PAME I-2013 Agenda Item 4
Report on IMO Consideration of Black Carbon
Submitted by CCU, IUCN and WWF

AMSA Recommendation II(H) on Reducing Air Emissions states:

That the Arctic states decide to support 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), taking into account the relevant IMO regulations.

At PAME II-2012 the Observers Circumpolar Conservation Union, International Union for the Conservation of Nature and World Wildlife Fund were invited to report on the work of the International Maritime Organization (IMO) on black carbon as it pertains to the Arctic.

Background: 2008 Amendments to MARPOL, Annex VI

Discussion of reducing shipping emissions of particulate matter, of which black carbon is a component, began at the IMO, albeit in a tangential manner, in 2005. In that year a group of European countries (Finland, Germany, Italy, the Netherlands, Norway, Sweden and the U.K.) proposed that the IMO's Marine Environment Protection Committee (MEPC) consider revisions to MARPOL, Annex VI, the treaty addressing air pollution from shipping, in light of improvements in marine engine technology and information concerning the effects of diesel emissions on human health and the environment (MEPC 53/4/4). The IMO agreed to conduct that process and, after several years of investigation and deliberation, the MEPC agreed in 2008 on amendments to MARPOL that tightened regulation of emissions of nitrogen and sulfur oxides from ships. Those amendments called for a two-part approach: in addition to emissions requirements applicable globally, coastal nations were authorized to propose specific geographical areas where tighter standards would apply (emissions control areas, or ECAs). The amendments did not regulate particulate matter emissions directly, but the required reductions in nitrogen and sulfur oxides were intended to produce the co-benefit of reductions in secondary particulate matter, *i.e.,* nitrates and sulfates.

In 2010 MEPC approved a proposal by the United States and Canada to create a North American ECA to reduce emissions of nitrogen and sulfur oxides and, indirectly, particulate matter. However, the North American ECA does not include the Arctic, as it excludes the Aleutian Islands and all U.S. waters north and west of them and all Canadian waters north of Labrador.

IMO Begins Consideration of Black Carbon

IMO's consideration of specific limits on black carbon emissions began with a January 2010 submission by Norway, Sweden and the United States to the MEPC describing the impact of shipping emissions of black carbon on the Arctic climate and on human health and seeking IMO consideration of the issue (MEPC 60/4/24). The document noted, among other things, that

- 85 percent of global shipping emissions occur in the Northern Hemisphere;
- global shipping accounts for about two percent of black carbon emissions;
- shipping in northern shipping routes is particularly damaging to the Arctic; and
- Arctic shipping may increase at two to three times the rate of growth of global shipping by 2050.

The document also provided a number of examples of ways in which black carbon shipping emissions might be reduced, including design measures and technologies that would reduce fuel consumption and the application of pollution control measures. It concluded with a proposal that the MEPC examine and discuss measures to be recommended or required to significantly reduce black carbon emissions from shipping having an impact on the Arctic.

Black Carbon Correspondence Group

In July 2011 the MEPC agreed on a work plan for addressing the Arctic impact of black carbon emissions from ships and instructed its Sub-Committee on Bulk Liquids and Gases (BLG) to develop a definition of black carbon emissions from international shipping; to consider methods of measuring black carbon and to identify the most appropriate method for measuring shipping emissions; to investigate appropriate control measures to reduce the impacts of black carbon shipping emissions on the Arctic; and to submit a final report to MEPC 65 in May 2013.

In February 2012 BLG established a correspondence group to tackle the black carbon questions by email; the coordinator of the group is Wayne M. Lundy of the U.S. Coast Guard Office of Design and Engineering Standards. In November 2012 the United States submitted the report of the correspondence group to BLG for consideration at BLG's February 2013 meeting, which will take place the week before PAME I-2013. The report included the following points:

a. The correspondence group was unable to resolve differences of opinion regarding a technical definition of black carbon emissions from international shipping. However, most participants in the correspondence group found "imperfect but largely acceptable" the definition "Black Carbon from international shipping is formed by

incomplete combustion of hydrocarbon fuels, and is the most effective component of PM [particulate matter], by mass, at absorbing solar energy." The group recommended that work on the definition be continued.

b. The group was unable to identify the most appropriate method of measuring black carbon emissions from international shipping, although most participants favored an approach to measurement that focuses on its light-absorbing qualities.

c. The group was also unable to come to a consensus with respect to control measures. Although various control measures were discussed, a few participants contended that there is not sufficient information to support a compelling reason to reduce black carbon from ships, while several others contended that control measures cannot be identified and evaluated in the absence of an agreed definition and measurement approach. Many participants supported more studies while others feared that additional studies would only delay necessary action to reduce black carbon emissions.

In conclusion, the correspondence group requested that BLG consider its report and a collation of the comments made by email and that they be a forwarded "to a working group to further consider and develop a definition, appropriate measurement methods and possible control measures regarding Black Carbon emissions." After BLG has considered the report it will in turn report to the MEPC, which will decide what is the appropriate follow-up. A working group, if established, might convene the first face-to-face discussion of the questions and could conceivably expedite their resolution.

LITEHAUZ Report on Black Carbon Abatement Technologies

Using funds provided to IMO by Transport Canada for analytical studies and other activities pertaining to the control of air related emissions from ships, the IMO contracted with a consortium led by the Danish consulting company LITEHAUZ to investigate abatement technologies that might be applied to reduce black carbon emissions from international shipping. Because there is limited data on black carbon emissions *per se* in measuring the effectiveness of marine emissions abatement technology, the authors of the report used data on black carbon emissions where available but also relied in some instances on data on particulate emissions as a proxy for black carbon emissions.

Like the correspondence group report, the LITEHAUZ report was submitted to BLG for consideration at its February 2013 meeting. It identifies a number of black carbon abatement options, including fuel efficiency measures, slow steaming, fuel treatments, fuel quality, alternative fuels and exhaust treatment; and summarizes what is known about each of them in terms of a number of factors, including effectiveness, availability, technological maturity, impact on emissions of other pollutants, and cost. The report concludes that the most feasible and cost-effective technologies likely lie with slow

steaming with de-rating (modifying engine operation so as to maximize efficiency at slower speeds), switching to low sulfur fuels or liquefied natural gas, and water-in-fuel emulsion. It is possible that some technologies could be used in combination with others, such as scrubbers, to produce even further reductions of black carbon, but the study does not try to evaluate the cost or effectiveness of the numerous possible combinations and notes that some combinations may be counter-productive.

Black Carbon Emissions Estimates

A number of studies estimating black carbon emissions from shipping have been submitted to the IMO over the past several years. The most recent is a review of marine black carbon inventories submitted to BLG in October 2012 by the Institute of Marine Engineering, Science and Technology (IMarEST). That review concludes that shipping was responsible for about 184,000 tonnes of black carbon in 2007 and about 2300 tonnes in the Arctic in 2004. Significantly, these estimates are 42 percent and 90 percent higher, respectively, than the figures the IMO has been using for black carbon emissions from shipping.