive and resilient – and increasingly well connected.

**Anyone who makes the Arctic their home is used to functioning in a challenging and difficult environment.** Many Arctic communities are responding to the challenges they face with extraordinary resolve. Communities are relocating to more solid ground, hunters are turning into farmers or entrepreneurs, potential economic calamities are being reframed as opportunities. Mobile phones, the Internet, conferences and better air and sea connections are binding the Arctic together as a region and helping to spread new ideas and solutions more quickly across national boundaries.

Faced with both ecological “regime shifts” and fickle global markets, the people of the Arctic are increasingly coming together and doing what they have always done: adapting.

## 3. A Sustainable Arctic Blue Economy: Assessing the Prospects



As documented earlier, the warming Arctic has already brought economic opportunity in many forms, from the sudden arrival of new fisheries to rapidly increasing coastal and cruise tourism to the gradual opening of new shipping lanes.

### OPPORTUNITIES

#### 1. While climate change brings threats and risks, it also brings economic benefits – and an opportunity to learn how to develop them sustainably.

As documented earlier, the warming Arctic has already brought economic opportunity in many forms, from the sudden arrival of new fisheries to rapidly increasing coastal and cruise tourism to the gradual opening of new shipping lanes. The challenge is how to manage that development, so it remains at a level that would avoid tipping points. Consider mackerel:

“By 2011... mackerel had found their way into Greenlandic waters, prompting the launch of a new fishery,” reported Arctic Deeply. “Three years later, the mackerel fishery made up 23 per cent of Greenland’s export earning.”<sup>111</sup>

Greenland’s new mackerel fishery can be sustainably managed, as can other new fisheries if the rate of ecosystemic change does not outpace our ability to understand all the impacts of the mackerel on the ecosystem when trying to predict sustainable harvest levels. Cruise ships coming into the Arctic can disrupt Indigenous cultures, harass marine mammals and cause damaging accidents, and emissions can exacerbate climate change impacts – or the tourist industry can be a model for thoughtful interaction and learning, observing best environmental practices and using the most advanced safety technologies.

#### 2. The Blue Bio-Economy presents special opportunities in Arctic marine environments.

Consider the fact that only about half of the biomass taken up from the ocean in fishing nets is actually used as food. The other half is either jettisoned or used in low-value products.<sup>112</sup> And much of what else grows, or can grow, in Arctic waters (such as algae) is underutilized from an economic perspective.

To use the Arctic marine environment economically, we should use it to maximum efficiency, generating maximum value – in a sustainable way. That is the promise of the Blue Bio-Economy, defined as “value creation based on sustainable and smart use of renewable marine and freshwater resources.”<sup>113</sup> Projects under way now, mostly focused on the Nordic Arctic, are demonstrating how high-value chemicals, biofuels, alternative sources of protein, cosmetics and even anti-cancer treatments could be produced in carefully and sustainably managed marine environments. Sustainability does not necessarily preclude development; however, some areas might need to remain underdeveloped to protect ecosystem integrity. Taking the Blue Bio-Economy path is expected to help “diminish the dependency on fossil resources, increase resource efficiency, create new jobs also in coastal and rural areas, increase technology, export and competitiveness, improve recirculation of micronutrients [such as phosphorus], strengthen sustainable agriculture, forestry and aquatics and contribute to environmental services.”<sup>114</sup>

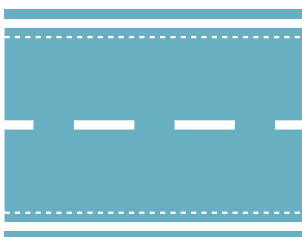
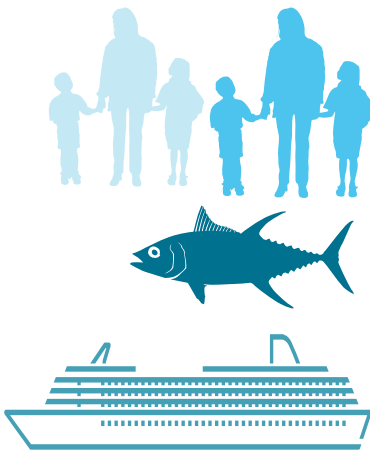
Development of the Blue Bio-Economy could also be spread more rapidly through the Arctic through regional knowledge exchange and governance platforms.

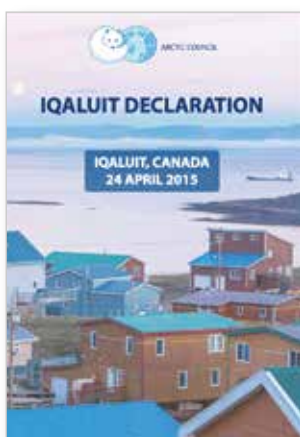
#### 3. There is a chance to get investment and infrastructure development right the first time.

Most types of infrastructure – ports, roads, buildings, airports, energy systems and so on – have a long lifespan. The vast bulk of the world’s infrastructure, constructed without much thought to sustainability or climate concerns, increasingly looks very unsustainable. Problems such as wasteful design, siting decisions that damage ecosystems, and fossil-fuel dependency are “locked in” by yesterday’s investment decisions. Retrofitting the resulting unsustainable global infrastructure will take a century of work.<sup>115</sup>

But in the Arctic, a great deal of infrastructure will be newly built, which means it has not yet missed the chance to be designed, sited and built in a sustainable way.

There are currently some hopeful signs that at least some future investment will take some sustainability concerns into consideration, guided by voluntary investor initiatives.<sup>116</sup> For example, Iceland and Germany are cooperating to construct an ice-free, deep-water harbour in Northeast Iceland’s Finnafjörður that will incorporate sustainability into its design.<sup>117</sup>





Putting ecosystems first does not only mean trying to preserve them as they are but learning how to live with them as they undergo transformation.

#### 4. We can put ecosystem-based management at the heart of the Arctic Blue Economy.

**Infrastructure investment provides a specific example** of what is also a general opportunity: getting economic development right the first time by linking it tightly to ecosystem-based management (EBM) and considering the roles of insurers and investors. There are many reasons to embrace EBM, which “strives to integrate commercial, social, cultural, and ecological values” while treating the ecosystem as “first among equals” because “ecosystem failure would compromise all other values or goals.”<sup>118</sup> No fewer than five major Arctic Council Declarations have already endorsed the use of EBM, starting in 2004. The Iqaluit Declaration of 2015 also calls for practical guidance:

“[We] Recognize the multiple stresses on the Arctic environment and the need for an ecosystem-based approach to management, welcome and continue to encourage progress toward implementation of the ecosystem-based management recommendations approved by Ministers in Kiruna, and request the development of practical guidelines for an ecosystem-based approach to the work of the Arctic Council be completed as soon as possible.”<sup>119</sup>

Putting ecosystems first does not only mean trying to preserve them as they are but learning how to live with them as they undergo transformation – and that is exactly what is happening and will happen in the Arctic. Knowing what’s happening in the ecosystem and working to sustain the Arctic’s resilience through intelligent management decisions needs to become the default practice. For an obvious example, there is no point constructing a port building on melting permafrost or eroding coastline. Placing an energy installation near a marine mammal zone or bird nesting area – or in places where these animals are likely to relocate after global warming pushes them northward – would simply accelerate the loss of other natural, cultural and economic values in the Arctic.

According to the Arctic Council Framework for a Pan-Arctic Network of Marine Protected Areas (April 2015), the purpose of the pan-Arctic Marine Protected Areas (MPAs) network, composed of individual Arctic State MPA networks and other area-based conservation measures, is to protect and restore marine biodiversity, ecosystem function and special natural features and preserve cultural heritage and subsistence resources for present and future generations. Development of the pan-Arctic network of MPAs can also contribute a major conservation element to and benefit from marine spatial planning and EBM in the circumpolar region. The pan-Arctic MPA network will not wholly achieve its conservation objectives unless it is integrated into a broader Arctic management regime such as EBM. Management practices that are not place-based, such as industry guidelines and codes of practice – and an ecosystem approach to management – help conserve the marine environment and support many of the objectives of the Pan-Arctic MPA network.

As with many opportunities, the result of not pursuing this one will be heightened risk or even threat. Developing the Arctic Blue Economy with anything less than EBM at the heart of the process is asking for trouble.

#### 5. The Arctic is becoming better known and valued.

**Arctic tourism is increasing** not just because the Arctic is more accessible, but because it is beautiful, unique and relatively unspoiled by humanity. We need to build on humanity’s growing affection for the Arctic.

Increasing tourism obviously comes with its own risks and threats. But well-planned and regulated tourism, coupled with increasing media exposure to this extraordinary environment in the rest of the world, helps spread awareness of the Arctic’s value. More importantly, tourism also builds the long-term economic case for preserving both natural wonders and traditional cultures that might be irretrievably damaged by short-term, extractive investments.

By encouraging the world to care more and more about the Arctic, we can also increase the number of eyes that are paying attention to what happens there. This attention can help increase research budgets and promote conservation values. It can also strengthen the political will to ensure that development decisions that affect the region are made in ways that benefit Arctic citizens while enhancing the resilience of Arctic ecosystems – and ultimately, the global ecosystems that are affected by what happens at the top of the world.



Regulated and well-planned tourism helps spread awareness of the Arctic’s value.

### 3. A Sustainable Arctic Blue Economy: Assessing the Prospects



Retreating glaciers can open up new areas for mining that were once inaccessible due to the thick ice shield.



## 4. Conclusions and Recommendations

Much of what happens in the Arctic Blue Economy, and indeed the entire Arctic, will depend on how well a number of groups collaborate to set common goals, make binding agreements, adopt standards and guidelines, ensure reporting and accountability, and exercise responsible stewardship at every level, from the Arctic community to the global community.



# CONCLUSIONS AND RECOMMENDATIONS

This review of prospects for the Arctic Blue Economy makes it clear that we need to make critical choices today. What kind of future does humanity want to see in this “brand new ocean” at the northern tip of our planet? What are we willing to do to save what can and must be saved while economic interests exploit new tracts of ocean real estate, harvest new northern fisheries, and send our ships through the emerging natural “Panama and Suez canals of the north?” How will we manage this process in a way that adapts nimbly to the inevitable transformations that are happening in the Arctic, ensuring both ecosystem viability and economic prosperity in the long term?

## CRITICAL CHOICES

NEED TO BE MADE  
TODAY FOR THE ARCTIC  
BLUE ECONOMY.

**One of the urgent choices we face** even involves deciding who gets to decide: Will future coastal infrastructure development, for example, continue to be driven by distant investors and remote national governments? Or will local Arctic stakeholders – some of whom trace their roots in the region back thousands of years – have a significant say in their own destinies?

A crucial aspect of this discussion concerns the word “we” as it was used in the preceding paragraphs. We – meaning people in general – tend to think of the Arctic as a global commons, where anyone can go as an adventurer, prospector, researcher or nature photographer. And yes, the central Arctic Ocean and North Pole are international waters, and thus belong to all of humanity. The global community can and should take care of this global commons and the area surrounding it. The most important global contribution to a sustainable Arctic Blue Economy will be to stabilize global greenhouse gas emissions so Arctic temperatures can be stabilized (albeit at higher levels than are experienced now).<sup>120</sup>





The rest of the Arctic is divided between national governments (which have a much more restricted sense of this word “we,” applying it in national contexts), and peoples who have a sense of ownership and stewardship of the Arctic that can cross national borders. Much of what happens in the Arctic Blue Economy, and indeed the whole Arctic, will depend on how well these very different “we’s” collaborate to set common goals, make binding agreements, adopt standards and guidelines, ensure reporting and accountability, and exercise responsible stewardship at every level, from Arctic communities to the global community.

The WWF Principles for a Sustainable Blue Economy provide a foundation for thinking about how to proceed when it comes to marine and coastal zones. This report’s analysis, framed by those Principles, suggests the following critical priorities for action by governments, Indigenous and other Arctic peoples, investors, business operators, researchers and civil society.

## THE GLOBAL COMMUNITY

MUST TAKE ADEQUATE  
MEASURES TO STABILIZE  
THE ARCTIC CLIMATE.

### 1. Carefully consider and prioritize climate change risks when investing.

Investors should only consider projects that will benefit the Arctic’s long-term prospects for sustainability and prosperity. That means prioritizing responsible investments that develop renewable resources, since these have the potential to reduce greenhouse gas emissions and create strong and resilient Arctic economies.

#### Actions to support this recommendation:

- Consider all types of climate-related risks when supporting activities in the Arctic, and only back projects that prepare for and anticipate the impacts of climate change and minimize the carbon footprint.
- Apply the Sustainable Blue Economy Finance Principles developed by the European Investment Bank, European Commission, Prince of Wales International Sustainability Unit and WWF.
- Create a transparent process to help investors consider the risks associated with climate change when making investment decisions.
- Invest in effectively communicating how rapid change in the Arctic affects the rest of the planet.

## 4. Conclusions and Recommendations

High-quality, transparent, interdisciplinary science is needed to understand how management and investment decisions affect ecosystems, and how this environmental change affects human well-being in turn.



Indigenous Peoples are the ones who will be most directly affected by the consequences of any development decisions.



Precautionary measures should be taken to ensure that the Arctic Blue Economy is based upon sustainable shipping.

### 2. Preserve biodiversity in a warmer Arctic.

**We cannot afford to wait until the effects of climate change are further felt.** We need to anticipate them.

#### Actions to support this recommendation:

- Proactively devise precautionary adaptation measures to promote a healthy, biodiverse Arctic in the face of rapid climate change.
- Protect unique sea-ice ecosystems that are expected to survive global warming to ensure a resilient, representative Arctic ecosystem.

### 3. Fully integrate Arctic research and Indigenous knowledge in decision-making processes.

**There is no comprehensive outlook on ecological and socio-economic trends for the Arctic.** High-quality, transparent, interdisciplinary science is needed to understand how management and investment decisions affect ecosystems, and how this environmental change affects human well-being in turn.

Producing this knowledge will require two paradigm shifts in how we conduct decision-making: we need more funding for research on adaptation and mitigation measures in the face of rapid change in the Arctic; and we need to consult and work with Indigenous Peoples in the Arctic to integrate their knowledge. This knowledge is valuable, and Indigenous Peoples are the ones who will be most directly affected by the consequences of any development decisions.

Better science and integration of Indigenous knowledge are critical for future sustainability. Where gaps in knowledge exist, a precautionary approach should prevail.

#### Actions to support this recommendation:

- Investors, corporations, governments and scientists need to join forces with Indigenous Peoples to develop scientific projects and support decision-making that incorporates Indigenous knowledge.
- Fund the scientific community and intentionally design research that integrates Indigenous knowledge to guide policy that develops an Arctic Blue Economy.
- Investigate the impacts of human activities, collect baseline data, develop risk assessments and iteratively design measures to avoid unsustainable impacts.

### 4. Focus on renewable resources to diversify Arctic economies.

**To obtain the highest possible level of economic growth in the Arctic** over the long-term, we need to conserve the natural resources upon which that growth depends. An Arctic Blue Economy focuses on developing renewable resources strategically, incrementally and sustainably in ways that diversify the economy. This is true for both biological and energy resources.

But the exploration and development of Arctic renewable energy projects should go beyond traditional sources like hydropower and geothermal. New sources of renewable energy are needed to provide energy security for the region. When biological resources are harvested sustainably, it aids the preservation of ecosystem resilience and integrity.

#### Actions to support this recommendation:

- Diversify Arctic economies by sustainably harvesting renewable biological resources, such as fish and marine plants.
- Create incentives for developing renewable energy resources with a view to long-term energy security.

### 5. Apply ecosystem-based management in the Arctic marine environment.

**Ecosystem-based management considers the overall impacts and interdependence** of human activities and the environment. In so doing, it spells out the necessary conditions for healthy ecosystems, sustainable development and human well-being.

**Standardized monitoring is an essential part of ecosystem-based management.** It can identify benchmarks, determine current status and help us understand the implications of changes over time. It is a useful tool for tracking the increasing and cumulative impacts of human activities.

To maximize sustainability in the Arctic marine environment, investors should support new types of Arctic infrastructure that can be used for one purpose and then adapted for another later. Planning for facilities that allow for different kinds of activities and act as community and commercial hubs will benefit communities, biodiversity and the sustainability of investments.

To help ecosystems cope with increasing economic activity and allow species to adapt and be resilient as they confront rapid change, we also need to establish a network of MPAs. Future development should not go beyond nature's ability to adapt and support life in a healthy Arctic.

### Actions to support this recommendation:

- Develop and implement further Arctic-specific technical guidance on to how to apply ecosystem-based management.
- Support new types of physical structures and facilities designed specifically for the Arctic and develop best standards and guidelines for industries operating in the region.
- Create a pan-Arctic, ecologically coherent network of MPAs and other flexible/adaptive area-based measures.



## THE ARCTIC COUNCIL

**DELIVERS VALUABLE SCIENTIFIC ASSESSMENTS AND RECOMMENDATIONS, BUT ARCTIC COUNTRIES ARE SLOW TO IMPLEMENT THEM.**

## 6. Improve Arctic governance to ensure sustainable development.

**The Arctic Council delivers valuable scientific assessments and recommendations,** but Arctic countries are slow to implement them. Consequently, regional governance needs to be strengthened. A cooperative mechanism for the Arctic marine environment can be modelled on existing successful international or regional mechanisms that govern other marine areas of the world. Arctic states need to design effective institutions to support sustainable development before global influence becomes an unchecked driving force.

Arctic shipping routes are becoming a matter for governance as they grow more accessible. With an increase in shipping activity comes an increase in the risk of accidents and operational oil spills. Investors, Arctic states and the International Maritime Organization should adopt precautionary measures to reduce stress on important areas of biodiversity, create a new generation of vessels powered by renewable technology, and phase out the use and carriage for fuel of heavy fuel oil to ensure the Arctic Blue Economy is based upon sustainable shipping. The International Maritime Organization's Polar Code can be a strong tool for ensuring sustainable shipping in the region if implemented correctly, and its environmental protections significantly improved.

Existing international agreements negotiated under the auspices of the Arctic Council define how states are to cooperate when responding to marine oil spills or training to manage incidents. The same level of constant cooperation should be replicated for other areas of work.

### Actions to support this recommendation:

- Arctic states and stakeholders should adopt WWF's Principles for a Sustainable Blue Economy for all activities in the region.
- Arctic states should establish a comprehensive regional instrument for marine cooperation to fulfil their roles as the prime stewards of the region.
- Arctic Council member countries should integrate all relevant decisions and recommendations into their national and sub-national policies.
- Clear parameters should be defined for constant international cooperation when implementing marine spatial planning – including a network of transboundary marine protected areas – in Exclusive Economic Zones and beyond.
- A low-impact, decarbonized marine transport system should be created.



# ANNEX 1: WWF PRINCIPLES FOR A SUSTAINABLE BLUE ECONOMY

The WWF “Principles for a Sustainable Blue Economy” were originally published in “manifesto” format, as a coherent statement to be read without the clutter of section names or paragraph numbers.\* For ease in applying the Principles to policy- and decision-making, after the initial Preamble, the version on pages 70 to 71 names the three sections – A: Definitions, B: Processes, C: Actions – and adds paragraph numbers to allow ease of moving back and forth between the Principles and other documents to which they are being applied and compared.

## Preamble

Humanity increasingly understands that we are an integral part of the marine ecosystem, and that we must plan and implement our economic activities with care, balancing the desire to improve human living standards and well-being with the imperative to sustain ecosystem health.

**The world’s oceans, seas, and coastal areas are the largest ecosystems on the planet** and a precious part of our natural heritage. They are also vital to the livelihoods and food security of billions of people around the world, and to the economic prosperity of most countries.

**The ability of these marine environments to provide jobs and nutrition over the long term** is, however, already under pressure from human economic activities; and it is being further threatened by development approaches that are fragmented, uncoordinated, and often in conflict with what science tells us is physically possible or ecologically sound.

**Fortunately, many governments, organizations and communities** in both developed and developing countries are becoming aware of the need for a more coherent, integrated, fair, and science-based approach to managing the economic development of the oceans.

**Humanity increasingly understands that we are an integral part of the marine ecosystem,** and that we must plan and implement our economic activities with care, balancing the desire to improve human living standards and well-being with the imperative to sustain ecosystem health. Active leadership is needed, in both the public and private sectors, to steer the Blue Economy in a sustainable direction. This includes delivering on commitments already made – globally, regionally, nationally and locally.

**To ensure that the economic development of the ocean contributes to true prosperity and resilience,** today and long into the future, with special recognition of the needs of developing countries, WWF is proposing the following Principles for a Sustainable Blue Economy.

**These Principles provide a definition of a sustainable Blue Economy and a roadmap to help us get there.** They are universal and can be applied to any part of the oceans, seas or coasts, as well as used by any actor involved in the economic development of the sea, including governments, private and financial sector actors, international agencies, and civil society groups.

**WWF invites all Blue Economy actors to use these Principles for a Sustainable Blue Economy** and to embed these definitions, descriptions, and actions into marine policy and activities, all around the world.

### SECTION A: Definitions

**A SUSTAINABLE BLUE ECONOMY** is a marine-based economy that ...

- A1. Provides social and economic benefits** for current and future generations, by contributing to food security, poverty eradication, livelihoods, income, employment, health, safety, equity, and political stability.
- A2. Restores, protects and maintains** the diversity, productivity, resilience, core functions, and intrinsic value of marine ecosystems – the natural capital upon which its prosperity depends
- A3. Is based on clean technologies, renewable energy,** and circular material flows to secure economic and social stability over time, while keeping within the limits of one planet.

### SECTION B: Processes

**A SUSTAINABLE BLUE ECONOMY** is governed by public and private processes that are ...

- B1. Inclusive.** A sustainable Blue Economy is based on active and effective stakeholder engagement and participation.
- B2. Well-informed, precautionary and adaptive.** Decisions are based on scientifically sound information to avoid harmful effects that undermine long-term sustainability.  
  
When adequate information and knowledge are missing, actors take a precautionary approach, actively seek to develop such knowledge, and refrain from undertaking activities that could potentially lead to harmful effects.  
  
As new knowledge of risks and sustainable opportunities is gained, actors adapt their decisions and activities.

### **B3. Accountable and transparent.**

Actors take responsibility for the impacts of their activities, by taking appropriate action, as well as by being transparent about their impacts so that stakeholders are well-informed and can exert their influence.

### **B4. Holistic, cross-sectoral and long term.**

Decisions are based on an assessment and accounting of their economic, social and environmental values, benefits and costs to society, as well as their impacts on other activities and across borders, now and in the future.

### **B5. Innovative and proactive.**

All actors in a sustainable Blue Economy are constantly looking for the most effective and efficient ways to meet the needs of present and future generations without undermining the capacity of nature to support human economic activities and well-being.



## SECTION C: Actions

To create a **SUSTAINABLE BLUE ECONOMY**, public and private actors must ...

**C1. Set clear, measurable, and internally consistent goals and targets** for a sustainable Blue Economy. Governments, economic sectors, individual businesses and other actors must all set relevant and measurable goals and targets for a sustainable Blue Economy to provide their planning, management and activities with a clear direction.

Goals and targets for different economic, social and ecological areas – as well as related policies and activities – must be made as integrated and coherent as possible, to avoid conflicts and contradictions.

**C2. Assess and communicate their performance** on these goals and targets. The goals and targets for a sustainable Blue Economy must be regularly monitored, and progress communicated to all stakeholders, including the general public, in a transparent and accessible way.

**C3. Create a level economic and legislative playing field** that provides the Blue Economy with adequate incentives and rules. Economic instruments such as taxes, subsidies and fees should be aimed at internalizing environmental and social benefits, costs and risks to society.

International and national laws and agreements, including private agreements, should be framed, implemented, enforced, and continuously improved in ways that support a sustainable Blue Economy.

**C4. Plan, manage and effectively govern the use of marine space and resources**, applying inclusive methods and the ecosystem approach. All relevant uses of marine space and resources must be accounted, planned, managed and governed through forward-looking, precautionary, adaptive and integrated processes that ensure the long-term health and sustainable use of the sea, while also taking into account human activities on land.

Such processes must be participatory, accountable, transparent, equitable and inclusive in order to be responsive to present and future human uses and needs, including the needs of minorities and the most vulnerable groups in society.

To make informed trade-offs, such processes should also use appropriate tools and methods to capture the range of benefits that ecosystem goods and services can bring to different stakeholders.

**C5. Develop and apply standards, guidelines and best practices** that support a sustainable Blue Economy. All actors – including governments, businesses, non-

profit enterprises, investors and consumers – must develop or apply the global sustainability standards, guidelines, best practices, or other behaviours that are relevant to them.

For organizations, application of such standards should not only ensure that their activities are conducted in a responsible way, but also improve their own performance and competitiveness, today and in the future.

**C6. Recognize that the maritime and land-based economies** are interlinked and that many of the threats facing marine environments originate on land. To achieve a sustainable Blue Economy in the seas and coastal regions, land-based impacts to marine ecosystems must be addressed and actors must also work to promote the development of a sustainable green economy on land.

**C7. Actively cooperate, sharing information, knowledge, best practices, lessons learned, perspectives and ideas**, to realize a sustainable and prosperous future for all. All actors in a sustainable Blue Economy have a responsibility to participate in the process of implementation, and to reach out across national, regional, sectoral, organizational, and other borders, to ensure collective stewardship of our common marine heritage.

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## NEXT STEPS on a long journey

**WWF is deeply committed to the Arctic.** We have worked in the region for more than 25 years and have offices in every Arctic country except Iceland.

**We firmly believe** that effective international stewardship will shield the Arctic from the worst effects of rapid change by promoting healthy, sustainable ecosystems to the benefit of local peoples and all humanity.

**We stand ready to engage** with governments (national, Indigenous, regional and local), intergovernmental organizations, industry, investors and other civil society organizations to help achieve all the above recommendations.

**We hope you will become a partner** in the creation of a sustainable Arctic Blue Economy.



# Getting it Right in a New Ocean: Bringing Sustainable Blue Economy Principles to the Arctic

## ARCTIC

This polar region is the size of Africa and is an ocean surrounded by three continents.

## A "NEW" OCEAN

Climate change is melting glaciers, increasing ocean acidification, and decreasing sea ice and snow cover in the Arctic –all of which is affecting the environment. Redistribution of species is changing local economies.



## NEW OPPORTUNITIES

Diminishing sea ice in summer exposes the Arctic to more tourism, mining, oil and gas exploration and shipping.

## SHIPPING

Scientists predict that by 2030, the Arctic Ocean will be ice-free in the summer. This will open up new shipping routes that can decrease costs and travel times by up to 30%.

## LIVING ON THE EDGE

Iconic species like bowhead whales, narwhals, polar bears and walruses have evolved over time to thrive in a very harsh environment. They are culturally important for Indigenous People as well as being a source of food.



### Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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