

DRAFT Arctic Action Plan

2021 – 2030

in support of the United Nations Decade for Ocean Science for Sustainable Development



**2021
2030** United Nations Decade
of Ocean Science
for Sustainable Development

Table of contents

Prologue	4
Summary of the Arctic Action Plan	5
The need an Arctic Action Plan	5
The Arctic Action Plan development process	6
Result of the Arctic process	7
Identified cross-cutting challenges for the Arctic in order to deliver Ocean Decade societal outcomes	7
Arctic objectives for the Ocean Decade 2021-2030	7
Action 1: E.g. Sustain monitoring of x in area y	8
Action 2:	8
Action 3:	9
The Arctic Action Plan roadmap	9
References	9
Appendix	10
Guiding documents and agendas used by working groups	10
A: NON-PAPER - scope of the process and the alignment between the Ocean Decade's societal goals international policies and initiatives in the Arctic	11
Introduction	11
Purpose of the non-paper	12
Spatial scoping	12
Funding of research, observation programmes and innovation	15
Recent key relevant publications	15
B: GUIDANCE TO WORKING GROUP CHAIRS	20
C: GUIDANCE TO WORKING GROUP PARTICIPANTS	21
D: GUIDANCE ON INTERPRETATION OF THE OCEAN DECADE SOCIETAL OUTCOMES - AND THE WORKING GROUPS FOCUS	23
Working group 1: How to achieve - A clean ocean where sources of pollution are identified, reduced or removed	23
Working group 2: How to achieve - A healthy and resilient ocean where marine ecosystems are understood and managed	24
Working group 3: How to achieve - A productive ocean supporting sustainable food supply and a sustainable ocean economy.	24
Working group 4: How to achieve - A predicted ocean where society understands and can respond to changing ocean conditions	25

Working group 5: How to achieve - A safe ocean where life and livelihoods are protected from ocean-related hazards	26
Working group 6: How to achieve - An accessible ocean with open and equitable access to data, information and technology and innovation.	27
Working group 7: How to achieve - An inspiring and engaging ocean where society understands and values the ocean in relation to human wellbeing and sustainable development.	28
List of participants and institutions which have provided input to the process	29

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Prologue

The United Nations Decade for Ocean Science for Sustainable Development (Ocean Decade) represents a milestone in modern efforts to rally global scientific and societal capacities around pressing societal challenges. But while the marine environment on planet earth may be viewed as one extended ocean, sustainable development represents highly complex place-based challenges spanning both environmental, economic and social dimensions. Actions to address these challenges, therefore demand considerable regional operationalisation to become relevant for stakeholders spanning both industry, governance and local communities.

Based on the recommendations in the global Ocean Decade implementation plan and with support from IOC Unesco, a series of regional workshops were encouraged in order to develop regional action plans. The initiative for the Arctic was planned as starting with a one day Policy - Business - Science Dialogue meeting in Tromsø hosted by the Norwegian Research Council, as part of the Arctic Frontiers conference in January 2020. This was to be followed by a three day workshop in April in Copenhagen, hosted by the Danish Centre for Marine Research where the Action Plan could be developed. Due to COVID this was transformed to a series of online workshops held throughout the autumn of 2020 dedicated to each of the desired societal outcomes of the Ocean Decade. Here Arctic challenges for reaching sustainable development were identified and the necessary actions discussed by >300 participants from industry, science, governments, NGOs and the broader public (See appendix x for breakdown of participant affiliations). This culminated in an online consultation in the beginning of 2021, where the plan at hand was reviewed and finalised.

Summary of the Arctic Action Plan

(1-2 pages)

This delivered the following results.

Arctic challenge 1:

Arctic challenge 2:

Arctic challenge 3:

Arctic challenge 4:

To address these challenges the following actions were identified as the most relevant

Arctic Action 1:

Arctic Action 2:

Arctic Action 3:

Arctic Action 4:

The need an Arctic Action Plan

(0,5 page)

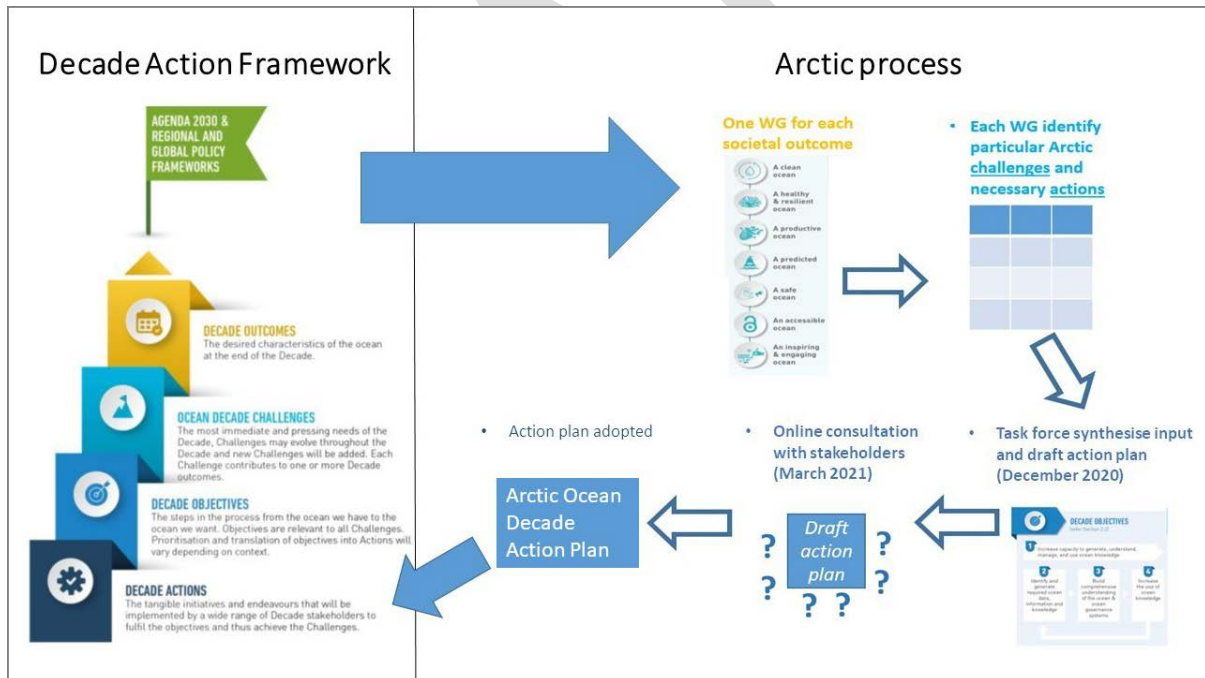
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The Arctic Action Plan development process

(1 page)

Based on the Ocean Decade framework, a dedicated stakeholder oriented process for the Arctic Ocean was carried out throughout the autumn of 2020 dedicated to each of the Ocean Decade desired societal outcomes. Here Arctic challenges for reaching sustainable development were identified and potential actions presented and analysed using e.g SWOT approaches.

Each working group was chaired by key experts from academia, governance and industry, with working group participation open to all interested parties to ensure the broadest representation.



Result of the Arctic process

Based on the process described above, x crosscutting challenges were identified, with Z key actions likely to represent the first wave of timely response to these.

Identified cross-cutting challenges for the Arctic in order to deliver Ocean Decade societal outcomes

Challenge 1:

Challenge 2:

Challenge 3:

What is presently being done (policies and initiatives) to address these challenges

- Overview of policies addressing the challenges (i.e. are there policy drivers in place which would support focus on the identified challenges)
- Table with ongoing or future initiatives and their overlap with identified challenges

Arctic objectives for the Ocean Decade 2021-2030

To address the challenges

- What goals are relevant for the Arctic?
- What steps would enable us to deliver on these?
- What should be the “Ocean Decade arctic objectives

The Arctic Ocean Action plan

Action 1: E.g. Sustain monitoring of x in area y

Motivation for the action

- Given Ocean Decade Arctic **objective** A, action 1 should be supported, as it would present a key step towards addressing **challenge** X and Y.
- The action would further support **policy** 1,2 and 3

Description of the action and possible implementation

- The action could be implemented in several ways. One could include....
- Relevant stakeholders to include are... Stakeholder A has competence within area A, and could deliver...
- Potential funding sources

SWOT of the action

- The strengths of this action is that it would cover area X, which so far has not been done
- The action will not cover X, This is however likely necessary in order to make the action more feasible etc..
- The action would provide several opportunities for alignment with ongoing xxx, and could also...
- Among identified threats to the actions successfully implemented is, the

Next step

- Stakeholders from A, B, C have indicated in interest in pursuing this action, and have appointed contact persons to draft...
- The next phase of the action development will be discussed by ABC, and a draft plan presented at X in Y 2021.

Action 2:

Action 3:

The Arctic Action Plan roadmap

With the publication of the Arctic Action Plan, the Task Force sets the scene for the next ten years. However, as for all long term plans, revisions and updates are anticipated. To follow this development, annual Arctic Ocean sessions are therefore planned to occur in connection with e.g. IASC (International Arctic Science Committee) annual meetings or other Ocean decade meetings. The updates of the plan will be supported by IOC Unesco supported by the Danish Centre for Marine Research.

At the time of writing, the first update meeting is planned to happen XX,

References

x

Appendix

Guiding documents and agendas used by working groups

To deliver a uniform and curated process across the multiple working groups the following guiding documents and agendas were provided for all working group participants and chairs. This was provided to enable better preparation for participants and the opportunity to email direct comments if unable to participate in full or particular sessions.

The documents included

- A. Non-paper - background document on the scope of the process and the alignment between the Ocean Decade's societal goals international policies and initiatives in the Arctic
- B. Guidance to working group chairs - with key questions to cover in working groups
- C. Guidance to working group participants - with explanation about the process and suggestions on how to prepare
- D. Guidance on interpretation of the Ocean Decade societal outcomes and the working groups focus

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A: NON-PAPER - scope of the process and the alignment between the Ocean Decade's societal goals international policies and initiatives in the Arctic

Introduction

A key ambition of the United Nations Decade of Ocean Science for Sustainable Development (Ocean Decade) is to harvest the potential of *modern science and technology* to bring about the transformation in marine governance that is needed to transition from *the ocean we have* to the *ocean we want*. This development depends on both overcoming specific research and innovation challenges, and the accelerated implementation of existing *policies supporting sustainable management* of resources and societal development. This translates into calls for actions and participation across borders and sectors at local, regional and global levels. The Ocean Decade Action Framework (below) illustrates this goal.

The Arctic region is closely interlinked with its marine environment, and currently is experiencing dramatic change. This change is impacting local communities and ecosystems but also has regional and global implications.

It is therefore important to align efforts towards a coordinated regional Action Plan to harvest the maximum benefit from the momentum of the global process.

The content of the Action Plan should address three levels of activities, which are mutually interlinked and thus dependent on each other:

- Knowledge generation driven by research and observations
- Policy development implementing the new insights into societal action
- Innovation providing society (industry, government, public) with the means and arenas to operate within agreed policies and targets



Purpose of the non-paper

This short *non-paper* (i.e. an unofficial paper to inform discussions) was prepared by the Arctic Ocean Task Force to support the seven working groups that will draft the input to the final plan. The development of the final Action Plan should be inspired by and recognize existing frameworks and activities. It should also strive to demonstrate the connection between drivers from industry, the general public, policymakers, Arctic residents and scientific stakeholders and the specific “Arctic challenges” and potential solutions (i.e. the proposed actions).

Working groups are therefore encouraged to use this non-paper as a starting point for developing discussions, including policies that might be more easily implemented or instituted if certain action(s) are performed.

Spatial scoping

The Task Force suggests using the delineation of the Arctic marine area used in the “*Agreement on enhancing International Arctic Scientific Cooperation*” (map to the right) as a suitable spatial demarcation in relation to topics and policies to consider in the drafting of the action plan. This delineation is different from the International Maritime Organization’s (IMO) demarcation of “Arctic Waters”, which e.g. does not cover the areas around Iceland, as well as other definitions of the Arctic including that used by the Arctic Monitoring and Assessment Program (AMAP).

It is also important to note that several nations outside the area are operators of regional or international observation, research and innovation programmes that are highly relevant to the Ocean Decade process.



Overview of international environmental and research policies relevant to the Arctic

The Arctic Ocean nations are all to different degrees parties in both international and regional agreements that cover the Arctic Ocean area. The table below presents the Task Force’s mapping of key policies (inspired by [Arctic Portal](#)) and their likely overlap with the O. Decade societal outcomes that are also consistent with working groups.

International policies* and policy targets relevant to the Arctic Ocean and it's nations	Arctic Ocean nations							Likely overlap with ambitions in Decade societal outcomes						
	Canada	Kg. of Denmark Greenland Faroe Is.	Finland	Iceland	Norway	Russia	U.S.A	1 Clean	2 Healthy	3 Productive	4 Predicted	5 Safe	6 Accessible	7 Inspiring
UBN Sustainable Development Goals SDG's														
UN Convention on the law of the Sea UNCLOS														
UNCLOS instrument: Marine Biodiversity of Areas Beyond National Jurisdiction (BBNJ) – In prep														
International Convention for the Regulation of Whaling IWC														
UN Fish Stocks Convention														
Convention on international trade in endangered species CITES														
UN Convention on Biological Diversity CBD														
Agreement on the Conservation of Polar Bears														
Convention on Environmental Impact assessment in a transboundary Context Espoo convention														
Agreement to prevent Unregulated High Seas Fisheries in the Central Arctic Ocean														
UN Framework Convention on Climate Change (i.e. Paris A.) UNFCCC														
UN Stockholm Convention on Persistent Organic Pollutants														
Convention on the Long-range Transboundary Air Pollution, Geneva														
UNEP Minamata Convention on Mercury														
Int. Convention for the Control and Management of Ship's Ballast Water and Sediments														
Arctic Council agreements														
Agreement on Cooperation on Aeronautics and Maritime Search and Rescue in the Arctic SAR or Arctic Search and Rescue Agreement														
Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic														
Agreement on Enhancing International Arctic Scientific Cooperation														
Non convention frameworks														
Sendai Framework														

Green = Parties which have ratified the policy

Yellow = Parties which have signed but not ratified the policy

Red = Not parties to the treaty

Sustained marine observation programs

The Arctic marine area and its ecosystems are often highlighted as one the least studied areas due to its remoteness and harsh conditions. Nonetheless many nations operate some level of sustained marine observation programs both within and outside their national exclusive economic zones (EEZ). The table below offers WG chairs and participants with inspiration regarding the overlap between particular parameters and their relevance to the Ocean Decade outcomes.

	Arctic Ocean nations according to the AMAP delineation										Likely overlap with ambitions in Decade societal outcomes									
	Name of program	Within EEZ	Outside EEZ	Canada	Kg. of Greenland	Denmark	Farose Is.	Finland	Iceland	Norway	Russia	USA	1 Clean	2 Healthy	3 Productive	4 Predicted	5 Safe	6 Accessible	7 Inspiring	
Marine env. conditions																				
- Hydrographic (temperature, currents, salinity)																				
- Biogeochemical and microbial (natural substances in pelagic & benthic env. Nutrients, Carbon, plankton etc.)																				
- Fauna stocks (fish, marine mammal, birds)																				
- Macro ecology and habitat conditions																				
Meteorological conditions																				
- Temperature, pressure, wind speeds, gas composition																				
Cryosphere																				
- Terrestrial (glaciers and permafrost)																				
- Marine (sea ice coverage)																				
Anthropogenic Pollutants																				
- Marine																				
- Atmospheric																				
- Biota																				
Human welfare																				
- Human Health																				
- Education																				
Economic activities																				
- Fisheries/aquaculture																				
- Tourism																				
- Mining																				
- Oil & Gas extraction																				

Funding of research, observation programmes and innovation

Most activities in the Arctic marine area, be they industrial, governmental, public or scientific, depend highly on an array of supporting services and enabling technologies. This includes the availability of chartered sailing routes, weather and ice forecasts, echo sounders, gps-transmitters and communications. Large-scale international investments for example in space-based satellite systems, are an excellent example of how coordinated international investments in innovation can support a large range of Arctic activities and further initiate local innovation and regional societal development.

This development would not have been possible without considerable long term financial investment such as undertaken for satellite based earth observation and communication programs. The challenge now is to identify and strengthen other existing innovative research and observation programs, including those that are earth-surface based. One consideration which actions should consider is therefore where likely funding could be obtained in the drafting of actions

Recent key relevant publications

- **IOC Unesco (2020) Ocean Decade Implementation plan v2.**

This document provides a framework for developing initiatives in the Decade. It is expected to evolve during the Decade as new opportunities and challenges arise. It incorporates points brought forward by discussions held in a series of global, thematic, and regional planning meetings held between June 2019 and May 2020

Available at: <https://oceandecade.org/news/72/Version-20-of-the-Ocean-Decade-Implementation-Plan-submitted-for-presentation-to-the-United-Nations-General-Assembly>

- **Summary report of the Arctic Ocean Decade workshop: Policy - Business - Science - Dialogue (2020)**

This report summarises the outcome of a one day workshop covering four of the Decades six societal outcomes: a clean ocean, a healthy and resilient ocean, a predicted ocean and a sustainably harvested and productive ocean. For each area knowledge gaps are highlighted and some cross cutting topics are indicated.

Available at: <https://www.oceandecade.org/resource/90/Summary-Report-of-the-Arctic-Ocean-Decade-Workshop>

- **Sustaining Arctic Observing Networks (SAON) Roadmap for Arctic Observing and Data Systems (ROADS)**

Document presenting a vision for an Arctic Observing system representing a transition shift from partnerships to a systematic collaboration. Proposes the development of a systems-level view of observing requirements and implementation strategies.

Available at:

https://arcticobservingsummit.org/sites/default/files/2019_049_Starkweather_SAON%20RM TF%20AOS%20Version%2020th%20December%202019.pdf

- **Arctic Council Arctic Marine Strategic Plan 2015-2025**

This document outlines forty strategic actions that address four overarching Arctic marine ecosystems strategic goals focused on knowledge generation and observation; conservation and protection; safe and sustainable use; and economic, social and cultural well-being in the region.

Available at: <https://pame.is/projects/arctic-marine-strategic-plan-2015-2025#:~:text=The%20AMSP%202015%2D2025%20was,impacts%20on%20Arctic%20marine%20eco systems.>

- **Agreement to prevent unregulated high seas fisheries in the Central Arctic Ocean**

The objective of this Agreement is to prevent unregulated fishing in the high seas portion of the central Arctic Ocean through the application of precautionary conservation and management measures as part of a long-term strategy to safeguard healthy marine ecosystems and to ensure the conservation and sustainable use of fish stocks.

Available at: http://publications.europa.eu/resource/cellar/d7bf52b8-ec1c-11e9-9c4e-01aa75ed71a1.0001.02/DOC_1

- **IASC Strategic Plan (2018-2023)**

Five year plan for the International Arctic Science Committee (IASC) which is a non-governmental scientific organization providing scientific and technical advice, and promoting cooperation and periodically reviewing the status of Arctic science. The plan identifies three core aims: facilitating Arctic research collaboration; promoting engagement and ensuring knowledge exchange.

Available at:

http://iasc.info/images/about/organization/StrategicPlan2018_layout_nospreads_web.pdf

- **Integrating Arctic Research – a Road- map for the Future ICARP III report (3rd International Conference on Arctic Research Planning**

This report was initiated by the International Arctic Science Committee (IASC) and presents a framework for the development of cross-cutting, interdisciplinary and trans-disciplinary initiatives for advancing Arctic research cooperation and applications of Arctic knowledge. It identifies three research areas that require attention: The role of the Arctic in the global system; Observing and predicting future climate dynamics and ecosystem responses; and Vulnerability and Resilience of Arctic Environments and Societies and Supporting Sustainable Development.

Available at:

https://icarp.iasc.info/images/articles/downloads/ICARPIII_Final_Report.pdf

- **Royal Society Global Environmental Research Committee (2018) Polar Science–Perspectives**

Document describing a UK perspective on the research priorities for polar regions.

Available at: https://royalsociety.org/-/media/policy/topics/energy-environment-climate/GERCpolar_science_report.pdf?la=en-GB&hash=E0639732EA30F9F61ED0E7E24B1E02C7

- **AMAP / EU-PolarNet International Stakeholder Workshops on Research Needs. Arctic Monitoring and Assessment Programme (AMAP), Tromsø, Norway (2020)**

Document presenting the outcome of four joint EU-PolarNet workshops with AMAP dedicated to stakeholder dialogue on an Integrated European Polar Research Programme with emphasis on key research needs related to Arctic ecosystems and human health and wellbeing in the Arctic.

Available at: <https://www.amap.no/documents/doc/amap-eu-polar-net-international-stakeholder-workshops-on-research-needs/3161>

- **EU-PolarNet White paper no. 1 The coupled polar climate system: Global context, predictability and regional impacts**

Document presenting the state and research needs related to Polar climate science.

Available at: https://www.eu-polar.net.eu/fileadmin/user_upload/www.eu-polar.net.eu/user_upload/White_Paper_1.pdf

- **EU-PolarNet White paper no. 2 Footprints on Changing Polar Ecosystems: Processes, Threats, Responses and Opportunities for Future Generations**

Document presenting the state and research needs related to the anthropogenic impact in Polar regions and possible opportunities to address them.

Available at: https://www.eu-polarnet.eu/fileadmin/user_upload/www.eu-polarnet.eu/user_upload/White_Paper_2.pdf

- **EU-PolarNet White paper no. 3 Managing human impacts, resource use and conservation of the Polar Regions**

Document presenting the state and research and governance needs related to the management of Polar socio-ecological systems and their resources.

Available at: https://www.eu-polarnet.eu/fileadmin/user_upload/www.eu-polarnet.eu/user_upload/White_Paper_3.pdf

- **EU-PolarNet White paper no. 4 The Road to the Desired States of Social-ecological Systems in the Polar Regions**

Document presenting the potential pathways to achieving desired societal goals related to Polar regions.

Available at: https://www.eu-polarnet.eu/fileadmin/user_upload/www.eu-polarnet.eu/user_upload/White_Paper_4.pdf

- **EU-PolarNet White paper no. 5 Advancing operational informatics for Polar Regions**

Document presenting the state and research needs related to operational levels of informatics in polar regions from.

Available at:

https://www.eu-polarnet.eu/fileadmin/user_upload/www.eu-polarnet.eu/user_upload/White_Paper_5.pdf

- **EU-PolarNet White paper on European polar data accessibility (2020)**

Document presenting the state and research needs related to polar data accessibility from a European perspective.

Available at: https://www.eu-polarnet.eu/fileadmin/user_upload/www.eu-polarnet.eu/Members_documents/Deliverables/WP3/EU-PolarNet_D3_8_White_paper_on_Polar_data_accessibility.pdf

- **An integrated European Union policy for the Arctic (2016). Joint communication to the European parliament and the Council**

Document presenting the European Commission's latest major policy communication regarding "An integrated European Union Policy for the Arctic. It particularly highlights three priority areas: climate change and safeguarding the Arctic environment; promoting sustainable development in the region; supporting international cooperation on Arctic issues.

Available at:

<https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12523-EU-Arctic-Policy/public-consultation>

- **The Arctic Science Agreement propels science diplomacy (2017)**

This paper in Science (Policy Forum) introduces and explains the background and ambitions related to the Arctic Science Agreement, and its role

Available at:

<https://science.sciencemag.org/content/358/6363/596>

- **Governing Arctic Seas: regional Lessons from the Bering Strait and Barents Sea (2020)**

This Book introduces and explains key concepts related to options for advancing informed decision making concerning sustainable development through better governance in the Arctic using examples from Bering Strait and Barents Sea.

Available at:

<https://www.springer.com/gp/book/9783030256739>

- **Science Diplomacy and Its Engine of Informed Decisionmaking: Operating through Global pandemic with Humanity (2020)**

This paper in The Hague Journal of Diplomacy introduces and explains key concepts related to the role of science diplomacy in supporting sustainable development with a forward-looking perspective on the lessons coming out of the COVID-19 pandemic.

Available at:

https://brill.com/view/journals/hjd/15/3/article-p435_13.xml

B: GUIDANCE TO WORKING GROUP CHAIRS

Each WG should work on answering the questions below covering as many perspectives as possible, i.e. both scientific, management, industry etc. Point 1-5 in the list below should help kick start the WGs discussion on shared priorities at the first meeting. How the workshops are moderated and spent their time is determined by the chairs. Some agenda points may have to be pushed to one of the later workshops.

The chairs will be responsible for drafting the minutes after the meeting, and circulate to the WG and coordinator from DCMR (Christian R-S, chrii@aqua.dtu.dk). The secretary will also be responsible for circulating the online meeting link to all WG participants.

1st working group meeting 1 (23. October):

1. Who is represented in the WG? - Presentation by each stakeholder in the WG, e.g. a two slide presentation of the stakeholders ongoing/planned activities and unfulfilled needs
2. What are the key shared regional challenges to achieve the WGs societal outcome over the next 10 years (*Define challenges which should be addressed*)
3. What activities and stakeholders are presently working towards addressing these or similar challenges, i.e. how, where, with who - and how is it funded (*Map the landscape both nationally and internationally*)
4. What direct actions would be able to address the challenges, if possible give several examples (*Identify relevant actions*)
5. How could each of these suggested actions be implemented, what stakeholders should be involved, how could it potentially be funded, when should it be initiated, who would have the capacity and motivation to take lead etc. (*Draft potential action plan*).

2nd working group meeting (5. November):

6. Each WG performs a SWOT on all suggested actions and score them based on their importance and ability to be achieved.
7. The workshop concludes with the adoption of top priorities to be included in the Arctic Action Plan. It will be necessary to have additional notes about the specific details of each activity

3rd working group meeting (18. November):

8. If necessary workshop 3 will follow up un unresolved issues

C: GUIDANCE TO WORKING GROUP PARTICIPANTS

1. What is the purpose of the Arctic workshops in relation to United Nations Ocean Decade?
 - To deliver an action plan for Ocean Decade activities in the Arctic 2021- 2030 which coordinates, inspires and includes all interested parties.
2. What is the specific goal of the working groups and the workshops?
 - Each working group will identify what the challenges and solutions are for the Arctic region, for a particular societal outcome of the Ocean Decade. Participants are anticipated to bring all their ideas, priorities and knowledge about ongoing and wanted actions, partnerships etc. This will also include reflections on the feasibility and timing of actions.
3. How will the input from the working groups contribute to the final Action Plan for the Arctic Ocean?
 - The input will be delivered by the working group chairs to the drafting team (the Arctic Ocean Task Force), which will ensure that all key suggestions are reflected in the action plan.
4. What will happen after the working groups deliver their input?
 - A draft action plan will be made available online, and all stakeholders invited to participate in the online consultation in March 16.-17. March where working group chairs will [CS1] present each contribution to the plan, and take questions from participants.
5. What should YOU prepare in advance for the workshop?
 - Be ready to briefly present yourself and your organisation (e.g. what activities are you already doing or planning), and have a clear idea about what challenges you see in relation to reaching the suggested societal outcome and what realistic actions, partnerships etc. would be able to address it.
6. When will the workshops happen and how
 - All workshop meetings will be online. You will be contacted on email with link to meetings. Key dates include 22. October - Working group kick off meeting for all groups, followed by two to three dedicated workshops on 23. October, 5. November, and 18. November (if necessary). Specific time for meetings will be made available on <https://www.oceandecade.dk/>

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D: GUIDANCE ON INTERPRETATION OF THE OCEAN DECADE SOCIETAL OUTCOMES - AND THE WORKING GROUPS FOCUS

Working group 1: How to achieve - A clean ocean where sources of pollution are identified, reduced or removed

Chairs:

- Colin Moffat – Scottish Government (UK)
- Toril Inga Røe Utvik - Equinor (Norway)

Ocean Decade definition of the societal outcome:

Society generates a vast range of pollutants and contaminants including marine debris, plastic, nutrients, underwater noise, pharmaceutical pollutants and heavy metals. These pollutants and contaminants derive from a wide variety of land and sea-based sources, including point and non-point sources. The resulting pollution is unsustainable for the ocean and jeopardises ecosystems, human health, and livelihoods. It will be critical to generate interdisciplinary and co-produced knowledge on the causes and sources of pollution and its effects on ecosystems and human health. This knowledge will underpin solutions co-designed by multiple stakeholders to eliminate pollution at the source, mitigate harmful activities, remove pollutants from the ocean, and support the transition of society into a circular economy.

Examples of potential issues and actions to be discussed by working groups based on the Task Force's interpretation of the outcome.

- Challenge
 - Sustained international coordinated pollution source and distribution mapping
 - Characterising new threats to Arctic marine ecosystems and the risk to environment and humans of current and future arctic marine pollution
 - Ensuring the necessary local cooperation across the Arctic
- Actions
 - Advance the categorisation of relevant pollutants in the Arctic
 - Increased international coordination of sustained mapping and reporting efforts
 - Regionally coordinated action plans to manage pollution sources
 - Active involvement of local communities

Working group 2: How to achieve - A healthy and resilient ocean where marine ecosystems are understood and managed

Chairs:

- Brendan Kelly - University of Alaska Fairbanks (USA)
- Katherine Richardson - University of Copenhagen (Denmark)

Ocean Decade definition of the societal outcome:

Degradation of marine ecosystems is accelerating due to unsustainable activities on land and in the ocean. To sustainably manage, protect or restore marine and coastal ecosystems, knowledge of these ecosystems, and their reactions to multiple stressors, needs to be enhanced. This is particularly true where multiple human stressors interact with climate change, including acidification and temperature increase. Such knowledge is critical to developing tools to implement management frameworks that build resilience and avoid ecological tipping points, and thus ensure ecosystem functioning and continued delivery of ecosystem services for the health and wellbeing of society and the planet as a whole.

Examples of potential issues and actions to be discussed by working groups based on the Task Force's interpretation of the outcome.

- Challenge
 - Understand the effects of multiple stressors on arctic marine ecosystems
 - Understand what solutions will be best to protect, monitor, manage and restore ecosystems and their biodiversity
 - Ensuring that progress also benefits local Arctic communities
- Actions
 - Identification of the key stressors at key locations, their temporal variability and their source(s)
 - Study of the impacts on biodiversity and function, resulting from exposure to multiple stressors
 - Improved understanding of the impacts of multiple stressors on marine ecosystem services, in particular climate change
 - Development of marine spatial planning initiatives, marine protected areas and ecosystem-based management practices towards good Arctic ocean stewardship
 - Initiate internationally coordinated habitat restoration or protection initiatives.
 - Identification of the state, functioning and value of Arctic marine geosystems, including diversity and heritage in relation to designation of marine protected areas

Working group 3: How to achieve - A productive ocean supporting sustainable food supply and a sustainable ocean economy.

Chairs:

- Anne Christine Brusendorff - ICES (International)

- Henry Huntington – The Ocean Conservancy (USA)

Ocean Decade definition of the societal outcome:

The ocean will be a foundation for future global economic development and human wellbeing, including assuring food security and secure livelihoods for hundreds of millions of the world's poorest people. Knowledge and tools to support the recovery of wild fish stocks, deploy sustainable fisheries practices, and support the sustainable expansion of aquaculture, while protecting essential biodiversity and ecosystems, will be essential. The ocean also provides critical goods and services to a wide range of established and emerging industries including extractive industries, energy, tourism, transport and pharmaceutical industries. Each of these sectors has specific needs in terms of increased knowledge, and support to innovation, technological development and decision support tools to minimise risk, avoid lasting harm, and optimise their contribution to the development of a sustainable ocean economy.

Examples of potential issues and actions to be discussed by working groups based on the Task Force's interpretation of the outcome.

- Challenge
 - Predicting the potential future opportunities for a sustainable blue Arctic economy
 - Ensuring that progress also benefits local Arctic communities
 - Ensure long-term food security in the Arctic
 - Developing a model for sustainable management of marine resources, which is supported by local stakeholders
 - Future needs for marine-geological resources that are essential for a sustainable economic development, e.g. quartz sand, critical minerals such as REE's
- Action
 - Assess current and future exploitation potential of wild fish/seafood stocks and aquaculture in the Arctic
 - Identify main challenges and solutions for increasing or managing different types of sustainable tourism, offshore renewable energy or extractive industries
 - Development of geodiversity variables and operational indicators to assess the pressure impact on Arctic marine geosystems and ecosystems, and to support sustainable planning and management of resources

Working group 4: How to achieve - A predicted ocean where society understands and can respond to changing ocean conditions

Chairs:

- Sandy Starkweather - NOAA (USA)
- Mark Payne – Technical University of Denmark (Denmark)

Ocean Decade definition of the societal outcome:

The vast volume of the ocean is neither adequately mapped or observed, nor is it fully understood. Exploration and understanding of the changing ocean including its physical, chemical and biological components and interactions with the atmosphere and cryosphere is essential, particularly under a changing climate. Such knowledge is required from the land-sea interface along the world's coasts to the open ocean, and from the surface to the deep ocean seabed. It needs to include past, current and future ocean conditions. More relevant and integrated understanding and ultimately prediction of ocean ecosystems and their responses and interactions will underpin the implementation of ocean management that is dynamic and adaptive to a changing environment and changing uses of the ocean.

Examples of potential issues and actions to be discussed by working groups based on the Task Force's interpretation of the outcome.

- Challenge
 - The Arctic marine environment is inadequately mapped, observed, and poorly understood
 - Climate change impacts on established and emerging maritime industries
 - Enabling Arctic local communities to respond adequately to increasing levels of ecosystem change
- Action
 - Establish commitment for and develop a coordinated sustained Arctic marine observation program encompassing biotic, abiotic, industrial and socio-economic parameters
 - Strengthen capacity for prediction of arctic marine ecosystems and their responses and interactions
 - Develop processes inclusive of Indigenous knowledge and highly local needs
 - Identifying the potential impacts of Arctic change on established and emerging maritime industries and how to address them, e.g. opening of new Arctic shipping routes

Working group 5: How to achieve - A safe ocean where life and livelihoods are protected from ocean-related hazards

Chairs:

- Matthew Owen – Geological Survey of Denmark and Greenland (Denmark)
- Lena Holm Saxtoft - SKULD (Denmark)

Ocean Decade definition of the societal outcome:

Both geophysical and human induced hazards create devastating, cascading and unsustainable impacts for coastal communities, ecosystems, and economies. The changing frequency and/or intensity of weather- and climate-related hazards is exacerbating these risks. Mechanisms and processes for assessing the risk, mitigating, forecasting and warning of these hazards and formulating adaptive responses are required to reduce short- and longer-term risks on land and at sea. Higher density ocean data and improved forecast systems—including those related to sea level, marine weather and climate are needed from near real time through decadal scales. When these enhancements are linked to education, outreach, and communication, they will empower policy and decision-making and mainstream individual and community resilience.

Examples of potential issues and actions to be discussed by working groups based on the Task Force's interpretation of the outcome.

- Challenge
 - To identify and quantify current and future threats to coastal Arctic communities, and develop mitigation and forecasting approaches
 - Ensuring safe shipping in increasingly ice free waters
- Action
 - Establish the need for coordinated early warning systems for marine, incl. geo-hazards
 - Development of a coordinated Arctic Ocean Observation System, covering key societal, environmental and industrial priorities
 - Understanding present gaps and needs in shipping safety and SAR coverage

Working group 6: How to achieve - An accessible ocean with open and equitable access to data, information and technology and innovation.

Chairs:

- Nicole Biebow – Alfred Wegener Institute (Germany)
- Molly McCammon – Alaska Ocean Observing System (USA)

Ocean Decade definition of the societal outcome:

Inequalities in ocean science capacity and capabilities need to be eradicated through simultaneously improving access to data, knowledge, and technology, and by increasing skills and opportunities to engage in data collection, knowledge generation and technological development. Increased dissemination of relevant ocean knowledge to the scientific community, governments, business and industry, and the public through relevant and accessible products will improve management, innovation and decision-making contributing to societal goals of sustainable development.

Examples of potential issues and actions to be discussed by working groups based on the Task Force's interpretation of the outcome.

- Challenge
 - To optimise transnational sharing of data and infrastructure relevant for Arctic marine communities, research and development
 - Development of enabling technologies capable of being used consistently in Arctic environments
 - To ensure access to data, information and products across wide range of internet and bandwidth capacity

- Action
 - Identification of key data, with high demand across sectors
 - Development of a system for a higher degree of open access to Arctic data and infrastructure and sharing of best practices
 - Partnerships on the development of key high demand technology needed in the Arctic for the Blue Economy
 - Development of a system capable of disseminating data products identified as key priorities in other working groups, including those of an integrated Arctic Observing System

Working group 7: How to achieve - An inspiring and engaging ocean where society understands and values the ocean in relation to human wellbeing and sustainable development.

Chairs:

- Raychelle Danielle – Pew trust (USA)
- Gunn-Britt Retter – Saami Council (Norway)

Ocean Decade definition of the societal outcome:

In order to incite behaviour change and ensure the effectiveness of solutions developed under the Decade there needs to be a step change in society's relationship with the ocean. This can be achieved through ocean literacy approaches and other public awareness and education tools that will build a significantly broader understanding of the economic, social, and cultural values of the ocean and the plurality of roles that it plays to underpin health, wellbeing and sustainable development. This outcome will highlight the ocean as a place of wonder and inspiration, thus also influencing the next generation of scientists, policy makers, government officials, managers and innovators

Examples of potential issues and actions to be discussed by working groups based on the Task Force's interpretation of the outcome.

- Challenge

- Recognition of the importance of the role of the marine ecosystems as basis for sustainable development in the Arctic
- Ensuring increasing capacity building among Arctic people and stakeholders working in the Arctic Blue Economy
- Action
 - Facilitate the integration and recognition of Indigenous knowledge across all themes of the Arctic Action plan
 - Efforts on Arctic capacity building (ocean education) and resource-sharing between countries and communities
 - Development of an Arctic regional cooperation on ocean literacy approaches, including of strategies for contributions to global ocean literacy initiatives that focus on the long range effects of Arctic change
 - Development of global outreach initiatives on improving understanding of the economic, social, and cultural values of the ocean and the roles that it plays to underpin health, wellbeing and sustainable development
 - Recognizing the importance of shared logistical platforms and building international collaboration to meet the challenges of working in the Arctic

List of participants and institutions which have provided input to the process

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