

The Blue Paper for eco-Arctic sailing expeditions.

Work-In-Progress edition.

Sailing4Science and NAPA-project 2024-2025.

More info on the project and participating partners

<https://www.sailing4science.org/projects/2024-napa-eco-arctic>

Foreword/Introduction (by Martin H/Björn D)

The Arctic environment is changing more rapidly than anywhere on the planet, with large consequences for its ecosystems and keystone species. Increased accessibility for exploitation poses added pressures, not the least in maritime sectors. Arctic tourism has been a rapidly increasing trend over the last decade, to a large extent through the cruise ship industry, which can put a large environmental footprint on sensitive habitats, cultural and natural heritage sites. Authorities are increasing regulation and control measures, e.g. Norwegian government restriction for tour operator landings on Svalbard to only designated sites (Miljødirektoratet, 2023). This particular regulation proposal was receiving strong objection from the local tourism visitor development sector and especially small expedition tour operators, not because they objected to the environmental conservation goals, but as they perceived it, the way the regulation was designed was both counterproductive to the goals and hindered their business opportunities. Small-scale sailing tour operators are able to provide a high experience-low – low footprint operation, but do not yet have a voice in the formulation of regulations and best practices adapted for sustainable and safe small-scale operation.

The rapidly changing climate in the Arctic increases the research needed to underpin policy actions. At the same time, the ice melting and increased accessibility open up opportunities for both industrial exploitation and interest for tourism. This decade is appointed by UNESCO as the UN Decade of Ocean Science for Sustainable Development, and one of the officially endorsed projects Sailing4Science, is the core of this project, with a community of practice (CoP) of small sailing tour and expedition operators, where common needs, challenges and opportunities have been widely discussed and articulated. This community of practice will formulate protocols for environmental standards and stewardship, and will, together with arctic research institutions co create citizen science opportunities. Furthermore, small commercial vessel arctic sea safety protocols, regulations, and best practices beyond compliance have been shared and reported.

Climate change is imposing direct and indirect ecological consequences globally, and in the Arctic, the changes are most rapid and obvious (IPCC Ocean and Cryosphere). The reduction in summer ice cover density and retreating melting glaciers are most evident, but changes in habitats for marine mammals, and "atlantification" of marine arctic ecosystems and keystone species, as well as changes in terrestrial habitat, will change the Arctic ecology. This also means thawing tundra and new land becoming seasonally exposed, including cultural history and heritage remnants.

Tourism trends in the Arctic show a rapid increase in cruise tourism over the last two decades across the whole Arctic (Lamers 2010, Bystrowska, 2019). The Arctic has been more accessible for seafarers in general and also a more attainable area for yacht exploration and sailing expedition tour operators, mainly due to the decreasing summer ice density and also with better communication and forecast technologies. For example, two decades ago it was rare to have a yacht passing through the Northwest Passage, but in 2023 ,it was 13 yachts

smaller than 24m passing through (Headland et al., 2024)(Dawson et al., 2018). Similarly, for expedition cruise ships (all sizes) in Svalbard increased after the pandemic to 81 in 2022 (Sysselmesteren, 2023).

Any maritime operation in the Arctic is faced with large risk challenges due to remoteness to resources, extended night and day, extreme air and water temperatures (topside icing, hypothermia, rope handling, equipment failure), ice actions, severe and unpredictable and rapidly changing weather conditions, uncertain communications, challenging rescue and medivacs, polar bear and other wildlife safety. This additionally stresses on-board resources for small, expedition yachts with often short-handed crew, starting with proper vessel designs and equipment choices, self-reliance, redundancy, training, and local experience build-up.

A new geopolitical security development also means that the authorities increase their surveillance on vessels of all kinds. Collectively, pressures from climate change, tourism intensity, and geopolitical security increase regulation demands on small (max 12pax) and medium-sized (12-200 pax) commercial expedition yacht operators. The latter (through AECO and individual operators) has recently articulated in a number of government letters that their operations, being both environmentally sustainable, with good ecological stewardship and arctic awareness educational to clients, are not properly taken into account, and proposed regulations are counterproductive. It shows an apparent conflict of interest, while both sides argue for the same goals of protecting and conserving the Arctic ecosystems. A better dialogue to avoid conflicts of interest may open up a better understanding and development of responsible protocols from expedition cruises.

This is recognized by environmental government agencies as well as supervision authorities, who in regions of the Arctic, e.g. Svalbard, are strongly tightening up access to protected areas (Sysselmesteren, 2023) (Norwegian Gov. 2024). Love and care for wildlife and nature is the core of what many of the eco tourism, small-scale tour operators are articulating, and that is that their operational goals are the same as authorities. They also argue that limiting their clients' wildlife experience opportunities is neither scientifically justified nor proportionally motivated. Thus, there has been a growing lack of trust and respectful dialogue rather than co-creating better environmental conservation goals and regulations. Small entrepreneurs articulate that their decades of practical experience and operational needs are not heard, and the actors talk passed each other. There are examples, from the Swedish-Norwegian marine National Park Koster-Hvaler, where fishermen, management, and researchers co-create the regulations and supervision, and a much higher trust and respect for each other have been achieved, while still allowing certain utilization, e.g. small-scale shrimp fishing, in the national park.

The monetary aspect is not the only positive driving force in arctic tourism development, according to the study of Chen et al., 2021, but cultural proliferation and community development may be as important for the local communities, while environmental degradation and social disturbances are key negative factors to minimize.

Small-scale eco tourism is both a way for small local entrepreneurs to offer an exclusive experience to clients rather than the mass tourism industry, and additionally, a way to

increase arctic awareness and even life-transforming experiences that stick, which may lead the clients to go home as “arctic ambassadors”.

Citizen science is a newer form of open participatory science where the general public is invited and embraced in studies of, e.g., their surroundings. It not only can contribute valuable data, but at least as important, increase interest, awareness, engagement, and stewardship of the environment of study. It can also provide added value and purpose to clients and participants. Here is proposed to build on the UN Decade of Ocean Science for Sustainable Development project, Sailing4Science, to co-create citizen science opportunities with sailing expedition tour operators that have some previous experience in this.

This decade is appointed as the UN Decade of Ocean Science for Sustainable Development, and the officially endorsed project Sailing4Science is the core of this proposal. Small-scale sailing tour operators in the Arctic provide low-footprint operations and connect people to the fragile environment that no big cruise ship can. Our project aims to bring small-scale (<12pax) sailing operators together, connecting with science, to build best practices for sustainable and safe operations in the area and give the ever-increasing fleet a common voice in the meetings with new rules and regulations.

The Arctic is experiencing worsening environmental change. Mass tourism, in the form of large cruise ships, contributes to this spiraling trend. Small-scale tour operators have a much smaller environmental impact and can also function as platforms for citizen science. Our project aims to develop sustainable opportunities for small-scale sailing tour operators, in balance, in tune, and in time with the development of necessary rules and regulations, as well as for the protection of the region. Our community of small-scale operators will take on the role of a joint platform when voicing concerns and responding to regulatory proposals.

1. The Arctic Region (by Jon A)

The Arctic is a vast, fragile, and climatically extreme region that plays a critical role in global climate regulation and biodiversity. Its future hinges on sustainable management and international efforts to address environmental changes and protect its indigenous cultures and ecosystems.



Source: Wikipedia/CIA World Fact Book - File:Arctic.svg, from the CIA World Fact Book

The Arctic is a region located at the northernmost part of Earth, centered around the North Pole. It is characterized by its unique environmental, geographical, and climatic features. It can be defined and described in different ways.

Geographical Definition

The Arctic is generally defined as the area north of the Arctic Circle (approximately 66.5°N latitude). This includes parts of eight countries: Canada, Greenland (Denmark), Iceland, Norway, Sweden, Finland, Russia, and the United States (Alaska).

The geography has also defined the members of the Arctic Council. The Arctic Council is the intergovernmental forum promoting cooperation, coordination, and interaction among the Arctic States, Arctic Indigenous Peoples, and other Arctic inhabitants on common Arctic issues, in particular on issues of sustainable development and environmental protection in the Arctic.

The council was formally established in 1996, and all decisions and statements require consensus of the eight Arctic States.

Climatic Definition

The Arctic is known for its cold, harsh climate, with long, frigid winters and short, cool summers. It is home to phenomena like the midnight sun (24-hour daylight in summer) and polar night (24-hour darkness in winter).

Ecological Definition

The Arctic encompasses diverse ecosystems, including tundra (treeless, frozen plains), sea ice, glaciers, and boreal forests at its southern edges. It supports unique wildlife such as polar bears, Arctic foxes, reindeer, walruses, and various marine species.

Oceanic Definition

The Arctic Ocean, the smallest and shallowest of the world's oceans, is a central feature of the region. It is largely covered by sea ice, which plays a critical role in regulating the global climate.

Cultural Definition

The Arctic is home to Indigenous peoples, such as the Inuit, Sami, and Nenets, who have lived in the region for thousands of years and have rich cultural traditions tied to the land and sea.

Scientific Definition

The Arctic is a key area for studying climate change, as it is warming at more than twice the global average rate. This has significant implications for sea ice melt, global sea levels, and weather patterns.

[should we include something about arctic attraction for explorers, adventurous minded, a destination tourism and researchers?

[new geopolitical stress...

In summary, the Arctic is a complex and dynamic region defined by its location, climate, ecosystems, and cultural significance, playing a critical role in global environmental systems.

2. Locals and cultural heritage (by Eelco L)

Local and indigenous peoples, along with their cultural heritage, are crucial for Arctic environmental conservation. Their traditional knowledge, cultural values, and advocacy foster sustainable practices, strengthen protection efforts, and serve as a vital link between cultural preservation and ecological health. The inherited knowledge goes back centuries and is often of crucial value for researchers.

At the same time, the climate crisis and other existential threats have a great impact on indigenous peoples. As WWF (one of the leading NGO's working in the Arctic) points out: For people living in the Arctic, climate change is not a distant threat—it is the driving force in many of the environmental, economic and societal transitions affecting the region today. These impacts are especially hard on Indigenous communities.

Perhaps even more important is the viewpoints from ICC, the Inuit Circumpolar Council, that Inuit are not mere stakeholders but rights holders and seek full and effective participation in conventions, multilateral agreements, and international fora where their rights, culture, and way of life are impacted.

Climate crisis and the Arctic

As climate change melts sea ice and global curiosity about the polar regions grows, the Arctic has become an increasingly popular destination for adventurous travellers. Both tourism and research have become very popular, so Arctic indigenous communities have seen an increasing number of people coming in from the South. Pristine landscapes, rare wildlife, and the allure of witnessing the Northern Lights draw thousands of tourists to the Arctic Circle every year. Yet this influx raises critical questions about the sustainability of Arctic tourism, particularly its impact on Indigenous communities who have inhabited these lands for millennia.

The Arctic is home not only to breathtaking vistas but also to more than 40 distinct Indigenous groups, including the Sámi, Inuit, Chukchi, and Yupik peoples. These communities possess deep, ancestral knowledge of their lands and have historically lived in harmony with nature, relying on fishing, hunting, and herding to sustain their way of life. Although large scale tourism, such as with big cruise ships has a larger footprint than small scale tourism, even the smallest sailboat can lead to disruption of traditional practices and degrade the environment. From cruise ships docking in remote villages to tourists or researchers wandering into sacred areas, the consequences can be profound if not properly managed.

Various challenges of Arctic Tourism

1. Environmental Impact:

The Arctic ecosystem is incredibly fragile. Tourism can contribute to pollution of aquatic ecosystems and the air and increased foot traffic and boat landings can damage tundra vegetation and disturb sensitive breeding grounds for birds and marine mammals.

2. Cultural Erosion:

The commercialization of Indigenous cultures—whether through staged performances or commodified souvenirs—can dilute their authenticity and exploit traditions. Misrepresentations or insensitive behaviour by tourists and researchers can offend or harm community cohesion.

3. Economic Inequality:

While tourism can bring economic opportunities, the benefits often do not reach Indigenous communities. Outsiders may control most of the revenue-generating ventures, leaving local people with low-wage service jobs or none at all.

Toward Respectful and Sustainable tourism and research

To mitigate these challenges, Arctic tourism and research programs must evolve into a more ethical and inclusive industry—one that centres Indigenous voices and fosters genuine partnerships. Sailing for Science suggest the following elements for respectful arctic tourism:

1. Involve indigenous communities in both research and tourism ventures in their waters and on their lands. This ensures cultural integrity and allows locals to benefit economically.
2. Cultural Sensitivity Training: Tour operators, researchers and tourists alike should learn about Indigenous customs, traditions, and protocols before setting off to Arctic destinations. Understanding cultural taboos, such as restricted areas or the significance of certain practices, is crucial for respectful engagement.
3. Environmental Stewardship: Boat owners and, operators, and researchers should adopt strict sustainability guidelines, including waste reduction, carbon offsetting, and wildlife protection. Tourists and scientists involved should be encouraged to follow "leave no trace" principles and participate in conservation efforts.
4. Policy and Regulation: National and local governments can play a key role by establishing regulations that require consultation with Indigenous communities and enforce sustainable practices. They can also invest in infrastructure that supports community-led tourism and involvement of indigenous people in research, without compromising traditional lifestyles.

The Association of Arctic Expedition Operators (AECO) has developed a set of instructions and guidance for tourist operations in the Arctic, among others:

- Engage the people and cultures with respect; an open mind leads to the best experiences.

- Talk to, and not about, the people you meet.
- Please always respect privacy and private property, and places of religious or cultural significance

When it comes to research, it needs to be agreed upon how Indigenous people can benefit from the research and what exactly will be given in exchange for people's participation and involvement. Also, Indigenous peoples should have access to leading roles in the overall research process, with proper remuneration and support for capacity building.

A Shared Responsibility

Travelers – whether for leisure or for work - to the Arctic have a responsibility to be mindful guests—curious but considerate, adventurous but aware. Involving Indigenous persons in the activities, respecting local norms, and minimizing environmental impact are simple but powerful ways to support ethical Arctic research and tourism.

For Indigenous communities, the influx of Southern researchers and tourists offers both a challenge and an opportunity. If approached with respect, collaboration, and a commitment to sustainability, Arctic expeditions can become a tool for cultural preservation, economic empowerment, and environmental advocacy.

In the end, the Arctic is not just a destination. It is home—alive with stories, knowledge, and a deep connection to the land. Let us tread carefully and listen deeply, ensuring that research and tourism enrich rather than erode the beauty and resilience of the Arctic and its people.

Sources:

<https://old.aeco.no/guidelines/community-guidelines/community-guideline/>

<https://arctic-council.org/projects/arctic-marine-tourism-development-in-the-arctic-and-enabling-real-change/>

<https://www.inuitcircumpolar.com/project/policy-paper-on-the-matter-of-local-communities/>

<https://phaidra.univie.ac.at/detail/o:1653557>

<https://www.arcticwwf.org/our-priorities/arctic-communities/>

3. Small-scale tourism in the Arctic (by Jon A)

Small-scale tourism, when carefully planned and embedded in local contexts, can promote sustainable economic growth, cultural preservation, environmental awareness, and stewardship in the Arctic. It provides a pathway for communities to benefit directly while contributing to the region's protection/development for future generations.

Small sailing yachts can play a unique and impactful role in combining citizen science and gentle tourism to foster a better understanding of the environmental challenges in the Arctic. Here are some examples of how they can achieve this:

Promoting Sustainable Tourism Practices

- **Low-Impact Operations:** Use eco-friendly practices like minimizing waste, reducing fuel consumption, and avoiding sensitive areas to set an example of sustainable tourism.
- **Awareness Campaigns:** Educate tourists about the fragility of Arctic ecosystems and the importance of conservation, inspiring them to advocate for environmental protection.

Documenting and Sharing Experiences

- **Storytelling:** Encourage tourists to document their experiences through photos, videos, or blogs, highlighting the beauty of the Arctic and the environmental challenges it faces.
- **Social Media Engagement:** Use social media to share findings and raise awareness about the Arctic's changing environment, reaching a broader audience.

Supporting Local Communities

- **Collaboration with Indigenous Groups:** Work with Indigenous communities to incorporate traditional ecological knowledge into citizen science projects, fostering mutual learning and respect.
- **Economic Benefits:** Support local economies by sourcing supplies and services from Arctic communities, ensuring tourism benefits the region sustainably.

By combining citizen science with tourism, small sailing yachts can transform tourists into active participants in Arctic conservation, fostering a deeper understanding of environmental challenges and inspiring global action to protect this fragile region.

4. Respect for the Arctic wildlife (by Belen G)



The Arctic is a uniquely fragile and dynamic biome, home to some of the planet's most iconic and vulnerable wildlife species—including polar bears (*Ursus maritimus*), walrus (*Odobenus rosmarus*), narwhals (*Monodon monoceros*), and numerous seabirds whose life cycles are intricately tied to sea ice and seasonal productivity. In recent decades, this region has experienced accelerated environmental change due to anthropogenic climate forcing, with profound implications for biodiversity, ecological balance, and the resilience of indigenous subsistence communities.

Respecting the Arctic and its wildlife is not merely a matter of ethical environmentalism; it is a prerequisite for safeguarding ecological integrity and ensuring the continued viability of a biome that functions as both a climate regulator and a sentinel for global change.

Arctic species are highly specialized, evolved to survive in narrow environmental niches. Even marginal disruptions to their behaviors, such as disturbances from vessel noise, close-range observation, or habitat degradation, can lead to long-term deleterious effects, including stress-induced reproductive failure, migration pattern alterations, and increased vulnerability to predation or starvation. For this reason,

**Small-Scale Sailing Tours Operators:
Frontline Ambassadors for Marine Conservation**

Small-scale sailing tour operators, in contrast to large cruise ships, hold a distinct and strategic position within the conservation hierarchy. Their inherently lower ecological footprint—enabled by slower cruising speeds (typically under 10 knots), smaller passenger groups, wind-assisted propulsion, and enhanced navigational agility—provides them with a unique capacity to implement, model, and advocate for low-impact marine practices.

These operators are exceptionally well-suited to offer customized, exclusive, and immersive experiences that allow individuals to meaningfully reconnect with nature. When guided by passion, deep local knowledge, and a commitment to place—rather than solely by commercial gain—such operators often prioritize environmental stewardship. In doing so, they help cultivate ecological awareness and foster a more nuanced understanding of the Arctic’s sensitive and rapidly changing ecosystems.

By adhering to a framework of precautionary navigation—including reduced speeds in ecologically sensitive zones, strict observance of exclusion distances around marine mammals, and the integration of noise-mitigating technologies—these operators can significantly reduce the risk of anthropogenic disturbance. In this way, they not only minimize their environmental impact but also actively contribute to the long-term preservation of Arctic biodiversity.

Education and citizen science as a Catalyst for Stewardship

When equipped with best practices and driven by a conservation ethos, they can serve as both protectors and educators, helping ensure that Arctic wildlife endures not just as a spectacle, but as a thriving component of a resilient and interconnected biosphere.

Integrating citizen science and biodiversity monitoring programs, such as passive acoustic monitoring and wildlife sighting logs, can contribute valuable data to community-based research initiatives, fostering a model of participatory conservation science.

Furthermore, small-scale operators play a critical role in marine conservation education. Through interpretive guiding and experiential learning, they have the power to translate abstract environmental issues into emotionally resonant narratives. Educating passengers about trophic cascades, ice-albedo feedbacks, and the cultural significance of Arctic megafauna can foster a deeper ecological awareness and cultivate a culture of respect and reciprocity, rather than passive consumption.

Operators who embrace this dual role—as both facilitators of awe and mediators of understanding—can reshape the tourism experience into one that not only minimizes harm but also mobilizes support for broader conservation goals. With tailored onboard programming, partnerships with local Indigenous knowledge holders, and multilingual educational resources, small-scale tours can become floating classrooms that bridge scientific insight with cultural knowledge systems.

5. Human behaviour onshore (by Rani H)

Human behavior onshore – through lifestyle choices, advocacy, and responsible actions – can contribute significantly to mitigating climate change, reducing pollution, and promoting conservation in the Arctic, helping preserve its unique ecosystems for future generations. The Arctic is a unique tourism destination with a remarkably increasing annual growth of visitors, estimated up to 8.3 million tourists per year.

At the same time the Arctic is under a lot of pressure from external climate factors, increasing water temperature causing the ice to melt, pollution of plastic and harmful substances is just a few to mention.

The existing pressure is only enhanced when large cruise ships make their visits to the Arctic, wishing to explore local villages and extraordinary nature landscapes. It might seem harmful but in the long run it is a vital threat.

The rather small communities in the Arctic are not prepared to facilitate such a high number of visitors with a not well developed infrastructure and adaptations for dealing with sewage, solid and liquid waste streams and recycling. Extended producer responsibility is not fully applicable in the arctic due to lack of circularity and waste and recycling logistics, and therefore extended user responsibility needs to be developed; meaning, if you generate “waste” in the arctic, you should be responsible to bring it out of the arctic also. By always having in mind the responsibility to make sure that the produced waste gets handled properly, the pressure on fragile communities can be minimized notably. However when not being able to throw away the waste at a somehow regular (and conventional) schedule/pace, the planning and structuring is playing a key role to minimize the generated waste to only what's absolutely necessary.

A way to contribute to the solution can be aiming to maintain a zero waste vision with everything including food, greywater, sewage, packaging emballage and so on. In order to maintain a low waste generating mentality the importance of being aware of resource usage and how to distribute it.

With plastic pollution possessing a severe threat to ocean health, its species and habitats we are well convinced that we need to continue to advocate and work towards minimizing the pressure that plastic pollution and marine debris causes.

Advocacy through spreaded actions and messages.

Currently many coastal waters are suffering from eutrophication which is a result of too high levels of nutrients, and organic matter loads from sewage water, agriculture, forestry and industrial effluents, causing massive algae blooms, oxygen depletion (anoxia) and consequently dead bottoms and loss of fish and wildlife.

To pursue sustainable behavior, onshore green boating actions and ideas come very handy.

6. Safety and protection in the Arctic (by Henrik E)

Safety and protection in Arctic waters are vital for preserving human life, safeguarding the environment, and ensuring sustainable use of this fragile region. Proper planning, specialized equipment, crew training, and strict adherence to regulations help mitigate the challenges posed by the Arctic environment, enabling safe and responsible navigation in these pristine waters

Any maritime operation in the Arctic with inherently higher hazards and risk factors, higher safety margins must be built into the operation. Hazards related to hypothermia, collisions with ice and cold climate sailing operation combined with remoteness to resources, search and rescue, medical evacuation, protected harbours, poorly charted waters, limited communication, quickly changing weather with limited weather and ice forecasts, magnetic compass anomalies etc build a high risk profile that need to be minimized and managed.

Extended night and day hours and extreme air and water temperatures make up the prerequisites for multiple issues to occur that are mostly common in high latitudes and cold waters, such as topside and deck icing, hypothermia, frozen rope handling, and equipment failure due to cold temperatures. Finally, the wildlife itself, with polar bears, also poses special safety precautions. Combined, this additionally stresses onboard resources for small, expedition yachts with often short-handed crews, starting with proper vessel designs and equipment choices, self-reliance, redundancy, training, and local experience build-up.

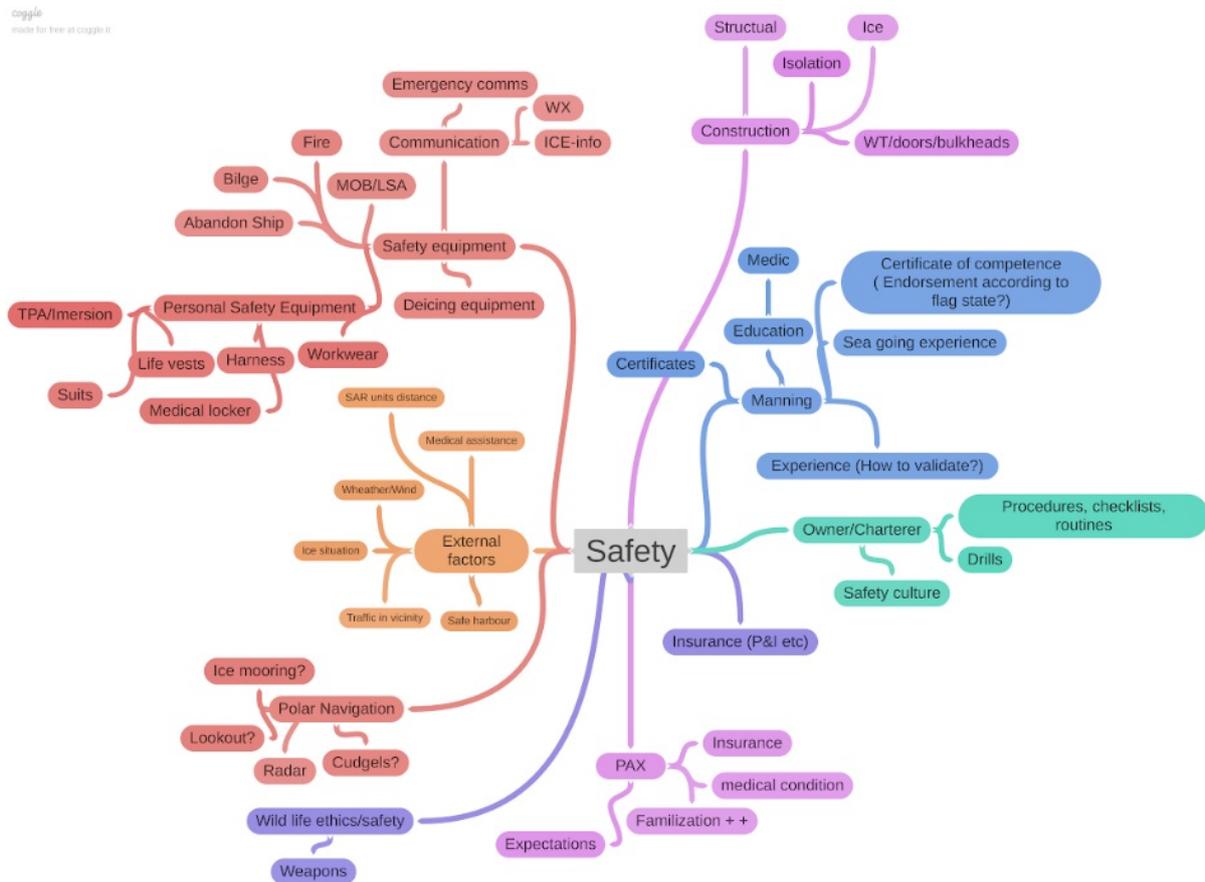
Small commercial sailing vessels as well as leisure boats are not obliged to follow the IMO Polar code in full, and the formal regulations applicable to ship construction, life-saving appliances, and training and certification of crew often vary between flag-states and are not always applicable or fit for purpose.

We gathered some experienced sailors and held a workshop regarding these matters.

Structuring small yacht polar sea safety aspects

Many diverse dimensions play important roles in polar operations for small vessels and crew, and the outcome of literature reviews, expert elicitations, and interviews emphasized the need for structuring these considerations.

We made a nested structure tree and worked out of this. The figure is shown below:



Summarizing the small sailing yacht practitioners' perspective on polar sea safety

- Safety Mindset** Instead of relying solely on formal checklists and the latest equipment, as the shipping industry is so full of those days, we instead discussed how to establish a reflective and adaptable safety culture for the entire crew. It has to start before the planning of the voyage. This includes but is not limited to:
 - Structured briefings and debriefings
 - Open discussion and feedback loops
 - Pre-departure checks that encourage understanding, not just repetition. Everyone needs to be involved
 - Flexible thinking in the face of changing conditions Creating space for reflection and situational awareness allows crews to respond dynamically to unpredictable challenges, be it shifting ice, sudden fog, or interpersonal fatigue.
- Practical and Adaptable Equipment Philosophy** Instead of relying on theoretical gear lists, we reviewed equipment through the lens of practicality, durability, and actual usage. Examples include:
 - Balancing immersion suits with usability in daily routines. If not practically it will not

be used.

- Selecting flotation aids that offer both thermal insulation and reliability
- Evaluating drones and thermal cameras as real-time decision aids
- Prioritizing gear redundancy for navigation, communication, and emergency recovery

We emphasized that "fit-for-purpose" may differ by vessel size, crew capacity, and mission type, and therefore requires local adaptation, not rigid standardization.

3. Self-Reliance through Preparation

In regions where support is limited or non-existent, redundancy and preparedness are extremely important. This means:

- Training the crew for multiple roles and duties
- Maintaining comprehensive spare parts and repair capability
- Equipping for life onboard under prolonged delays or isolation
- Establishing DPA (Designated Person Ashore) support and communications fallback options, as shipowners/operators in the larger shipping segment already does.

The philosophy is simple: plan as though help is not coming. This informs everything from medical preparation to what gear to use to weather routing.

4. Voyage Planning as a Living Process

We approached voyage planning not as a fixed document but as a continuous cycle. Elements include, but are not limited to:

- Regular updates using satellite forecasts and ice imagery
- Real-time feedback from on-water observations
- Planning fallback ports and shelter options
- Medical background forms for each person onboard

This approach supports constant awareness and adaptation, rather than rigid adherence to outdated plans.

Many of our conclusions from the meeting echoed the Yacht Polar Guide's principles: the need for self-reliance, the prioritization of crew competence, and the importance of ethical conduct. However, our approach places strong emphasis on dialogue, lived experience, and scenario-based planning. We believe these human elements are what transform safety theory into safety practice.

7. In balance with modern values (by Bodil F)

Tourism trends in the Arctic show a rapid increase in cruise tourism over the last two decades across the whole Arctic (Lamers 2010; Bystrowska, 2019; Dawson et al., 2018), and authorities are adapting regulations to balance tourism business with conservation goals (Hovelsrud et al., 2021 & 2023).

Small-scale sailing tour operators in the Arctic provide low environmental footprint operations and connect people to the fragile environment, in a manner that no big cruise ship can compete with.

Science has shown a positive effect on human well-being from blue-green-white nature immersive experiences (Olive & Wheaton, 2021; Sokolíčková et al., 2021).

An offer to clients to experience a low footprint, life-changing Arctic experience near nature and cultural heritages, in a safe and eco-responsible manner, should be considered a sustainable development of Arctic tourism and an attractive alternative to mass tourism. Small commercial vessel operators (<24m, <12PAX) are not adequately considered in legislation, statistics or guidelines, sometimes mixed with the expedition cruise ships and sometimes mixed with private leisure boats (World Sailing, 2012; AECO 2023, Port Longyear personal communication). This small scale experience rich vessel segment, should be considered, developed and supported since it is the least intrusive opportunity for sustainable arctic immersive experience tour modus.

Existing Guidance on Sustainable Boating Practices

A substantial body of literature and practical resources exists on the subject of ocean protection and environmentally responsible boating practices. Several prominent organizations have published guidelines and frameworks aimed at promoting sustainability within the maritime leisure sector.

The [World Sailing organization](#), for example, has developed the Guide to Sustainable Sailing Clubs, which provides training and guidance grounded in the United Nations Sustainable Development Goals (SDGs) for 2030. This guide offers practical recommendations for sailing clubs to align their operations with global sustainability objectives.

[Sailors for the Sea](#), a leading international ocean conservation organization, actively engages the sailing and boating community in efforts to restore ocean health. Through education and advocacy, the organization has created the Go-To Guide for Eco-smart Boating, a comprehensive resource for adopting sustainable boating practices.

[The International SeaKeepers Society](#) also plays a significant role in promoting marine conservation. By fostering collaboration with the yachting community, the organization supports oceanographic research, education, and preservation initiatives. It has published the

Green Guide to Boating, which outlines best practices for reducing the environmental impact of recreational boating.

Rather than rewrite existing guides a summary has been provided below:

- **Energy Efficiency:** Opt for fuel-efficient engines and consider hybrid or electric power options to reduce emissions. Use renewable energy sources for charging batteries.
- **Waste Management:** Implement a waste disposal system, including holding tanks for sewage, and recycling practices for plastics and other materials.
- **Pollution Prevention:** Conduct regular bilge inspections and quickly address any required maintenance and use bilge sock to absorb, remove oily water at a bilge pumpout station. Whenever possible, use shoreside facilities for showering, laundry, dishwashing, etc. If this is not possible, treat graywater as if it were sewage, and only discharge if you're at least 3 miles offshore.
- **Eco-Friendly Cleaning Supplies:** Use biodegradable and non-toxic cleaning products to minimize chemical runoff into waterways.
- **Sustainable Practices:** Follow the "leave no trace" principle, ensuring that all waste is removed and natural environments are protected.
- **Water Conservation:** Utilize water-saving devices such as low-flow faucets and showerheads, and be mindful of fresh water usage.
- **Sustainable Materials:** Choose eco-friendly materials for boat construction, maintenance and repair. Green your galley with sustainable materials onboard.
- **Food provisioning:** Research beforehand and plan food provisioning and buy locally and sustainable food reducing waste and lowers the carbon footprint. Pre-prepare the food instead of buying pre-prepared foods.
- **Wildlife Protection:** Be aware of local wildlife regulations and avoid anchoring in ecologically sensitive areas or disturbing marine habitats. For longer journeys be aware that the vessel can carry fouling organisms (such as barnacles, seaweeds and mussels) to another location and become invasive species there. Take proper actions to prevent this.
- **Carbon Offsetting:** Consider investing in carbon offset programs to compensate for carbon emissions from boating activities.
- **Regular Maintenance:** Keep the vessel well-maintained to improve efficiency and reduce pollution; this includes checking for leaks and ensuring the engine is running optimally.
- **Education and Awareness:** Stay informed about environmental regulations and best practices in sustainable boating, and share this knowledge with peers.

What has been done so far by our project members

In this we are addressing some of the activities carried out by the project team members.

Exploring a zero waste lifestyle

(Bjorn B complimentary text)

Development of a Carbon Footprint Calculator for Small-Scale Sailing Tour Operators

In order to assess environmental impact and support improvement efforts, it is essential to first establish and understand the starting point, that is one's baseline.

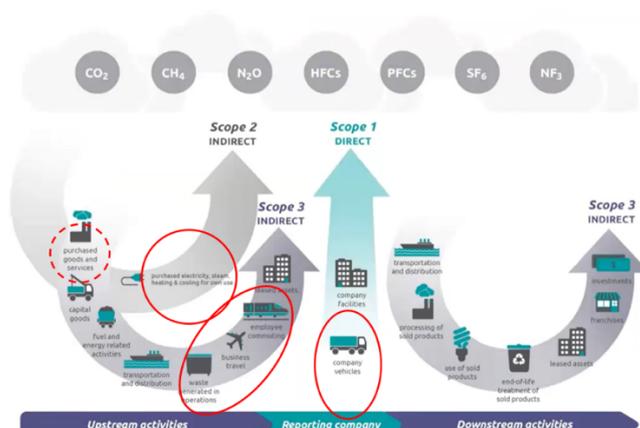
Assessing the carbon footprint of individual lifestyle choices is essential for understanding and mitigating personal contributions to climate change. Several online calculators exist to estimate carbon dioxide equivalent (CO₂e) emissions based on daily activities. However, most of these tools are designed for general purposes and do not address the specific conditions or operational realities of boating. Moreover, they often lack a holistic approach. As such, there is a clear need for a carbon footprint calculator tailored specifically to small-scale sailing tour operators.

To address this gap, Ocean Ladies undertook the development of a specialized carbon footprint calculator designed for the operational profile of a small-scale sailing tour operator. This work is grounded in the methodological framework provided by the [Greenhouse Gas \(GHG\) Protocol](#), which offers globally recognized standards for quantifying and managing greenhouse gas emissions across public and private sector activities, value chains, and mitigation strategies. Although Ocean Ladies is a non-profit, membership-based organization, it operates in a manner comparable to a small-scale tour operator and is thus a relevant case study.

During the initial implementation phase in the 2024 sailing season, Ocean Ladies personnel participated in relevant training on the GHG Protocol. Concurrently, foundational data were collected to determine the emission sources that should be included in the calculator. A preliminary version of the calculator was developed using Excel and incorporates key emission sources relevant to the operation of a small-scale sailing tour. It should be noted that vessel maintenance and repair activities were excluded from the scope of this first-year effort.



Scopes in corporate reporting



The picture above shows which sources were considered in the basic year 1:

- GHG protocol Scope 1
 - Own vehicle fuel usage (boat diesel)
 - Own vehicle oil usage (oil for boat diesel engine)
 - Use of gas in the gally
 - Direct wastewater disposal (grey and black water)
- GHG protocol Scope 2
 - Shore power while in harbour
- GHG protocol Scope 3
 - Food sources (main protein)
 - Red meat
 - Chicken
 - Fish
 - Vegetarian
 - Cheese
 - Waste management
 - Organic waste
 - Residual waste
 - Plastic waste
 - Wastewater
 - Septic tank to shore (black water)
 - Dish water to shore (grey water)
 - Travel to the sailing legs
 - Domestic flights
 - Short-haul international flights
 - Long-haul international flights
 - By Train
 - By Sea
 - By Car
 - By Bus
 - other (electric car)

During the baseline year, it was not possible to quantify shore power consumption due to the absence of suitable measurement equipment. Similarly, the amount of waste generated was estimated, as an appropriate scale was available at the time of data collection. Food provisioning data were limited to the primary source of protein only.

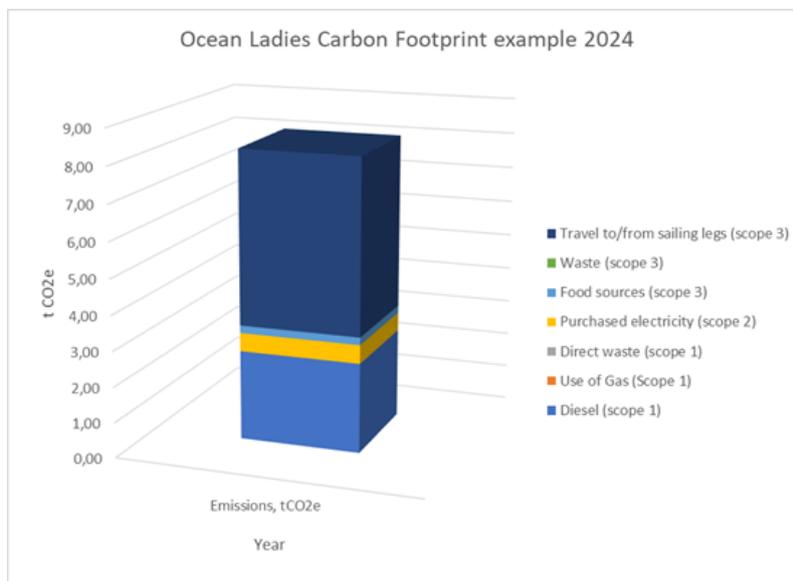
In strict adherence to the Greenhouse Gas (GHG) Protocol, travel-related emissions would be excluded from a report, as they fall under the responsibility of individual members. However, for small-scale sailing tour operators, such data may still be relevant in broader environmental assessments and was thus included in the data collection.

As the data collection during the baseline year was conducted in the Baltic Sea, estimates were also made for direct offshore wastewater discharge. While this factor does not directly

contribute to carbon footprint calculations, it is highly relevant from a green boating perspective. The Baltic Sea's unique characteristics—such as low salinity, shallow depth, and limited total water volume—render it particularly susceptible to eutrophication.

Data were collected from 75% (12 out of 16) of all sailing tours conducted during the baseline year. Analysis of the collected data indicates that energy consumption and travel are the primary contributors to the overall carbon footprint. Nonetheless, other aspects remain significant when considering sustainable boating practices more broadly.

The figure below presents a preliminary distribution of the carbon footprint based on the currently available data. However, it should be noted that the data collection process does not fully comply with the five principles of the GHG Protocol—Relevance, Completeness, Consistency, Transparency, and Accuracy. Some data points are based on estimates due to the absence of appropriate measurement equipment, and data from all tours were not comprehensively collected.



		Emissions/ unit, tCO2e	Emissions/ unit, without travel, tCO2e	
Nautical miles	4000	0,00205	0,00082	tCO2e/nm
Persons	91	0,09	0,04	tCO2e/pax
Days at Sea	74	0,11	0,04	tCO2e/days at s
Legs	12	0,68	0,27	tCO2e/leg

Planned Measures to Enhance Data Accuracy

To improve the accuracy of future data collection efforts, the following measures will be implemented:

- Acquisition of appropriate measurement equipment for monitoring shore power usage.
- Procurement of a scale for accurate waste measurement.
- Comprehensive data collection on all food sources, not limited to the main protein;
- Inclusion of all sailing tours in data collection activities.

Additional Initiatives to Promote Green Boating Practices

In support of broader sustainability goals, the following measures will also be undertaken:

- Replacement of the existing diesel engine with a new, more efficient model;
- Modernization of the vessel's electrical system to facilitate the use of solar and wind energy;
- Promotion of carbon offsetting by encouraging members to contribute to verified emission reduction projects.

Sustainability Food Provisioning for the sailing tour

Food is one of the three largest contributors to environmental impact. A critical factor in evaluating the environmental effects of food is the method of its production. This includes how the food is cultivated, fertilized, harvested, and processed.

The carbon footprint of food arises primarily from greenhouse gas emissions generated throughout the food supply chain. Key contributors include the production, transportation, storage, processing, and packaging of food items. In addition to greenhouse gas emissions, food production can significantly contribute to eutrophication of the sea.

Food production also has a substantial water footprint. Furthermore, environmental impact is influenced not only by the production chain but also by how food is prepared.

Finally, food waste represents a major and unnecessary environmental burden. When edible food is discarded, the environmental impacts associated with every stage of its production—farming, processing, transportation, and storage—are rendered futile.

Checklist for a Clean Sea: Sustainable Food Practices onboard:

- Research beforehand and plan food provisioning and buy local products – this supports rural areas and small-scale producers.
- Prefer local products and ingredients that are in season.
- Use local fish and aim to include fish in your meals at least twice a week.
- Eat vegetarian meals regularly, ideally daily, with an emphasis on plant-based proteins.
- Eat meat less frequently and in moderation.
- Use plant-based margarines and include seeds and nuts in your diet.
- Plan your shopping list in advance and use a reusable shopping bag.
- Store food properly and return items to refrigeration as soon as possible to prevent spoilage.
- Store fruits and vegetables in mesh bags – remember that many items (e.g., bananas, apples, and tomatoes) emit ethylene, which accelerates ripening of other produce in the same bag.
- Make use of dry goods and canned products that can be stored at room temperature.
- Keep track of the contents of your pantry to avoid unnecessary purchases.
- Do not throw away food – make use of leftovers.
- Favour reusable packaging.

State of the Arctic environment in terms of small expedition operators/leisure sailing

What are the possibilities in the Arctic region for Green Boating?

Green boating must be pursued in all respects; however, full implementation of its principles is not possible unless the region is adequately prepared to support them. Shore-based infrastructure must be capable of handling segregated waste, recycling, greywater, and blackwater. Harbour facilities must also be equipped to serve small expedition operators and leisure sailors, including access to septic tank stations, waste management systems, and dishwashing provisions.

In addition to further developing the carbon footprint calculator, the project will assess the readiness of harbour facilities in the Arctic region to support small-scale tour operators. Developing the harbour facilities in the Arctic region must also be done in respect of the local communities and involving Indigenous people in the activities.

The project will also explore food provisioning solutions in line with zero-waste principles.

8. Citizen Science (by Bjorn B)

Citizen science enhances scientific knowledge, supports conservation, and fosters a sense of shared responsibility for the Arctic's future. By harnessing the power of local communities and international participants, we can better understand and respond to the rapid environmental changes in this critical region.

How can citizen science be a valuable resource for conscious development in the Arctic region?

Unfortunately, we can not assume that every new visitor in the Arctic region is aware of the sensitive area they are entering. But we can assume that a majority of the visitors – tour operators and their guests and clients – are at least fairly well informed.

The need for information for both categories is crucial. Understanding the status, the historic legacies, the sensitive habitats for all life, and the local communities' needs for respect and consideration is vital.

Inspiring visitors to understand the respect needed from visitors is an efficient way to raise awareness, rather than only demonstrate limitations, strict regulations and forcing feelings of guilt onto visitors as non-welcomed “trespassers” (study XYZ).

Citizen science is a growing phenomenon with good results and valuable changes of attitudes and behaviours. These changes occur thanks to a better understanding, appreciated engagement, and via ripple effects when sharing experiences. Citizen science assignments based on observation in nature also help visitors to be more aware of the current status of the surroundings around them and changes over time,

**“Tell me and I will forget.
Show me and I may remember
Involve me and I will understand.”**

Confucius (551–479 BCE) Chinese scholar and teacher

Observations collected by the general public and gathered onto open source data platforms helps ongoing research substantially. A citizen scientist's motivation is in general, spiked by an interest in a certain field and the desire to participate and be acknowledged. It can be as simple as just knowing that “the water temperature measurements we did around our sailboat while we were on holiday” is in fact valuable data for researchers and scientific studies about the development of the boat owner's community, as well as studies on the climate change development on the planet.

Examples of citizen science observation areas:

Citizen science from small yachts in the Arctic can make a meaningful contribution to a wide range of research areas. Given the mobility, flexibility, and access to remote areas that yachts provide, here are some suitable fields and types of assignments for Arctic citizen science:

1. Oceanographic and climate data

- Use of simple sensors (e.g., thermometers, refractometers, Secchi disks)
- Ice observations (thickness, coverage, photos)
- Drifter or buoy deployment

Parameters:

- Sea surface temperature
- Salinity
- Water clarity/turbidity
- Ocean currents
- Sea ice extent and type

Programs/Receivers of data:

- Saildrone (collaboration possibilities)
- Smartfin (adapted sensors for small craft)
- Arctic Observing Network (AON)

2. Microplastics and marine debris

- Water sampling for microplastics using plankton nets (e.g., manta trawl)
- cleanup and debris cataloging
- Photo documentation and mapping of debris

Programs/Receivers of data:

- Adventure Scientists Global Microplastics Project
- International Coastal Cleanup (Ocean Conservancy)

3. Weather observations

- Logging atmospheric pressure, temperature, wind speed/direction
- cover and types
- Participation in weather balloon releases (in collaboration with institutions)

Programs/Receivers of data:

- Global Learning and Observations to Benefit the Environment (GLOBE)
- CoCoRaHS (precipitation reporting)

5. Glacier and ice observation

- Visual documentation of glacier fronts and iceberg calving
- GPS and photographic records of permafrost coastal erosion
- Snow depth measurements

Programs/Receivers of data:

- Glacier Photograph Collection (USGS)
- Permafrost Watch (community observations)

6. Water quality and plankton

- Collect and filter water for chlorophyll or nutrients
- Sample for plankton identification (microscopy or photos)
- pH and dissolved oxygen measurements

Programs/Receivers of data:

- Plankton Planet
- Earthwatch Institute ocean health projects

7. Marine wildlife monitoring

Species: Whales, seals, polar bears, seabirds

Tasks:

- Sightings logs with GPS coordinates and photos
- Acoustic recordings (hydrophones) for whale/dolphin calls
- Behavioral observations
- Reporting strandings or unusual activity

Programs/Receivers of data

- Happywhale (whale photo-ID)
- Polar Bear Watch (WWF-supported community observations)
- eBird (global bird sightings)

8. Indigenous and community collaboration

While not a "field" per se, contributing to community science with Indigenous partnerships can be invaluable:

- Supporting traditional ecological knowledge (TEK) by logging changes in seasonal patterns, animal behavior, or environmental events
- Co-developing projects with Arctic communities (e.g., Inuit Circumpolar Council initiatives)

9. Lifestyle traveling and onboard lifestyle

- Fuel consumption
- Food
- Toxic free product alternatives
- Toxic free coating
- Sound pollution
- Marine life disturbance
- Traveling to and from the docking destination
- Zero Waste
 - Single use plastics and utensils
 - Toxic free cleaning and hygiene products
 - Options for the five R:s

- Recyclables collection opportunities in marinas
- Waste water handling
- Human waste water handling

Logistical Considerations for Yacht-Based Projects

- Space & Power: Ensure gear is compact and energy-efficient
- Connectivity: Satellite comms for data upload or coordination
- Permits: Respect local regulations, especially in protected areas
- Training: Basic training in sample collection protocols and safety
- Data Sharing: Use platforms like iNaturalist, ArcGIS StoryMaps, or open-access marine databases

9. UN Ocean Decade and the Arctic (by Martin H)

The United Nations has appointed 2021-2030 as the UN Decade of Ocean Science for Sustainable Development with the vision: The science we need for the ocean we want. It encompasses the six mission outcomes: A healthy, resilient, clean, productive, and safe ocean, and also a predictable, accessible, and inspiring ocean. To reach these goals there are ten focus challenges that is prioritized: Understand and beat marine pollution, Protect and restore ecosystems and biodiversity, Sustainably nourish the global population, Develop a sustainable, resilient and equitable ocean economy, Unlock ocean-based solutions to climate change, Increase community resilience to ocean and coastal risks, Sustainably expand the Global Ocean Observing System, Create a digital representation of the ocean, skills, knowledge, technology and participation for all, Restore humanity's relationship with the ocean.

The ocean decade is science based obviously, while it is different to many previous large scientific coordinations, in that its ambition is much clearer focused on a wide co-creation process, and ocean literacy as broad public education, ocean awareness and participatory processes are clearly articulated in the implementation plan and established subprogrammes and endorsed projects. Sailing4Science was one such project from the first round of endorsements, and the vision of Sailing4Science is to Unite Sailors and Scientists to surface deep ocean realities. Sailing4Science Arctic funded by NAPA is a realization of the vision by bringing together different professional sailing entities with an clear environmental engagement with scientists to share experiences and create a platform for conducting research and citizen science and spreading ocean awareness and commitments. There has been developed an Arctic Ocean decade implementation plan (REF), which emphasized fostering sustainable ocean management, protecting Arctic marine environments, advancing scientific research, and enhancing international cooperation to address climate change and human impacts in the Arctic region. Its goal is to support resilient and healthy Arctic ecosystems while promoting responsible economic activities and indigenous community well-being.

The UN Ocean Decade 2030 can significantly advance understanding, management, and protection of the Arctic Ocean by fostering international scientific collaboration, integrating indigenous knowledge, raising awareness, and promoting sustainable and innovative solutions for the region's future.

The proposed Sailing4Science Arctic community of practice will formulate protocols for environmental standards and stewardship, and will together with arctic research institutions co-create citizen science opportunities.

Citizen science is a newer form of open participatory science where the general public are invited and embraced in studies of e.g. their surroundings. It not only can contribute with valuable data, but at least as important increase interest, awareness, engagement and stewardship of the environment of study. It also can provide added value and purpose to clients and participants. Here is proposed to build on the UN Decade of Ocean Science for

Sustainable Development project Sailing4Science to co-create citizen science opportunities with sailing expedition tour operators that have some previous experience on this.

Development of activities such as beach cleaning and citizen science assignments give additional ocean and arctic awareness for participants and contributes to arctic research and conservation goals. There is a fragmented and resource-limited group of entrepreneurs addressed, that could only develop and be given a voice by pan-arctic cooperation, which we foresee could be started through a community of practice.

References

Riisager-Simonsen, C., & Stedmon, C. (Eds.) (2021). Ocean Decade - Arctic Action Plan. Danish Center for Marine Research