

ARCTIC MARINE SHIPPING ASSESSMENT

UPDATED RECOMMENDATIONS

MAY 2021



ARCTIC COUNCIL

PAME
Protection of the Arctic Marine Environment

Arctic Ministers approved the Arctic Marine Shipping Assessment (AMSA) Report and its 17 Recommendations at the 2009 Tromsø Ministerial Meeting. The Recommendations – which continue to guide PAME’s shipping-related work – have now been updated to reflect progress, developments, and changes since first being released.

Since 2017, the USA and Canada coordinated the development of draft updates to the AMSA Recommendations, and have solicited input from PAME members – governments, Permanent Participants, and Observers – as well as Arctic shipping experts from across academia and industry.

All proposed edits, including additions and deletions, are highlighted via red text or strikethrough to clearly indicate changes to the text of the original 17 AMSA Recommendations and are accompanied by a short description noting the rationale for each change. These are available in Annex I. Also included are notes on the status of each original recommendation (e.g., ongoing or complete) and the assigned implementation lead (e.g., member government, Arctic Council working group).

The changes captured run the gamut from editorial to substantive and are spread across all three themes outlined in the original 2009 AMSA Report. Certain trends and reoccurring comments in the final draft changes that merit highlighting are:

- making amendments to avoid the use of prescriptive language in favor of more nimble or inclusive terminology (e.g., avoiding the use of lists);
- removal of dated or antiquated, and in some cases incorrect, language or references (e.g., use of ‘Polar Code’ instead of ‘Guidelines for Ships Operating in Arctic Ice-Covered Waters’);
- where applicable, the complete removal (or significant reconfiguration) of recommendations that were either finite or have since come to fruition (e.g., the signing of the Arctic Search and Rescue Agreement); and
- the augmentation of certain recommendations with additional language (e.g., regarding marine mammal impacts, consideration of competent international and regional organizations in addition to the International Maritime Organization).

The updated recommendations were approved by the SAO’s in November 2020.

THEME I - ENHANCING ARCTIC MARINE SAFETY



I(A) LINKING WITH INTERNATIONAL ORGANIZATIONS

“That the Arctic states decide, on a case by case base, to continue to identify areas of common interest and develop unified positions and approaches with respect to international and regional bodies organizations such as the IMO, IHO, WMO and IMSO with recognized competence, to promote and advance safe, secure, environmentally sound and sustainable Arctic marine shipping; and encourage meetings, as appropriate of member state national maritime safety organizations to coordinate, harmonize and enhance the implementation of the Arctic maritime regulatory framework.”

RATIONALE FOR UPDATE

Update Recommendation to encourage Arctic States through AC Working Groups and Subsidiary Bodies to continue to reach out to other bodies with recognized competence and, more specifically, explore areas of mutual interest that could form the basis of initiatives or projects that enhance Arctic marine shipping safety and sustainability. Possible bodies with which the Arctic Council could explore new or updated initiatives include not only intergovernmental organizations, but also industry and non-governmental organizations.

I(B) IMO MEASURES FOR ARCTIC SHIPPING

“That the Arctic states, in recognition of the unique environmental and navigational conditions in the Arctic, decide to continue to cooperatively support efforts at the IMO to strengthen, harmonize and regularly update international standards for vessels operating in the Arctic. These efforts include: Support the updating and augmenting of global IMO ship safety and pollution prevention instruments with specific mandatory requirements or other provisions for ship construction, design, equipment, communications, crewing, training and operations, aimed at safety and environmental protection; develop consensus recommendations at the regional level to support global measures adopted by IMO; and report periodically regarding such efforts.”

RATIONALE FOR UPDATE

Update Recommendation to encourage PAME to continue to support efforts at IMO to strengthen, harmonize and regularly update international standards for vessels operating in the Arctic, omitting reference to the Guidelines for Ships Operating in Arctic Ice-Covered Waters, which have been superseded by the Polar Code.

Addition of “Communications” suggested by the WMO, which noted the current limitations of the GMDSS in Arctic waters, and the challenge of providing universal access to meteorological and ice information to ships in these waters.

Additional Arctic shipping efforts at the IMO might address marine litter, fate and toxicity of spilled bunker fuel, black carbon and/or other air emissions, gray water discharges, and anthropogenic underwater noise incidentally generated by merchant ships.

I(C) UNIFORMITY OF ARCTIC SHIPPING GOVERNANCE

“That the Arctic states should encourage broad subscription to IMO instruments and their uniform implementation, in particular as they relate to safe, secure, and environmentally sound and sustainable Arctic shipping, consistent with UNCLOS, and where possible to strengthen efforts to harmonize implementation and enforcement.”

RATIONALE FOR UPDATE

Edits to this Recommendation are intended to refocus it on supporting IMO as the international organization with recognized global competence to regulate ship safety and environmental performance. In terms of implementation and enforcement, the Arctic Shipping Best Practices Information Forum (ASBPIF) was in large measure established to facilitate effective implementation of and compliance with the Polar Code. Similar efforts with respect to other IMO instruments, including through the Arctic Coast Guard Forum and the Paris and Tokyo Port State Control MOUs, seems desirable.

I(D) STRENGTHENING PASSENGER SHIP SAFETY IN ARCTIC WATERS

“That the Arctic states should strongly encourage cruise ship operators to apply international rules and standards adopted by the IMO as well as to continue to develop implement and share their own best practices for operating in such conditions, including consideration of measures to further strengthen ship safety and environmental sustainability.”

RATIONALE FOR UPDATE

Reference to the IMO Contingency Planning Guidance for Passenger Ships Operating in Areas Remote from SAR Facilities, while important, no longer needs to guide PAME’s work and can be removed from the Recommendation. The Recommendation is updated to identify promote the development of additional best practices and guidelines, both for the activities of ships carrying passengers in Arctic waters and for the passengers themselves, especially when they venture close to shore and when they disembark to visit coastal sites.

Note that last phrase would be dropped - ship “pairing” is a concept that no longer appears supported by industry or national maritime administrations in light of IMO passenger ship safety initiatives, guidance, and updates of relevant instruments. See, e.g., <https://bit.ly/2Yh3Yst>.

I(E) ARCTIC SEARCH AND RESCUE (SAR) AGREEMENT

“That the Arctic states should actively cooperate in operationalizing the agreement on cooperation on aeronautical and maritime search and rescue in the Arctic, 2011, and in maintaining a state of readiness to respond to emergencies.”

RATIONALE FOR UPDATE

Modification of the text of the Recommendation recognizes that the “Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic” has come into force, and Arctic States should actively cooperate to operationalize the agreement and conduct drills to maintain a state of readiness.

THEME II - PROTECTING ARCTIC PEOPLE AND THE ENVIRONMENT



II(A) SURVEY OF ARCTIC INDIGENOUS MARINE USE

“That the Arctic states should consider conducting surveys on Arctic marine use by the indigenous communities where gaps are identified to collect information for establishing up-to-date baseline data to assess the impacts from Arctic shipping activities.”

RATIONALE FOR UPDATE

Retain recommendation.

II(B) ENGAGEMENT WITH ARCTIC COMMUNITIES

That the Arctic states decide to determine if effective communication mechanisms exist to ensure engagement of their Arctic coastal and indigenous communities and, where there are none, to develop their own mechanisms to engage and coordinate with the shipping industry, relevant economic activities and Arctic communities (in particular during the planning phase of a new marine activity) to increase benefits and help reduce the impacts from shipping.”

RATIONALE FOR UPDATE

Retain Recommendation. Modify it as indicated to be consistent with the terminology of the Declaration on the Establishment of the Arctic Council, 1996 (the Ottawa Declaration), which observes that one of the purposes of the Arctic Council is to “provide a means for promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic indigenous communities and other Arctic inhabitants...”.

II(C) AREAS OF HEIGHTENED ECOLOGICAL AND CULTURAL SIGNIFICANCE

“That the Arctic states should, taking into account the special characteristics of the Arctic marine environment should identify areas of heightened ecological and cultural significance in light of changing climate conditions and increasing multiple marine use and, where appropriate, should encourage adoption by relevant bodies with recognized competence implementation of measures relating to these areas of heightened ecological or cultural significance that merit protection from the impacts of Arctic marine shipping, in coordination with all stakeholders and consistent with international law.”

RATIONALE FOR UPDATE

This text as modified reflects that AMAP, CAFF, and SDWG issued a report in 2013 that identified areas of heightened ecological and cultural significance throughout the Arctic. The Report identified the central Arctic Ocean beyond national jurisdiction as an area of heightened ecological significance. The text modifications also reorient the Recommendation on supporting appropriate actions regarding the identified area.

II(D) SPECIALLY DESIGNATED ARCTIC MARINE AREAS

“That the Arctic states should, taking into account the special characteristics of the Arctic marine environment, continue to explore the need for and feasibility of internationally designated areas for the purpose of environmental protection in regions of the Arctic Ocean.”

RATIONALE FOR UPDATE

The text as modified provides support for future work by Arctic States, PAME, and other AC Working Groups to continue to explore the need for and feasibility of internationally designated areas for the purpose of environmental protection in regions of the Arctic Ocean.

II(E) PROTECTION FROM INVASIVE SPECIES

“That the Arctic states should continue to implement the IMO *International Convention for the Control and Management of Ships Ballast Water and Sediments* in a timely and effective manner. Arctic states should also assess the risk of introducing invasive species through ballast water biofouling and other means so that they can implement adequate prevention measures can be implemented in waters under their respective jurisdictions.”

RATIONALE FOR UPDATE

Update recommendation to encourage Arctic States to continue to effectively implement the IMO Ballast Water Management Convention. Retain second sentence and update it to reflect the threat posed by biofouling for which IMO has adopted voluntary “Guidelines for the Control and Management of Ships’ Biofouling to Minimize the Transfer of Invasive Aquatic Species”, [MEPC.207\(62\) \(15 July 2011\)](#).

II(F) OIL SPILL PREVENTION

“That the Arctic states decide to enhance the mutual cooperation in the field of oil spill prevention and, in collaboration with industry, support research and technology transfer to prevent release of oil into Arctic waters, since prevention of oil spills is the highest priority in the Arctic for environmental protection.”

RATIONALE FOR UPDATE

Retain recommendation as it focuses on prevention - a topic not addressed by the Arctic Marine Oil Pollution Preparedness and Response instrument.

II(G) ADDRESSING IMPACTS ON MARINE MAMMALS, SEABIRDS, FISH AND OTHER MARINE LIFE

“That the Arctic states decide to engage with relevant international bodies to further assess the effects on marine mammals due to ship noise, disturbance and strikes in Arctic waters; and consider, where needed, to work with the IMO and other competent international and regional bodies such as IWC and NAMMCO in developing and implementing mitigation strategies.”

RATIONALE FOR UPDATE

The text modifications broaden this recommendation to encourage initiatives related not only to marine mammals, but also other marine life in the Arctic. This broadening reflects an increase in knowledge and a greater appreciation for the potential impact of anthropogenic activities on Arctic marine life. See., e.g., UN Sustainable Development Goal 14, 2017 UN Oceans Conference.

II(H) REDUCING AIR EMISSIONS

“That the Arctic states continue to support IMO efforts to address air emissions from ships as well as the development of improved practices and innovative technologies for ships in port and at sea to help reduce current and future emissions of greenhouse gases (GHGs), Nitrogen Oxides (NO_x) Sulfur Oxides (SO_x) and Black Carbon and other Particulate Matter (PM).

RATIONALE FOR UPDATE

Revise this Recommendation, replacing “decide” with “continue” since a decision to support was already taken, and modify it to indicate explicit Arctic State support for work at IMO to address air emissions from ships. Consistency with IMO’s ongoing work on black carbon is achieved by replacing the reference to “Particulate Matter” with “black carbon and other Particulate Matter.” (This fits within the Bond definition that MEPC decided for black carbon.) The words “taking into account...” are deleted for the following reason. At IMO, “taking into account” is usually paired with guidance of a recommendatory nature such as guidelines rather than binding regulations of a mandatory nature. The original formulation of this recommendation could inadvertently suggest that the IMO regulations on air emissions are recommendatory.

THEME III - BUILDING THE ARCTIC MARINE INFRASTRUCTURE



III(A) ADDRESSING THE INFRASTRUCTURE DEFICIT

“That the Arctic states should continue to recognize that improvements in Arctic marine infrastructure are needed to enhance safety and environmental protection in support of sustainable development. Examples of infrastructure where critical improvements remain necessary include: ice navigation training; navigational charts; communications systems; aids to navigation, port services, including reception facilities for ship-generated waste; accurate and timely ice information (ice centers); meteorological forecasts; places of refuge; and icebreakers to assist in response.”

RATIONALE FOR UPDATE

Retain Recommendation. Add “aids to navigation” and “meteorological forecasts” as additional areas where infrastructure improvements remain necessary. It has been suggested that requirements for ships to report ice observations and iceberg locations in the Arctic could be strengthened to help with hazard notification.

III(B) ARCTIC MARINE TRAFFIC SYSTEM

“That the Arctic states should support continued development of a comprehensive Arctic marine traffic awareness system to improve monitoring and tracking of marine activity, to enhance data sharing, and to augment vessel management service in order to reduce the risk of incidents, facilitate emergency response and provide awareness of potential user conflict. The Arctic states should encourage shipping companies and other maritime stakeholders to cooperate in the improvement and development of national monitoring systems.”

RATIONALE FOR UPDATE

Operationalization of [PAME's Arctic Ship Traffic Data \(ASTD\) System](#) is well underway and some 40 applications for access have been received since the system was launched in January 2019. The Arctic Shipping Best Practice Information Forum's web portal also includes links to authoritative information helpful to maritime administration, mariners, classification societies, insurance companies, port facilities and other stakeholders.

III(C) CIRCUMPOLAR ENVIRONMENTAL RESPONSE CAPACITY

“That the Arctic States decide to continue to develop and strengthen circumpolar environmental pollution response capabilities that are critical to protecting the unique Arctic ecosystem.

This can be accomplished, for example, through effective implementation and operationalization of the agreement on cooperation on marine oil pollution and Response, 2013, additional circumpolar cooperation and agreement(s), as well as regional bilateral capacity agreements.”

RATIONALE FOR UPDATE

Update Recommendation to reflect the adoption in 2013 of the “Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic” and its entry into force in 2016.

EPPR has been given the mandate to update the operational guidelines.

III(D) INVESTING IN HYDROGRAPHIC, METEOROLOGICAL AND OCEANOGRAPHIC DATA

“That the Arctic states should continue to improve, where appropriate, the level of and access to data and information in support of safe and environmentally responsible navigation and voyage planning in Arctic waters. This would entail sustaining and continuing to increase efforts for: hydrographic surveys to bring Arctic navigation charts up to a level acceptable to support current and future safe, and environmentally responsible navigation; obtaining hydrographic data where appropriate from industry and other sources such as crowdsourced bathymetry; and systems to support and improve the timely acquisition, analysis and transfer of meteorological, oceanographic, sea ice and iceberg observations to meteorological centers.”

RATIONALE FOR UPDATE

Retain recommendation. Some proposed new clarifying text is added.

WMO suggested the clarification at the end of the Recommendation to emphasize the importance of transferring these observations to the meteorological centres to improve forecast and warning services.

ANNEX: ORIGINAL AMSA RECOMMENDATION WITH EDITS

THEME I: ENHANCING ARCTIC MARINE SAFETY

I(A) Linking with International Organizations

*"That the Arctic states decide, on a case by case base, **[TO CONTINUE TO]** identify areas of common interest and develop unified positions and approaches with respect to international **[AND REGIONAL BODIES]** organizations such as the IMO, IHO, WMO and IMSO **[WITH RECOGNIZED COMPETENCE, TO PROMOTE AND ADVANCE SAFE, SECURE, ENVIRONMENTALLY SOUND AND SUSTAINABLE]** Arctic marine shipping; and encourage meetings, as appropriate of member state national maritime safety organizations to coordinate, harmonize and enhance the implementation of the Arctic maritime regulatory framework."*

I(B) IMO Measures for Arctic Shipping

*"That the Arctic states, in recognition of the unique environmental and navigational conditions in the Arctic, decide to **[CONTINUE TO]** cooperatively support efforts at the IMO to strengthen, harmonize and regularly update international standards for vessels operating in the Arctic. These efforts include: Support the updating and the mandatory application of relevant parts of the Guidelines for Ships Operating in Arctic Ice-covered Waters (Arctic Guidelines) and Drawing from IMO instruments, in particular the Arctic Guidelines, augment**[ING OF]** global IMO ship safety and pollution prevention **[INSTRUMENTS]** conventions with specific mandatory requirements or other provisions for ship construction, design, equipment, **[COMMUNICATIONS]** crewing, training and operations, aimed at safety and **[ENVIRONMENTAL]** protection; **[DEVELOP CONSENSUS RECOMMENDATIONS AT THE REGIONAL LEVEL TO SUPPORT GLOBAL MEASURES ADOPTED BY IMO; AND REPORT PERIODICALLY REGARDING SUCH EFFORTS.]**"*

I(C) Uniformity of Arctic Shipping Governance

*"That the Arctic states should explore the possible harmonization of Arctic marine shipping regulatory regimes within their own jurisdictions and uniform Arctic safety and environmental protection regulatory regimes **[ENCOURAGE BROAD SUBSCRIPTION TO IMO INSTRUMENTS AND THEIR UNIFORM IMPLEMENTATION, IN PARTICULAR AS THEY RELATE TO SAFE, SECURE, AND ENVIRONMENTALLY SOUND AND SUSTAINABLE ARCTIC SHIPPING]**, consistent with UNCLOS, **AND WHERE POSSIBLE STRENGTHEN EFFORTS TO HARMONIZE IMPLEMENTATION AND ENFORCEMENT.]** that could provide a basis for protection measures in regions of the central Arctic Ocean beyond coastal state jurisdiction for consideration by the IMO."*

I(D) Strengthening Passenger Ship Safety in Arctic Waters

*"That the Arctic states should support the application of the IMO's enhanced Contingency Planning Guidance for Passenger Ships Operating in Areas Remote from SAR Facilities, given the extreme challenges associated with rescue operations in the remote and cold Arctic region; and strongly encourage cruise ship operators **[TO APPLY INTERNATIONAL RULES AND STANDARDS ADOPTED BY THE IMO AS WELL AS CONTINUE TO]** develop, implement and share their own best practices for operating in such conditions, including consideration of measures **[TO FURTHER STRENGTHEN SHIP SAFETY AND ENVIRONMENTAL SUSTAINABILITY]** such as timing voyages so that other ships are within rescue distance in case of emergency."*

I(E) Arctic Search and Rescue (SAR) Agreement

*“That the Arctic states **[SHOULD ACTIVELY COOPERATE IN OPERATIONALIZING THE AGREEMENT ON COOPERATION ON AERONAUTICAL AND MARITIME SEARCH AND RESCUE IN THE ARCTIC, 2011, AND IN MAINTAINING A STATE OF READINESS TO RESPOND TO EMERGENCIES]** ~~decide to support developing and implementing a comprehensive multi-national Arctic Search and Rescue (SAR) Instrument, including aeronautical and maritime SAR, among the eight Arctic nations and, if appropriate, with other interested parties in recognition of the remoteness and limited resources in the region.”~~*

THEME II - PROTECTING ARCTIC PEOPLE AND THE ENVIRONMENT

II(A) Survey of Arctic Indigenous Marine Use

“That the Arctic states should consider conducting surveys on Arctic marine use by the indigenous communities where gaps are identified to collect information for establishing up-to-date baseline data to assess the impacts from Arctic shipping activities.”

II(B) Engagement with Arctic Communities

*“That the Arctic states decide to determine if effective communication mechanisms exist to ensure engagement of their Arctic coastal **[AND INDIGENOUS]** communities and, where there are none, to develop their own mechanisms to engage and coordinate with the shipping industry, relevant economic activities and Arctic communities (in particular during the planning phase of a new marine activity) to increase benefits and help reduce the impacts from shipping.”*

II(C) Areas of Heightened Ecological and Cultural Significance

*“That the Arctic states **[SHOULD, TAKING INTO ACCOUNT THE SPECIAL CHARACTERISTICS OF THE ARCTIC MARINE ENVIRONMENT]** ~~should identify areas of heightened ecological and cultural significance in light of changing climate conditions and increasing multiple marine use and, where appropriate, should encourage~~ **[ADOPTION BY RELEVANT BODIES WITH RECOGNIZED COMPETENCE]** ~~implementation of measures~~ **[RELATING TO]** these areas **[OF HEIGHTENED ECOLOGICAL OR CULTURAL SIGNIFICANCE THAT MERIT PROTECTION]** from the impacts of Arctic marine shipping, in coordination with all stakeholders and consistent with international law.”*

II(D) Specially Designated Arctic Marine Areas

*“That the Arctic states should, taking into account the special characteristics of the Arctic marine environment, **[CONTINUE TO]** explore the need for **[AND FEASIBILITY OF]** internationally designated areas for the purpose of environmental protection in regions of the Arctic Ocean.”*

II(E) Protection from Invasive Species

~~“That the Arctic states should consider ratification of the IMO International Convention for the Control and Management of Ships Ballast Water and Sediments, as soon as practical [CONTINUE TO IMPLEMENT THE IMO INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS BALLAST WATER AND SEDIMENTS IN A TIMELY AND EFFECTIVE MANNER.] Arctic states should also assess the risk of introducing invasive species through ballast water [BIOFOULING] and other means so that [THEY CAN IMPLEMENT] adequate prevention measures can be implemented in waters under their [RESPECTIVE] jurisdiction[S].”~~

II(F) Oil Spill Prevention

“That the Arctic states decide to enhance the mutual cooperation in the field of oil spill prevention and, in collaboration with industry, support research and technology transfer to prevent release of oil into Arctic waters, since prevention of oil spills is the highest priority in the Arctic for environmental protection.”

II(G) Addressing Impacts on Marine Mammals [SEA-BIRDS, FISH, AND OTHER MARINE LIFE]

“That the Arctic states decide to engage with relevant international organizations [BODIES] to further assess the effects on marine mammals due to ship noise, disturbance and strikes in Arctic waters; and consider, where needed, to work with the IMO [AND OTHER COMPETENT INTERNATIONAL AND REGIONAL BODIES SUCH AS IWC AND NAMMCO] in developing and implementing mitigation strategies.”

II(H) Reducing Air Emissions

“That the Arctic states [CONTINUE] decide to support IMO EFFORTS TO ADDRESS AIR EMISSIONS FROM SHIPS AS WELL AS] the development of improved practices and innovative technologies for ships in port and at sea to help reduce current and future emissions of greenhouse gases (GHGs), Nitrogen Oxides (NOx) Sulfur Oxides (SOx) and Particulate Matter (PM) [BLACK CARBON AND OTHER PARTICULATE MATTER (PM)] taking into account the relevant IMO regulations.”

THEME III: ARCTIC MARINE TRAFFIC SYSTEMS

III(B) Arctic Marine Traffic System

“That the Arctic states should support continued development of a comprehensive Arctic marine traffic awareness system to improve monitoring and tracking of marine activity, to enhance data sharing [delete: in near real-time], and to augment vessel management service in order to reduce the risk of incidents, facilitate [EMERGENCY] response and provide awareness of potential user conflict. The Arctic states should encourage shipping companies [AND OTHER MARITIME STAKEHOLDERS] to cooperate in the improvement and development of national monitoring systems.”

III(C) Circumpolar Environmental Response Capacity

“That the Arctic States decide to continue to develop [AND STRENGTHEN] circumpolar environmental pollution response capabilities that are critical to protecting the unique Arctic ecosystem. This can be accomplished, for example, through [EFFECTIVE IMPLEMENTATION and OPERATIONALIZATION OF THE AGREEMENT ON COOPERATION ON MARINE OIL POLLUTION PREPAREDNESS AND RESPONSE, 2013, ADDITIONAL] circumpolar cooperation and agreement(s), as well as regional bilateral capacity agreements.”

III(D) Investing in Hydrographic, Meteorological and Oceanographic Data

“That the Arctic states should [CONTINUE TO] significantly improve, where appropriate, the level of and access to data and information in support of safe [AND ENVIRONMENTALLY RESPONSIBLE] navigation and voyage planning in Arctic waters. This would entail [SUSTAINING AND CONTINUING TO] increased efforts for: hydrographic surveys to bring Arctic navigation charts up to a level acceptable to support current and future safe, AND ENVIRONMENTALLY RESPONSIBLE] navigation; [OBTAINING HYDROGRAPHIC DATA WHERE APPROPRIATE FROM INDUSTRY AND OTHER SOURCES SUCH AS CROWDSOURCED BATHYMETRY;] and systems to support [AND IMPROVE THE TIMELY] real-time acquisition, analysis and transfer of meteorological, oceanographic, sea ice and iceberg information [OBSERVATIONS TO METEOROLOGICAL CENTERS].”

PAME SECRETARIAT

Borgir, v. Nordurslod

Akureyri - Iceland

Tel: +354 461 1355

pame@pame.is

pame.is