October 3, 2007

Hon. Stephen L. Johnson
Administrator
United States Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Mail Code 1101A
Washington, DC 20460

Re: Petition for Rulemaking Under the Clean Air Act to Reduce the Emission of Air Pollutants from Marine Shipping Vessels that Contribute to Global Climate Change

Dear Administrator Johnson:

Every day the people of the United States, and the world, become more aware of the gravity and the urgency of the challenge posed by global climate change. This challenge must be met by all nations and by all sectors of the economy.

The ships that ply the world's waterways emit a significant share of the pollutants causing global climate change.[1] In fact, only six countries in the world emit more carbon dioxide than the world's fleet of marine vessels: the United States, China, Russia, India, Japan

[1] Veronika Eyring and Jim Corbett, *Comparing Fuel Consumption, Carbon Dioxide and Other Emissions from International Shipping and Aircraft: A Summary of Recent Research Findings*, DLR-Institute of Atmospheric Physics, (2007), *available at* http://www.pa.op.dlr.de/SeaKLIM/Fuel_Emissions_International_Shipping.html, *cited in* Friends of the Earth International (FOEI), *Prevention of Air Pollution from Ships: Recent Findings on Global Warming Justifying the Need for Speedy Reductions of Greenhouse Gas Emissions from Shipping*, submitted to Marine Environment Protection Committee, IMO, (May 4, 2007), at p.2. *See also* CE Delft, et al., *Greenhouse Gas Emissions for Shipping and Implementation Guidance for the Marine Fuel Sulfur Directive*, (2006), at 185.

and Germany.[2] Thus, the marine transport industry should be asked to make a significant contribution to reducing emissions that contribute to global climate change.[3] Oceana, Friends of the Earth, and the Center for Biological Diversity therefore petition the Administrator of the United States Environmental Protection Agency ("Administrator" or "EPA"), pursuant to the Administrative Procedure Act, 5 U.S.C. §§ 551-559, 701-706 (2000), (pursuant to 5 U.S.C. § 553(e), "[e]ach agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule,") the Clean Air Act, 42 U.S.C. §§ 7401-7671q (1990), ("the Act"), and the Act's implementing regulations, to control and reduce the emissions of marine shipping vessels that contribute to global climate change. In this petition we request that EPA promulgate regulations (1) requiring marine shipping vessels to meet emissions standards by operating in a fuel-efficient manner, using cleaner fuels, and/or employing technical controls, so as to reduce emissions of carbon dioxide, nitrous oxide, and black carbon, and (2) controlling the manufacture and sale of fuels used in marine shipping vessels by imposing fuel standards to reduce emission products that contribute to global warming.

Given the gravity of the threat to public health and welfare that global climate change represents and the significant contribution of marine shipping vessels and aircraft engines to ambient concentrations of global climate change pollutants, EPA must not delay any longer in regulating these emissions.

EPA is required to give prompt consideration to this petition. In keeping with the urgency of addressing global warming, Petitioners hereby request a substantive response to this petition within one hundred eighty (180) calendar days. Petitioners will consider litigating to compel a response that is unreasonably delayed.

This petition is organized in the following manner:

[2] United Nations, Department of Economic and Social Affairs, Statistics Division, *Carbon Dioxide Emissions, Thousands of Metric Tons, available at* http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749 (August 1, 2007); based on 2004 data from Carbon Dioxide Information Analysis Center, *available at* http://cdiac.ornl.gov/trends/emis/tre_tp20.htm.

[3] Marine vessel emissions also pose significant other threats to human health and welfare. These threats are being addressed by EPA in its ongoing rulemaking process to set standards for emissions of carbon monoxide, nitrogen oxides, and volatile organic compounds from new and existing nonroad engines or nonroad vehicles. Change in Deadline for Rulemaking to Address the Control of Emissions from New Marin Compression-Ignition Engines at or Above 30 Liters per Cylinder, 72 Fed. Reg. 20948, 20977 (April 27, 2007). *See also Friends of the Earth v. EPA*, No. 07-1572 (D.D.C. filed Sept. 5, 2007). As is further explained below, the *Friends of the Earth* case and this petition are seeking complementary controls that will enhance health and welfare more effectively than if either proceeding were going forward alone.

BACKGROUND

In this background section, we set forth a description of the petitioners and their interest in protecting the environment from the injury threatened by global climate change, the statutory regime under which the Administrator has authority to regulate global climate change emissions, and the science behind the worldwide consensus that the global climate change challenge must be met.

I. PETITIONERS

Oceana is a non-profit international advocacy organization dedicated to protecting and restoring the world's oceans through policy, advocacy, science, law, and public education. Oceana has over 280,000 members and supporters around the world. Oceana is organized under the laws of the District of Columbia, and maintains its headquarters in Washington, D.C. It has offices or staff in five states (Alaska, California, Massachusetts, New York, and Oregon) and three foreign countries (Chile, Belgium, and Spain). Through its policy, scientific, litigation, and grass-roots activities, Oceana has been a prominent advocate for protecting threatened and endangered marine species and marine ecosystems. Many of these species, such as loggerhead sea turtles and species of deep sea corals, are threatened by global warming and ocean acidification.

Friends of the Earth is a public interest, not-for-profit advocacy organization, whose mission is to defend the environment and champion a just and healthy world. Friends of the Earth maintains its headquarters in Washington, DC, and is the U. S. voice of the world's largest network of environmental groups with affiliates in 70 countries. The Bluewater Team (formerly Bluewater Network) based in San Francisco works to stop environmental damage from vehicles and vessels, and to protect human health and the planet by reducing dependence on fossil fuels. Over nearly a decade of advocacy to clean up the shipping industry, the Bluewater Team has achieved more stringent regulations for air pollution and wastewater discharges from marine vessels along the West Coast of the United States and has urged the EPA through petitions and litigation to adopt more stringent national regulations to reduce emissions of oxides of nitrogen and various other pollutants, (including sulfur oxides, hydrocarbons, particulate matter, carbon monoxide, airborne toxics, and greenhouse gases), from the world shipping fleet.

Center for Biological Diversity ("The Center") is a non-profit organization with offices in San Francisco, Los Angeles, and Joshua Tree, California, Phoenix and Tucson, Arizona, Silver City, New Mexico, Portland, Oregon, and Washington, D.C. The Center is a national membership organization with over 35,000 members in the United States. The Center's mission is to ensure the preservation, protection, and restoration of biodiversity, native species, ecosystems, public lands and waters, and public health. Because climate change from society's production of greenhouse gases is one of the foremost threats to the earth's biodiversity, the environment, and public health, the Center's Climate, Air, and Energy Program works to reduce United States greenhouse gas emissions in order to protect these resources. The Center has advocated in local, state, and federal forums for the reduction of greenhouse gas emissions. The Center has petitioned to have some of the first species to be threatened by global warming listed under the U.S. Endangered Species Act, including the polar bear, staghorn and elkhorn corals in

the Caribbean, and the Kittlitz's murrelet, a small seabird that feeds at the base of tidewater glaciers in Alaska. These species will not survive unless the United States substantially reduces its greenhouse gas emissions. The Center has previously requested EPA regulate greenhouse gases under Section 202 of the Clear Air Act, and was a party in the successful case overturning EPA's decision to not regulate greenhouse gases from automobiles. The Center submits this petition on behalf of itself and its adversely affected members.

II. STATUTORY BACKGROUND

The Administrator has the authority under the Clean Air Act to control global climate change emissions through his authority to set emissions standards for new nonroad engines and new nonroad vehicles and through his authority to require the manufacture and sale of cleaner fuels.

A. The Administrator Has Authority to Set Emissions Standards for Nonroad Engines and Vehicles.

The Clean Air Act provides the EPA with authority to limit the emission of pollutants from "nonroad" engines and vehicles, a broad category of mobile sources that includes marine vessels and their engines, 42 U.S.C. §§ 7550(10), (11); 40 C.F.R. § 89.2 (2005) (defining "marine engine" and "marine vessel" in the context of regulating emissions from nonroad vehicles and engines). Section 213(a) of the Act, creates a specific regulatory program to reduce emissions from such sources. 42 U.S.C. § 7547(a). This section first directs the EPA to address nonroad emissions of carbon monoxide, nitrogen oxides, and volatile organic compounds.[4] *Id.* § 7547(a)(1)-(3). By reducing emissions of these three pollutants, regulations will not only reduce asthma, lung disease, and other adverse health impacts, but also reduce global warming, because the ozone formed from these emissions contributes to climate change.[5] However, nonroad engines and vehicles emit other pollutants that contribute even more significantly to global climate change than carbon monoxide, nitrogen oxides, and volatile organic compounds.

Having required the swift creation of a regulatory system to address nonroad emissions of carbon monoxide, nitrogen oxides, and volatile organic compounds, section 213(a) then sets up a framework for the future regulation of additional pollutants. Under section 213(a)(4), the EPA's

[4] EPA has failed to meet its statutory deadline for setting standards for emissions of carbon monoxide, nitrogen oxides, and volatile organic compounds from new and existing nonroad engines or nonroad vehicles, having announced on April 27, 2007, that it is postponing its rulemaking on this topic until December 17, 2009. Change in Deadline for Rulemaking to Address the Control of Emissions from New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder, 72 Fed. Reg. 20,948. Friends of the Earth is currently pursuing an action under section 304(a) of the Clean Air Act, 42 U.S.C. § 7604(a), to compel EPA to carry out its nondiscretionary duty to promulgate regulations containing standards applicable to emissions from Category 3 marine diesel engines as required by section 213(a) of the Act, 42 U.S.C. § 7547(a). *See* Friends of the Earth v. EPA, No. 07-1572 (D. D.C. filed Sept. 5, 2007). By targeting emissions that cause global climate change but are not addressed by section 213(a)(1), this petition is complementary to that ongoing rule-making.

[5] For example, nitrogen oxides react with other substances to form the greenhouse gas ozone. See section III(C) of the Background section of this petition for a more detailed explanation of how nitrogen oxides contribute to global climate change.

authority to take regulatory action hinges on two key findings: a finding that emissions from new nonroad engines or vehicles "significantly contribute to air pollution," and a finding that a class or category of new nonroad engines or vehicles "cause[s] or contribute[s] to such air pollution." 42 U.S.C. § 7547(a)(4). Thus, if the EPA finds that emissions from new nonroad engines or vehicles, in the aggregate, significantly contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, then the EPA has the authority to establish standards applicable to specific classes or categories of new nonroad engines or vehicles that the EPA determines cause or contribute to such air pollution. *Id; see also Bluewater Network v. EPA*, 370 F.3d 1, 13-14 (D.C. Cir. 2004) (explaining the operation of section 213(a)(4)).

B. The Administrator Has the Authority to Prohibit the Manufacture or Sale of Fuels.

The Clean Air Act establishes a system for the regulation of fuels that turns on a single finding: whether any emission product of a fuel causes or contributes to air pollution which may reasonably be anticipated to endanger the public health or welfare. 42 U.S.C. § 7545(c)(1). Upon making the finding, the EPA has the authority to control or eliminate the manufacture or sale of the offending fuel. *Id.* Section 211 of the Act provides the EPA with considerable authority to regulate the content of fuels manufactured or sold for use in nonroad vehicles and engines, allowing the Administrator to promulgate such regulations as he "may deem appropriate." *Id.*

III. FACTUAL BACKGROUND

The existence of global climate change is beyond dispute. Carbon dioxide, nitrogen oxides, nitrous oxide, and black carbon – all emissions products of marine engines and vessels – contribute to global climate change.

A. Global Climate Change Is Occurring.

There is no longer any serious dispute that global climate change is happening and causing harm. In a report published earlier this year the Intergovernmental Panel on Climate Change (IPCC)[6] expressed in the strongest language possible its finding that global warming is occurring: "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."[7]

[6] The IPCC was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme to provide an authoritative international statement of scientific understanding of climate change. Its various Working Group and Assessment Reports on climate change are available at: http://www.ipcc.ch/.

[7] IPCC, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [SUMMARY FOR POLICYMAKERS,] (Feb., 2007) at 5, (*available at* http://www.ipcc.ch/spm2feb07.pdf), [hereinafter WORKING GROUP I SUMMARY].

Evidence of dramatic changes in Earth's climate abounds. Changes in climatically sensitive indicators support the inference that the average temperature in the Northern Hemisphere over the last half-century is likely higher than at any time in the previous 1,300 years, while ice-core records indicate that the polar regions have not experienced an extended period of temperatures significantly warmer than today's in about 125,000 years.[8] Further, the IPCC reports "numerous long-term changes in climate" observed at "continental, regional and ocean basin scales," including "changes in Arctic temperatures and ice, widespread changes in precipitation levels, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones."[9]

B. Carbon Dioxide

1. Contribution to Global Climate Change

Carbon dioxide's behavior in the atmosphere is well understood. Carbon dioxide is a "radiative forcing" gas, meaning that it alters the balance of incoming and outgoing energy in Earth's atmosphere.[10] Carbon dioxide absorbs terrestrial radiation leaving the Earth's surface, trapping this heat in the atmosphere.[11] As levels of carbon dioxide increase, primarily from the burning of fossil fuels, less and less heat escapes the atmosphere to space, and the planet warms.[12]

As the Supreme Court has recently recognized, there is a consensus in the scientific community that the increasing atmospheric concentration of carbon dioxide is a leading cause of global climate change:

> A well-documented rise in global temperatures has coincided with a significant increase in the concentration of carbon dioxide in the atmosphere. Respected scientists believe the two trends are related. For when carbon dioxide is released into the atmosphere, it acts like the ceiling of a greenhouse, trapping solar energy and retarding the escape of reflected heat. It is therefore a species-the most important species-of a "greenhouse gas."

Massachusetts v. EPA, 549 U.S. ___, 127 S. Ct. 1438, 1446 (2007). If anything, this modest statement by the Court understates the true extent of the scientific consensus on the causes of global warming. For example, the IPCC recently concluded that "[m]ost of the observed

[8] *Id.* at 1.

[9] *Id.* at 7.

[10] *See* Solomon, S., et al., *Technical Summary, Working Group I*, (2007), at 21 n.1, *available at* http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_TS.pdf, [hereinafter "Technical Summary"] (noting that radiative forcing "is an index of the importance of the factor as a potential climate change mechanism").

[11] EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2005*, (2007), at 1-2, *available at* http://www.epa.gov/climatechange/emissions/downloads06/07CR.pdf [hereinafter EPA Inventory].

[12] *Id.* (explaining that changes in the atmospheric concentrations of carbon dioxide "can alter the balance of energy transfers between the atmosphere, space, land, and the oceans").

increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations."[13] Thus, the world's leading scientific body on the subject has now concluded, with greater than 90 percent certainty, that emissions of greenhouse gases like carbon dioxide are responsible for climate change.[14]

It is abundantly clear that anthropogenic emissions of carbon dioxide are a principal driver of the observed warming of the planet. Prior to the industrial revolution, over the last 650,000 years the global atmospheric concentration of carbon dioxide ranged from 180 to 300 parts per million ("ppm"), but in 2005, global carbon dioxide levels reached 379 ppm.[15] The increasing concentrations of this radiative forcing gas has led the IPCC to conclude that, "[c]arbon dioxide is the most important anthropogenic greenhouse gas."[16] The IPCC found that increases in atmospheric carbon dioxide concentrations since pre-industrial times exert a radiative forcing effect of approximately +1.66 Watts per square meter (W/m^2), "a contribution which dominates all other radiative forcing agents."[17] In comparison, all other long-lived greenhouse gases combined contribute slightly less than approximately +1 W/m^2.[18]

2. Emissions from Marine Engines and Vessels

Ocean-going ships are responsible for moving 80 percent of all goods shipped into and out of the United States.[19] The sheer number of these ships, coupled with operating practices that use fuel inefficiently and poor government oversight, results in carbon dioxide emissions estimated to be between 600 to 900 million metric tons per year (546 to 818 million short tons per year),[20] equivalent to the emissions from roughly 130 to 195 million cars for one year.[21] Carbon dioxide emissions from shipping worldwide are estimated to make up almost three

[13] WORKING GROUP I SUMMARY, at 10 (emphasis in original).

[14] *See id.* at 4, n.6 (explaining the use of the term "very likely").

[15] *Id.* at 2.

[16] *Id.*

[17] Technical Summary at 25. Positive radiative forcing tends to warm the Earth's surface; negative forcing tends to cool it. *Id.* at 21 n.1. The IPCC assigns radiative forcing values as a global and annual average value according to changes relative to a pre-industrial background – the year 1750. *Id.*

[18] *See id.* at 31 (stating that all long-lived greenhouse gases, including CO_2, contribute roughly +2.63 W/m^2). However, because some anthropogenic emissions exert negative radiative forcing (or cooling) effects, the IPCC estimates that the cumulative impact of human activities since 1750 equates to a net positive radiative forcing of approximately +1.6 W/m^2. *Id.*

[19] International Council on Clean Transportation (ICCT) (Mar., 2007) *Air Pollution and Greenhouse Gas Emissions from Ocean-Going Ships: Impacts, Mitigation Options and Opportunities for Managing Growth* at 7, *available at* http://www.theicct.org/documents/MarineReport_Final_Web.pdf (figure given is by weight of cargo).

[20] Eyring and Corbett, *supra* note 1.

[21] Calculated at http://www.usctcgateway.net with data from EPA Inventory, *supra* note 11.

percent of global greenhouse gas emissions.[22] In fact, a single container ship emits more pollution than 2,000 diesel trucks.[23]

Of even greater concern is the projected growth in carbon dioxide emissions from shipping. Over the last three decades, the shipping industry has grown by an average of five percent per year.[24] By 2050, one study predicts total carbon dioxide emissions from ships will grow to about 1700 million metric tons per year (1874 million short tons per year), roughly double their present levels.[25] However, this study "makes some judicious simplifying assumptions that tend to underestimate rather than overestimate fuel consumption and emission levels."[26] Thus, the International Maritime Organization may present a more realistic picture of future carbon dioxide emissions from shipping in projecting a 72 percent increase between 2000 and 2020, assuming a three percent annual rate of growth.[27] Even the IMO study may be too conservative. If fuel consumption increases at the rate forecast by current studies, shipping emissions may double 2002 levels by 2020 and triple them by 2030.[28]

Even when only U.S. emissions are considered, ships account for a significant portion of total carbon dioxide. For example, based on national fuel consumption statistics, ships in the United States emitted nearly 100 million metric tons (110 million short tons) of carbon dioxide in 2005.[29] In all, marine engines contributed about five percent of the total U.S. carbon dioxide emissions from transportation-related fossil fuel combustion.[30]

C. Nitrogen Oxides and Nitrous Oxide

Nitrogen oxides consist of a family of several compounds containing nitrogen and oxygen in varying amounts.[31] Nitrogen oxides play a role in climate change through two primary means: (1) nitrogen oxides react with other substances to form the greenhouse gas ozone, and (2) nitrous oxide is itself a highly potent and long-lived greenhouse gas. Moreover,

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[22] Eyring and Corbett, *supra* note 1.

[23] Sean Poltrack, *The Maritime Industry and Our Environment: The Delicate Balance of Economic and Environmental Concerns, Globally, Nationally, and Within the Port of Baltimore,* (2000), 8 U. BALT. J. ENVTL. L. 51, 64.

[24] As measured by the increase in metric ton-kilometers of cargo transported. ICCT, *supra* note 19, at 7.

[25] *Id.* at 36, fig. 13.

[26] *Id.* at 36.

[27] International Maritime Organization (IMO) *Study of Greenhouse Gas Emissions from Ships: Final Report to the International Maritime Organization* at 17, Table 1-5, (2000) (modeling future fuel consumption) *available at* http://unfccc.int/files/methods_and_science/emissions_from_intl_transport/application/pdf/imoghgmain.pdf.

[28] FOEI, *supra* note 1, at 2.

[29] EPA Inventory, *supra* note 11, at 3-8 – 3-9, Table 3.7 (based on ship consumption of residual fuel oil, distillate fuel oil, and gasoline).

[30] *See id.* (total CO_2 emissions from the transportation sector were 1995.1 million metric tons in 2005).

[31] EPA, *Technical Bulletin: Nitrogen Oxides (NO_x): Why and How They Are Controlled*, (1999) at 1-2, EPA-456/F-99-006R, *available at* http://www.epa.gov/ttn/catc/dir1/fnoxdoc.pdf.

nitrogen oxide pollution represents an additional burden on oceanic pH levels by lowering pH and increasing acidity.

1. Contribution to Global Climate Change

Emissions of nitrogen oxides contribute to global climate change by influencing the atmospheric concentration of ozone, which the IPCC has determined is the third most damaging greenhouse gas, after carbon dioxide and methane.[32] As nitrogen oxides react with volatile organic compounds, they create ozone in the lower layer of the atmosphere, called the troposphere.[33] Through the production of tropospheric ozone, nitrogen oxide emissions contribute to the warming of the surface-troposphere system.[34]

Nitrogen oxides have also been found to contribute to ocean acidification, thereby amplifying one of the many deleterious impacts of climate change.[35] Approximately one third of all nitrogen oxide emissions end up in the oceans.[36] The impact of these emissions on acidification is intensely felt in specific, vulnerable areas. In some areas it can be as high as 10 to 50 percent of the impact of carbon dioxide.[37] The hardest hit areas are likely to be those directly around the release site, so these emissions are especially significant in and around coastal waters.[38]

Nitrous oxide behaves very similarly to carbon dioxide in that it both directly traps heat in the atmosphere and remains in existence for many decades once emitted.[39] However, nitrous oxide is far more potent, with a global warming potential 298 times that of carbon dioxide over 100 years.[40] According to the IPCC, the concentration of nitrous oxide in the atmosphere in 2005 was 319 parts per billion (ppb), approximately 18 percent higher than its pre-industrial

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[32] Denman, K.L., et al. *Couplings Between Changes in the Climate System and Biogeochemistry*, (2007), at 544. In: WORKING GROUP I SUMMARY, *supra* note 7. ("The dominant impact of NO_x emissions on the climate is through the formation of tropospheric ozone, the third largest single contributor to positive radiative forcing").

[33] EPA, *NO_x – How Nitrogen Oxides Affect the Way We Live and Breathe*, (1998), *available at* http://www.epa.gov/air/urbanair/nox/noxfldr.pdf.

[34] Denman, *supra* note 32, at 544 ("The dominant impact of NO_x emissions on the climate is through the formation of tropospheric ozone, the third largest single contributor to positive radiative forcing").

[35] Doney, Scott C., et al., *Impact of Anthropogenic Atmospheric Nitrogen and Sulfur Deposition on Ocean Acidification and the Inorganic Carbon System*, (2007), PNAS Vol. 104:14580-14585, at 14580.

[36] *Id.*

[37] *Id.*

[38] *Id.*

[39] *E.g.*, Technical Summary at 27 (discussing the radiative forcing effect of N_2O); *Id.* at 23-24 (discussing the long atmospheric lifetimes of CO_2, CH_4, and N_2O).

[40] *Id.* at 33, Table TS.2.

level.[41] Moreover, data from ice cores indicate that in the 11,500 years before the Industrial Revolution, the level of nitrous oxide in the atmosphere varied by less than about ten ppb.[42]

2. Emissions from Marine Engines and Vessels

Ships are beyond doubt a significant source of nitrogen oxide emissions. Ships contribute as much as 30 percent of the world's nitrogen oxide emissions, an estimated 27.8 million tons per year.[43] In the United States, the EPA has already determined that marine engines and other nonroad engines and vehicles are a "major source" of nitrogen oxides. 59 Fed. Reg. 31,306, 31,307 (June 17, 1994). Recent EPA estimates show nitrogen oxide emissions from ships make up 9.1 percent of all U.S. mobile source nitrogen oxide emissions and 5.2 percent of U.S. nitrogen oxide emissions from all sources. 72 Fed. Reg. 15,938, 15,963, Table II-3 (Apr. 3, 2007) (figures include NO_x emissions from all categories of marine engines). Moreover, based on national fuel consumption statistics, EPA estimates that ships in the United States emitted approximately 2000 metric tons (2205 short tons) of nitrous oxide in 2005.[44]

The contribution of ships to nitrogen oxide emissions is also projected to grow substantially in the coming decades. One EPA study forecasts that nitrogen oxide emissions from ocean-going ships in United States waters will increase by almost 300 percent above 1996 levels by 2030.[45] Moreover, EPA's own modeling indicates that nitrogen oxide emissions from marine engines will grow to over 30 percent of all U.S. mobile source nitrogen oxide emissions by 2030 and will then account for 12.8 percent of total U.S. emissions of nitrogen oxides. 72 Fed. Reg. 15,938, 15,963, Table II-3 (Apr. 3, 2007) (figures include NO_x emissions from all categories of marine engines). At the international level, emissions of nitrogen oxides from ships are projected to nearly double by 2050 and to increase their share of total nitrogen oxide emissions relative to other sources as well.[46]

These gases have a significant impact on the global climate, both through the formation of ozone and as nitrous oxide. Thus, given the large quantity of nitrogen oxides that ships emit, it is not surprising that marine engines' emissions of these pollutants play a significant role in climate change. In fact, nitrogen oxide emissions from ships are believed to have a net warming effect potentially equivalent to the warming effect from ship carbon dioxide emissions.[47]

D. Black Carbon

[41] *Id.* at 27.

[42] *Id.*

[43] FOEI, *supra* note 1, at 3.

[44] EPA Inventory, *supra* note 11, at 3-31, Table 3-24.

[45] EPA, *Final Regulatory Support Document: Control of Emissions from New Marine Compression –Ignition Engines at or Above 30 liters per Cylinder*, (Jan. 2003), EPA420-R-03-004, at 4-14, Table 4.3-1.

[46] ICCT, *supra* note 19, at 35, figs. 11 & 12.

[47] *Id.* at 34.

1. Contribution to Global Climate Change

A product of inefficient combustion, black carbon, also known as soot, consists of microscopic solid particles of incompletely burned organic matter.[48] As explained further below, black carbon is a potent warmer, exerting effects on the global climate both while suspended in the atmosphere and when deposited on snow and ice. In fact, one study estimates that a given mass of black carbon will warm the air between 360,000 and 840,000 times more than an equal mass of carbon dioxide.[49] The most pernicious characteristic of black carbon from a climatic perspective is its dark color and correspondingly low albedo, or reflectivity. Because of this dark coloring, black carbon absorbs heat from sunlight.[50]

When suspended in the air, black carbon warms by trapping heat in the top of the atmosphere.[51] The IPCC estimates that atmospheric black carbon exerts a positive radiative forcing effect of +0.2 W/m^2.[52] This direct warming leads to feedback effects which magnify the global warming contribution of black carbon.[53] For example, as black carbon particles absorb sunlight, they warm the air around them, decreasing the relative humidity of the air and thus the liquid water content of other particles suspended in the air.[54] The drying out of these other particles reduces *their* reflectivity, and as they absorb more sunlight the air warms even more.[55] Further, the water evaporated from such particles remains in the air as water vapor, which is itself a greenhouse gas.[56]

When deposited out of the air onto a lighter surface, the darker black carbon causes the surface to absorb more of the sun's energy. Thus, when deposited on snow or ice, black carbon can reduce the snow's reflectivity and accelerate the melting process.[57] As when suspended in the atmosphere, black carbon's deposition onto ice and snow creates positive feedback effects that lead to even greater warming. For example, as snow and ice around them melt away, the deposited black carbon particles can become even more concentrated on and near the surface,

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[48] *See* W. Chameides and M. Bergin, *Soot Takes Center Stage*, 297 SCIENCE 2214 (Sept. 27, 2002), (explaining that "BC is produced through incomplete combustion of biomass, coal, and diesel fuel").

[49] Mark Z. Jacobson, *Control of Fossil-Fuel Particulate Black Carbon and Organic Matter, Possibly the Most Effective Method of Slowing Global Warming*, 107 JOURNAL OF GEOPHYSICAL RESEARCH 4410 (2002) at 10.

[50] Chameides and Bergin, *supra* note 48, at 2214 (noting that while "greenhouse gases warm by absorbing infrared or terrestrial radiation," "BC warms by absorbing sunlight").

[51] M. Shekar Reddy and Olivier Boucher, *Climate Impact of Black Carbon Emitted from Energy Consumption in the World's Regions*, 34 GEOPHYSICAL RESEARCH LETTERS L11802 (2006) at 1 (stating that "Black carbon (BC) exerts a positive forcing at the top of the atmosphere").

[52] Technical Summary, *supra* note 10, at 29.

[53] Jacobson, *supra* note 49, at 6-8 (discussing twelve ways in which suspended BC affects climate).

[54] *Id.* at 6.

[55] *Id.*

[56] *Id.* at 7.

[57] Reddy and Boucher, *supra* note 51, at 2.

further reducing the reflectivity of the remaining snow and ice.[58] Thus, although the IPCC estimates the radiative forcing effect of black carbon deposition on snow and ice to be +0.1 W/m^2, it acknowledges that the radiative forcing metric may not accurately capture the climatic impacts of black carbon deposition on snow and ice. In the words of the IPCC, "the 'efficacy' may be higher" for black carbon radiative forcing, as it produces a temperature response 1.7 times greater than an equivalent radiative forcing due to carbon dioxide.[59]

Because it can accelerate the melting of snow and ice, black carbon may play a particularly important role in Arctic climate change.[60] Moreover, the radiative forcing of suspended black carbon particles may be amplified at the poles, where there is more light reflected from the Earth's surface, and thus more light available for the black carbon particles to absorb.[61] Because the Arctic has warmed at around twice the rate of the rest of the world over the last 100 years,[62] controlling and reducing black carbon emissions is particularly important.

The impacts of black carbon are not limited to the Arctic, however. Black carbon may be responsible for as much as 25 percent of observed global warming.[63] Thus, the overall contribution of black carbon to global warming may be substantial, perhaps second only to that of carbon dioxide.[64]

2. Emissions from Marine Engines and Vessels

Marine engines account for a significant share of black carbon emissions. Black carbon is a component of the particulate matter emitted from ships and other engines. In fact, approximately 66 percent of anthropogenic black carbon emissions come from the burning of fossil fuels.[65] Ships emit between 50,000 tonnes and 71,400 tonnes of back carbon per year.[66] Thus, in 2000, shipping contributed between 0.4 and 1.4 percent of global black carbon emissions.[67] Moreover, shipping is responsible for all black carbon released over the oceans.[68]

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[58] Flanner, Mark G., et al., *Present-Day Climate Forcing and Response from Black Carbon in Snow*, 112 JOURNAL OF GEOPHYSICAL RESEARCH D11202 (2007) at 2.

[59] IPCC, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, Forster, P., et al. *Changes in Atmospheric Constituents and in Radiative Forcing* (2007) at 184-85.

[60] FOEI, *supra* note 1, at 3.

[61] *See* Forster, *supra* note 59, at 163 ("Additionally, the presence of BC in the atmosphere above highly reflective surfaces such as snow and ice, or clouds, may cause a significant positive RF").

[62] IPCC, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, Trenberth, K.E, et al. *Observations: Surface and Atmospheric Climate Change* (2007) at 237.

[63] ICCT, *supra* note 19, at 34.

[64] Chameides and Bergin, *supra* note 48, at 2214.

[65] Reddy and Boucher, *supra* note 51, at 1.

[66] FOEI, *supra* note 1, at 4.

[67] A. Lauer, et al., *Global Model Simulations of the Impact of Ocean-Going Ships on Aerosols, Clouds, and the Radiation Budget*, ATOMS. CHEM. PHYS DISCUSS., 7, (2007) 9419–9464.

Although black carbon from shipping is emitted mainly to the air above the oceans, plumes of black carbon can also travel great distances and deposit on areas far away from the initial emission site. For example, plumes of black carbon from Asia are believed to deposit on snow in the Arctic.[69]

ARGUMENT

As explained above, ships are playing a significant role in global climate change primarily through the emission of four pollutants: carbon dioxide, nitrogen oxides, nitrous oxide, and black carbon. To address this urgent problem, EPA must proceed on multiple fronts. Thus, while EPA's ongoing rulemaking to address nitrogen oxide emissions from Category 3 marine diesel engines will have the secondary effect of helping to curb the growth of some greenhouse gas emissions, the agency must go further. By promulgating regulations in response to this petition to limit greenhouse gas and black carbon emissions from ships and by mandating cleaner fuels for marine diesel engines, EPA can achieve significant reductions in the emissions of climate change pollutants from ships.

I. THE ADMINISTRATOR SHOULD PROMULGATE REGULATIONS CONTROLLING GREENHOUSE GAS AND BLACK CARBON EMISSIONS FROM MARINE SHIPPING VESSELS.

The following sections demonstrate not only that EPA has the legal authority to regulate greenhouse gas and black carbon emissions from ships, but also that EPA should make full use of that authority to promulgate broadly applicable regulations reducing such emissions from all U.S.-flagged ships and all ships traveling within U.S. waters.

A. The Administrator Has the Legal Authority to Regulate Global Climate Change Emissions from Marine Shipping Vessels.

EPA has the legal authority to regulate greenhouse gas and black carbon emissions from ships because, consistent with the threshold determinations required under section 213(a)(4) of the Clean Air Act, greenhouse gas and black carbon emissions from marine engines and vessels significantly contribute to global climate change, which may be reasonably anticipated to endanger public health or welfare. 42 U.S.C. § 7547(a)(4).

In many respects, the legal issues underlying this petition are nearly identical to those that the Supreme Court confronted in *Massachusetts v. EPA*, 549 U.S. ___, 127 S.Ct. 1438 (2007). That case involved a petition to regulate the emissions of greenhouse gases from motor vehicles under section 202(a)(1) of the Act, which provides as follows:

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[68] Reddy and Boucher, *supra* note 51, at 1.

[69] Joseph R. McConnell, et al., *20th-Century Industrial Black Carbon Emissions Altered Arctic Climate Forcing*, 317 SCIENCE 1381 (2007) 1383.

> The Administrator shall by regulation prescribe . . . , standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.

42 U.S.C. § 7521(a)(1). A side-by-side comparison with the provision at issue here is instructive:

> If the Administrator determines that any emissions . . . from new nonroad engines or vehicles significantly contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, the Administrator may promulgate . . . standards applicable to emissions from those classes or categories of new nonroad engines and new nonroad vehicles . . . which in the Administrator's judgment cause, or contribute to, such air pollution . . . .

Id. § 7547(a)(4). Although section 202(a)(1) differs from section 213(a)(4) in that the motor vehicles provision uses the mandatory "shall" in place of the more permissive "may," in each case the judgment triggering EPA authority is essentially the same: If the Administrator determines that some particular kind of emissions from the source at issue are sufficiently connected with "air pollution which may reasonably be anticipated to endanger public health or welfare," then the Administrator is empowered to regulate those emissions.

In *Massachusetts v. EPA*, because EPA had declined to regulate carbon dioxide emissions from motor vehicles, in part on the grounds that carbon dioxide did not qualify as a "pollutant" under the Act, the Court faced the initial question of whether carbon dioxide fit the Act's definition of a pollutant. 127 S.Ct. at 1460. After affirming that carbon dioxide indeed fit squarely within the Act's "sweeping definition of 'air pollutant,'" *id.*, the Court turned to the remaining issue of the nature of EPA's duties in responding to the petition at issue:

> Under the clear terms of the Clean Air Act, EPA can avoid taking further action only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do.

Id. at 1462.

In sum, now that the Supreme Court has put to rest the contention that the Clean Air Act does not provide EPA authority to regulate global climate change related emissions, the EPA cannot avoid considering the key questions underlying this petition: (1) do greenhouse gas and black carbon emissions from new nonroad engines and vehicles significantly contribute to climate change, (2) do greenhouse gas and black carbon emissions from new marine vehicles and engines contribute to the overall contribution of new nonroad engines and vehicles to climate change, and (3) may climate change reasonably be anticipated to endanger public health or public welfare. If, as it must, the EPA answers all three questions in the affirmative, then the

EPA has the authority to promulgate regulations limiting emissions of greenhouse gas and black carbon from new marine vehicles and engines.[70]

1. Greenhouse Gas and Black Carbon Emissions from New Marine Engines and Vehicles Significantly Contribute to Global Climate Change

Section 213(a)(4) of the Clean Air Act empowers EPA to regulate specific classes or categories of new nonroad engines and vehicles, such as marine engines and vessels, if EPA first determines that new nonroad engines and vehicles, as a whole, contribute significantly to an air pollution problem.[71] Here, however, it is not necessary to consider the impacts of other classes or categories of nonroad engines or vehicles; new marine engines and vehicles are themselves significant contributors to climate change.

In making significant contributor determinations under section 213(a)(4), the Administrator has looked broadly at the impact of new nonroad vehicles over time.[72] For example, EPA has found that emissions from new nonroad engines and vehicles meet the section 213(a)(4) significant contributor criterion with respect to emissions of hydrocarbons. 67 Fed. Reg. 68,243 (Nov. 8, 2002). In reaching this conclusion, EPA employed two methods of analysis. The agency used a "snapshot" approach that considered the current impact of all nonroad engines and vehicles (both new and existing), and supplemented this approach with modeling to estimate future emissions of nonroad sources. *Id.* at 68,251 (analyzing emissions from nonroad sources in both 2000 and 2030).

Both approaches make sense, as they provide an estimate of the likely impact of new nonroad sources in the future. As a practical matter, emissions from new nonroad engines and vehicles do "significantly contribute" to air pollution when measured over the useful life of those

[70] Although emissions from ships do not become subject to regulation unless those emissions "significantly contribute to *air pollution* which may reasonably be anticipated to endanger public health or welfare," 42 U.S.C. § 7547(a)(4) (emphasis added), and although EPA has in the past determined that the term "air pollution," as used in the Act "cannot be interpreted to encompass climate change," 68 Fed. Reg. 52,928 (Sept. 8, 2003), these facts present no barrier to this petition. EPA's determination that climate change does not qualify as "air pollution" was based on its incorrect claim that carbon dioxide was not an "air pollutant" under the Act. 68 Fed. Reg. 52,928. Moreover, in rejecting EPA's overly narrow interpretation of "air pollutant" the Supreme Court also voided EPA's construction of the term "air pollution," noting that because greenhouse gases both enter the ambient air and warm the atmosphere, they are "unquestionably 'agents' of air pollution." *Massachusetts v. EPA*, 127 S. Ct. at 1460 n.26.

[71] 42 U.S.C. § 7547(a)(4). In considering the statutory language of section 213 of the Clean Air Act, the United States Court of Appeals for the District of Columbia Circuit explained that "the language and structure of § 213 as a whole make quite clear that Congress did not intend to require a finding of 'significant contribution' for individual vehicle categories." *Bluewater Network v. EPA*, 370 F.3d at 13. Instead, "Congress drew a distinction between the 'significant contributor' finding required for all new and existing nonroad vehicles, and the 'cause, or contribute to' finding for an individual category of new nonroad vehicles." *Id.* (emphasis omitted). Thus, if all new and existing nonroad engines and vehicles collectively are "significant contributors" to air pollution, then the Act empowers EPA to set standards regulating emissions from each category of new nonroad vehicles and engines that "cause, or contribute to, such air pollution."

[72] Thus, the EPA has made clear that even though the wording of section 213(a)(2)-(3) and 213(a)(4) is slightly different, it understands that Congress intended the same kind of "significant contributor analysis. *Compare* 42 U.S.C. § 7547(a)(2), *with id.* § 7547(a)(4).

nonroad engines and vehicles that are currently new. Moreover, both approaches are consistent with the forward-looking language of section 213(a)(4), which allows EPA to abate the emission of pollution "which may reasonably be anticipated" to endanger public health or welfare. 42 U.S.C. § 7547(a)(4).

Although the Act therefore sets up a complex threshold for regulation under section 213(a)(4), here the task of application is made simple by the large contribution that emissions from ships make and will continue to make to climate change. By any definition of the term "significant," ships contribute significantly to global climate change. Carbon dioxide emissions from international shipping exceed the annual total greenhouse gas emissions from most of the Kyoto Protocol Annex I countries.[73] In the United States, marine engines contribute about five percent of the total U.S. carbon dioxide emissions from transportation-related fossil fuel combustion.[74] It is likely that only six countries in the world contribute more carbon dioxide to the atmosphere than global shipping.[75] These carbon dioxide emissions are augmented by significant emissions of nitrous oxide and black carbon.[76]

The contribution of marine engines and vehicles to global climate change is comparable to the share of emissions of other pollutants that Congress believed to be significant when it enacted section 213. Thus, the Senate Environment and Public Works Committee's report accompanying the Senate's version of the 1990 Clean Air Act Amendments noted that nonroad sources "now make up a *significant* portion of pollution, especially in urban areas." S. Rep. No. 101-228, at 104 (emphasis added). The Committee then cites as an example of this significant contribution to pollution, the fact that "[e]missions inventories from EPA estimate that farm and construction equipment emit 3.7 percent of carbon monoxide nationwide, four percent of nationwide nitrogen oxide, and 1.3 percent of total hydrocarbons." *Id.* As EPA has already recognized, "[t]hese figures provide an indication of how much nonroad vehicles and engines have to contribute to nationwide levels of specified pollutants in order for Congress to consider such nonroad sources significant contributors." 58 Fed. Reg. 28811-12 (May 17, 1993). Moreover, in determining that nonroad engines and vehicles emitted sufficient amounts of ozone precursors to qualify as significant contributors to ground-level ozone pollution, EPA relied on modeling demonstrating that, in the absence of nonroad emissions, ozone levels would decrease between 3 to 8 percent. 59 Fed. Reg. 31,307 (June 17, 1994). EPA further concluded that this level of contribution would satisfy "any reasonable indicator of significance." *Id.* at 31,308.

In sum, new marine vehicles and engines account for such a large and rapidly growing portion of all carbon dioxide, nitrous oxide, and black carbon emissions that they are plainly contributing significantly to global climate change. Thus, provided that global climate change

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[73] ICCT, *supra* note 19, at 34.

[74] *See id.* (total CO_2 emissions from the transportation sector were 1995.1 million metric tons in 2005).

[75] United Nations, Department of Economic and Social Affairs, Statistics Division, *supra* note 2.

[76] See sections III(C)(2)) & III(D)(2) of the Background, above. They are also significantly augmented by emissions of nitrogen oxides, but the authority to regulate nitrogen oxides falls principally under Section 213(a)(1)-2), 42 U.S.C. § 7547(a)(1)-(2). As explained in n.1, *supra*, the regulations sought in this petition would be complementary to regulations promulgated specifically to address nitrogen oxide.

may be reasonably anticipated to endanger public health or welfare, the Clean Air Act permits EPA to regulate carbon dioxide, nitrous oxide, and black carbon emissions from these sources.[77]

2. Global Climate Change May Reasonably Be Anticipated to Endanger Public Health or Welfare

Climate change is projected to have numerous adverse impacts on public health and welfare. The severity of the effects of climate change, in conjunction with the Clean Air Act's precautionary approach, make clear that climate change can be reasonably anticipated to endanger public health or welfare.

As the "may be reasonably anticipated" language of section 213(a)(4) affirms, the Clean Air Act is a precautionary statute under which proof of actual harm is not required. 42 U.S.C. § 7547(a)(4). Congress directed that regulatory action taken pursuant to an endangerment finding would be designed to "precede, and, optimally, prevent, the perceived threat." *Ethyl Corp. v. EPA*, 541 F.2d 1, 13 (D.C. Cir. 1976). EPA is not required to document "proof of actual harm" as a prerequisite to regulation; rather, EPA is supposed to act where there is "a significant risk of harm." *Id.* at 12-13. In *Ethyl Corp.*, noting the novelty of many human alterations of the environment, the Court of Appeals for the District of Columbia Circuit found:

> Sometimes, of course, relatively certain proof of danger or harm from such modifications can be readily found. But, more commonly, 'reasonable medical concerns' and theory long precede certainty. Yet the statutes and common sense demand regulatory action to prevent harm, even if the regulator is less than certain that harm is otherwise inevitable.

Id. at 24; a*ccord, Industrial Union Dep't v. American Petroleum Institute,* 448 U.S. 607, 656 (1980) (plurality) (agency need not support finding of significant risk "with anything approaching scientific certainty," but rather must have "some leeway where its findings must be made on the frontiers of scientific knowledge," and "is free to use conservative assumptions in interpreting the data," "risking error on the side of overprotection rather than underprotection").

The 1977 Clean Air Act Amendments, Pub. L. No. 95-95, § 401, 91 Stat. 790-91 (August 7, 1977), confirmed and adopted the precautionary interpretation enunciated in *Ethyl*, enacting special provisions designed to "apply this interpretation to all other sections of the act relating to public health protection." H.R. Rep. No. 294 at 49 (1977); *accord, id.* at 51 (amendments are designed inter alia to "emphasize the precautionary or preventive purpose of the act (and, therefore, the Administrator's duty to assess risks rather than wait for proof of actual harm)"). Congress rejected the argument that, "unless conclusive proof of actual harm can be found based

[77] Because emissions of carbon dioxide, nitrous oxide, and black carbon each contribute to a single air pollution phenomenon, it is within EPA's authority to determine that the aggregate emissions of these global climate change pollutants from new nonroad engines and vehicles significantly contribute to climate change. In the alternative, should EPA determine that it must consider the emissions of each pollutant in isolation, Petitioners maintain that emissions of carbon dioxide, nitrous oxide, and black carbon from marine shipping vessels each contribute significantly to global climate change when considered alone.

on the past occurrence of adverse effects, then the standards should remain unchanged," finding that this approach "ignores the commonsense reality that 'an ounce of prevention is worth a pound of cure.'" *Id.* at 127.

While the precautionary nature of the Clean Air Act creates a low threshold for findings relating to the negative consequences of air pollution, here there is ample evidence that global climate change is endangering and will continue to endanger public health and welfare.

a. Public Health Impacts

Global climate change is expected to have significant impacts on human health in numerous ways, including increased heat-related mortalities, the spread of infectious disease vectors, greater air and water pollution, an increase in malnutrition, and greater casualties from fires, storms, and floods. EPA has already recognized that climate plays a significant role in public health:

> Throughout the world, the prevalence of some diseases and other threats to human health depend largely on local climate. Extreme temperatures can directly lead to loss of life, while climate-related disturbances in ecological systems, such as changes in the range of infective parasites, can indirectly impact the incidence of serious infectious diseases. In addition, warm temperatures can increase air and water pollution, which in turn harm human health.[78]

Given the ample evidence linking climate change to adverse public health impacts, the EPA must conclude that climate change can be reasonably anticipated to endanger public health.

Perhaps the most direct impact of climate change on human health will occur through increased heat-related mortalities. Heat waves already pose a serious threat to public health, and climate change is predicted to increase the magnitude, frequency, and duration of heat waves in the United States.[79] The Department of State's, *U.S. Climate Action Report 2002*, indicated that rising temperatures will likely produce dramatic increases in summer heat index values in the Northeast, Southeast, and Midwest.[80] By the end of the century, cities such as Hartford and Philadelphia could average nearly 30 days with high temperatures above 100°F each year.[81]

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[78] EPA, *Climate Change, Health and Environmental Effects*, *available at* http://www.epa.gov/climatechange/effects/index.html, (last visited Oct. 1, 2007) [hereinafter EPA Climate Change Effects].

[79] IPCC, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, [SUMMARY FOR POLICYMAKERS] (2007) at 10-11, *available at* http://www.ipcc.ch/SPM13apr07.pdf, [hereinafter WORKING GROUP II SUMMARY].

[80] U.S. Department of State, *U.S. Climate Action Report 2002* at 110.

[81] Peter C. Frumhoff, et al., *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions* (2007) at x, *available at* http://www.climatechoices.org/ne/resources_ne/nereport.html.

Segments of the population that are particularly vulnerable, such as those with heart problems, asthma, the elderly and very young, and the homeless, are especially at risk to extreme heat.[82]

Climate change is also expected to play a role in worsening air quality problems that already affect human health. For example, EPA has recognized that the higher temperatures that result from climate change may result in increased concentrations of ground-level ozone.[83] Breathing ozone can trigger a variety of health problems, including chest pain, coughing, throat irritation, and congestion, and repeated exposure can lead to bronchitis, emphysema, asthma, and permanent scarring of lung tissue.[84] Moreover, climate change may also indirectly affect the concentration of particulate matter in the air by increasing sources such as wildfires and dust from dry soils.[85] Exposure to such particles can affect both the lungs and heart and has been linked to a variety of problems, including increased respiratory symptoms such as irritation of the airways, coughing or difficulty breathing, decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, nonfatal heart attacks, and premature death in people with heart or lung disease.[86] As with other forms of air pollution, certain vulnerable segments of the population, such as children with asthma and the elderly, are the most likely to be affected.[87]

Climate change is also expected to increase the risk from certain infectious diseases, especially vector-born diseases spread by mosquitoes or other insects.[88] Thus, vector-born diseases like malaria and dengue fever may expand their ranges.[89] In the United States, hotter, longer, and drier summers punctuated by heavy rainstorms may also create more favorable conditions for outbreaks of West Nile Virus in the Northeast.[90]

Climate change's role in increasing the frequency and severity of extreme weather events, such as hurricanes, droughts, and floods, may also adversely affect public health. For example, in delta regions, coastal areas, and small islands, sea level rise is anticipated to threaten human populations by exacerbating flooding and increasing the size of storm surges.[91] The Atlantic coast of the Southeast is likely to see such effects and suffer the loss of important buffers against storm damage.[92] In Appalachia, the increase in intense rainfalls is likely to result

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[82] EPA Climate Change Effects, *supra* note 77.

[83] *Id.*

[84] EPA, *Ground-Level Ozone: Health and Environment, available at* http://www.epa.gov/air/ozonepollution/health.html (last visited Oct. 1, 2007).

[85] EPA Climate Change Effects, *supra* note 77.

[86] EPA, *Particulate Matter: Health and Environment, available at* http://www.epa.gov/air/particlepollution/health.html (last visited Oct. 1, 2007).

[87] *Id.*

[88] EPA Climate Change Effects, *supra* note 77.

[89] *Id.*

[90] Frumhoff, *supra* note 80, at xi.

[91] Working Group II Summary, *supra* note 78, at 9-11.

[92] U.S. Department of State, *supra* note 79, at 110.

in more dangerous flash floods.[93] Meanwhile, warming in the West is projected to decrease mountain snowpack and cause more winter flooding with reduced summer flows.[94] Finally, rising sea levels are expected to increase the salinity of surface and ground water through salt water intrusion, threatening drinking water supplies in places like the New York metropolitan area, Philadelphia, southern Florida, and California's Central Valley.[95]

b. Public Welfare Impacts

The Clean Air Act provides a broad definition of "effects on welfare," that encompasses a host of environmental ills:

> All language referring to effects on welfare includes, but is not limited to, effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being, whether caused by transformation, conversion, or combination with other air pollutants.

42 U.S.C. § 7602(h). Of particular importance here, "effects on welfare" refers to "effects on . . . weather . . . and climate." Thus, the most basic effect of global climate change – that the Earth's average mean temperature will increase – is directly implicated as an effect on welfare under the Act. As discussed above, global climate change is already resulting in well-documented impacts on climate and weather, including air and ocean temperature increases, widespread melting of snow and ice, changes in precipitation amounts and wind patterns, and more frequent extreme weather such as hurricanes, heat waves, floods, and droughts.[96] However, aside from these direct impacts on weather and climate, there are numerous other ways in which global climate change may be reasonably anticipated to endanger public welfare.

In its recent assessment of the impacts of climate change, the IPCC concluded that "[o]bservational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases."[97] In the United States, the impacts vary by region, but climate change will have significant consequences for ecosystems in many areas. For example, the State Department reports that each of the following are likely results of climate change: (1) water quantity and quality in the Great Lakes will decrease; (2) prairie potholes, an important migratory bird habitat in the Great Plains, will become drier; (3) river temperatures in the Northwest will increase, placing additional stress on migrating fish; and (4) melting of sea ice and permafrost in Alaska will harm ecosystems and

[93] *Id.*

[94] Working Group II Summary, *supra* note 78, at 10.

[95] EPA Climate Change Effects, *supra* note 77.

[96] Working Group I Summary , *supra* note 7, at 5-9.

[97] Working Group II Summary, *supra* note 78, at 1.

infrastructure.[98] Climate change is also likely to pose problems for many forested areas in the United States by extending and increasing the intensity of fire seasons and fostering insect outbreaks.[99]

Changes in the Earth's climate are already having an impact on marine and freshwater biological systems. For example, the ranges of algae, plankton, and fish have shifted in many water bodies in response to changes in water temperature, ice cover, oxygen content, salinity, and circulation.[100] Corals are particularly vulnerable to thermal stress and have a limited ability to adapt to changes in their ecosystem.[101] Thus, the IPCC projects that an increase in sea surface temperature of approximately 1° to 3° C (1.8°-5.4° F) will result in widespread coral mortality.[102] Finally, the increasing absorption of carbon dioxide has already decreased ocean pH by 0.1 units on average,[103] and the IPCC predicts that further acidification will harm corals and other shell forming organisms.[104]

Some habitats that are already imperiled by other forces will be particularly susceptible to damage from climate change. For example, sea level rise driven by climate change will contribute to the loss of coastal wetlands.[105] In addition to their role in protecting against floods and storm surges, such wetlands provide habitat for many species, afford recreational opportunities, and play a key role in both nutrient uptake and the economy of the surrounding area.[106] However, because they are generally located within a few feet of sea level, coastal marshes and swamps are particularly vulnerable to rising sea levels.[107] Thus, sea level rise could eliminate up to 22 percent of the world's coastal wetlands by the end of this century.[108] EPA has estimated that a two-foot rise in sea level, a figure that is within range of the IPCC's modeling for sea level rise during the 21st Century, could eliminate between 17 and 43 percent of U.S. wetlands.[109]

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[98] U.S. Department of State, *supra* note 79, at 110. This is especially true for species like the polar bear, which is evolutionarily adapted to life on the sea ice and spends only short periods on land. *See* 72 Fed Reg. 1064 (Jan. 9, 2007) (Proposed Rule To List the Polar Bear as Threatened Under the Endangered Species Act).

[99] EPA Climate change Effects, *supra* note 77.

[100] Working Group II Summary, *supra* note 78 at 2.

[101] *Id.* at 6.

[102] *Id.* The National Marine Fisheries Service has found that shallow reef habitats are especially vulnerable to increases in global air and sea temperatures due to coral bleaching. 71 Fed. Reg. 26,852, 26,858 (May 9, 2006) (Final Rule to List Elkhorn (*Acropora palmata*) and Staghorn (*A. cervicornis*) Corals as Threatened Under the Endangered Species Act).

[103] Working Group II Summary, *supra* note 78 at 2.

[104] *Id.* at 6.

[105] *Id.* at 3.

[106] EPA Climate Change Effects, *supra* note 77.

[107] *Id.*

[108] *Id.*

[109] *See id.*; Working Group I Summary, *supra* note 7, Table SPM-3.

The welfare impacts of climate change are not limited to impacts on natural systems. For example, climate change will also adversely affect agriculture. EPA has recognized that, "[a]griculture is highly sensitive to climate variability and weather extremes, such as droughts, floods and severe storms," and that climate change can adversely affect crop yields in regions where summer heat already limits production, increase the likelihood of severe droughts, and increase the rate of evaporation of moisture from topsoil.[110] Moreover, the increase in heavy precipitation events to which climate change contributes is projected to lead to increased soil erosion.[111]

B. EPA Should Exercise Its Authority to Promulgate Regulations Limiting Global Climate Change Emissions from Marine Shipping Vessels.

Because of the serious consequences of climate change described above, EPA should take immediate action to limit the emissions of greenhouse gas and black carbon from ships. These emissions from ships significantly contribute to air pollution that may reasonably be anticipated to endanger public health or welfare. Though they are already beginning to appear, the adverse impacts of global warming on public health and welfare will only grow worse with time. Delay in the face of such profound consequences is inexcusable. A look back at EPA's response to an earlier request to limit greenhouse gas emissions confirms the need for decisive action on this petition.

In its initial response to the petition that resulted in *Massachusetts v. EPA*, the agency maintained that even if it had the authority to regulate greenhouse gas emissions from motor vehicles, it would refuse to exercise that authority. EPA first noted that the "science of climate change is extraordinarily complex and still evolving." 68 Fed. Reg. 52,930 (Sept. 8, 2003). Therefore, according to the agency, establishing greenhouse gas emission standards for motor vehicles "would require EPA to make scientific and technical judgments without the benefit of the studies being developed to reduce uncertainties and advance technologies." *Id.* at 52,931. Regardless of any merit this argument may have had in 2003, the understanding of climate science has progressed by leaps and bounds since then. Moreover, as discussed below, technologies that are readily available today can significantly reduce global climate change emissions from ships.

EPA also advanced a second pragmatic argument in rejecting the petition to regulate motor vehicle emissions, contending that acting to limit greenhouse gas emissions from motor vehicles "would also result in an inefficient, piecemeal approach to addressing the climate change issue." *Id.* Instead, EPA reasoned, "[a] sensible regulatory scheme would require that all significant sources and sinks of GHG emissions be considered in deciding how best to achieve any needed emission reductions." *Id.* However, the developments following EPA's initial refusal to regulate motor vehicle greenhouse gas emissions have turned this argument on its head. With EPA presently considering a response to requests to limit global climate change emissions from motor vehicles, power plants, and petroleum refineries, and with requests to

[110] EPA Climate Change Effects, *supra* note 77.

[111] Working Group II Summary, *supra* note 78, at 14.

regulate carbon dioxide emissions from other major sources all but certain to follow in the coming months, the agency's response to climate change would more likely be inefficient and piecemeal if it *declined* to regulate global climate change emissions from ships. If, as EPA suggests, "a sensible regulatory scheme" is necessarily broad in scope, then EPA's refusal to limit the greenhouse gas and black carbon emissions from ships would only promote an arbitrary and capricious approach to the regulation of global climate change emissions.

C. Effective Regulation of Global Climate Change Emissions from Marine Shipping Vessels Is Possible.

Regulatory measures that can measurably reduce carbon dioxide, nitrous oxide, and black carbon emissions from marine engines and vessels are readily available. Further, implementation of such measures could be accomplished consistent with the Clean Air Act and other statutory requirements.

1. EPA Has Broad Discretion in Promulgating Regulations to Limit Global Climate Change Emissions from Marine Shipping Vessels.

In drafting the Clean Air Act, Congress recognized that some pollutant emissions might not be amenable to control via "end-of-pipe" technologies, and therefore provided EPA with broad authority to craft emissions standards that address multiple aspects of the regulated source, such as operational practices and design requirements.

Although the endangerment finding that triggers EPA's authority to regulate global climate change emissions from ships is essentially a "yes or no" question, the realm of potential regulatory responses to an affirmative endangerment finding is quite broad. In considering EPA's possible responses to the petition at issue in *Massachusetts v. EPA*, the Court noted that it considered the agency to have "significant latitude as to the manner, timing, content, and coordination of its regulations with those of other agencies." 127 S.Ct. at 1462. The specific Clean Air Act provision under which EPA would adopt regulations limiting ship greenhouse gas and black carbon emissions also confers a broad grant of discretion to the Administrator in selecting the appropriate regulatory initiatives to carry out the statutory goal of limiting air pollution reasonably anticipated to endanger public health or welfare. Section 213(a)(4) provides that

> the Administrator may promulgate . . . *such regulations as the Administrator deems appropriate containing standards applicable to emissions* from those classes or categories of new nonroad engines and new nonroad vehicles . . . which in the Administrator's judgment cause, or contribute to, such air pollution, taking into account costs, noise, safety, and energy factors associated with the application of technology which the Administrator determines will be available for the engines and vehicles to which such standards apply.

42 U.S.C. § 7547(a)(4) (emphasis added). Thus, the Act provides EPA with expansive authority to adopt "standards applicable to emissions" that govern the emission of greenhouse gas and black carbon from ships.

Although the Clean Air Act does not define the term "standards applicable to emissions," it does provide a definition for the analogous term "emission standard." *Id.*. § 7602(k). That definition informs the scope of EPA's authority in responding to this petition. The Act defines "emission standard" as

> a requirement established by the State or the Administrator which limits the quantity, rate, or concentration of emissions of air pollutants on a continuous basis, including any requirement relating to the operation or maintenance of a source to assure continuous emission reduction, and any design, equipment, work practice or operational standard promulgated under this chapter.

Id. Accordingly, even if EPA were to determine, for example, that no control technology to scrub carbon dioxide emissions from ship exhaust were available, the Act's definition of "emissions standard" would allow the agency to limit emissions via operational or maintenance requirements, including "design, equipment, work practice, or operational standard[s]." In light of the flexibility that Congress envisioned would often be necessary to limit air pollutant emissions, EPA clearly has the authority to promulgate requirements "relating to the operation or maintenance" of ships.

Moreover, this interpretation of the scope of EPA's authority is consistent with other judicial opinions examining the range of regulatory measures subsumed under the term "standard," as used in the Clean Air Act's mobile source provisions. For example, in *Engine Manufacturers Association v. South Coast Air Quality Management District*, 541 U.S. 246 (2004), the Supreme Court held that fleet purchase restrictions qualified as standards under the Act. *Engine Manufacturers Ass'n* at 252. The Court explained that Congress employed the term "'standard' throughout Title II of the Clean Air Act . . . to denote requirements *such as* numerical emission levels with which vehicles or engines must comply or emissions control technology with which they must be equipped." *Id.* at 253 (emphasis added, internal citations omitted). Thus, the Court concluded that regulations need not apply exclusively to the manufacturers of vehicles to qualify as emissions standards under the Act: "a standard is a standard even when not enforced through manufacturer-directed regulation." *Id.* at 254. Similarly, the Eastern District of California recently determined that regulations requiring that marine engines emit no more pollutants than if their engines had used specified fuels qualified as "standards" under the Act, even though these regulations did not establish a uniformly applicable numerical emissions level. *Pacific Merchant Shipping Association v. Cackette*, No. CIV. S-06-2791, 2007 WL 2492681 (E.D. Cal. Aug. 30, 2007) at *9-10.[112]

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[112] The California regulations at issue provided:

> [N]o person subject to this section shall operate any auxiliary diesel engine, while the vessel is operating in any of the Regulated California Waters, which emits levels of diesel PM, NO_x, or SO_x in exceedance of the emission rates of those pollutants that would result had the engine used the following fuels:
>
> (A) Beginning January 1, 2007:
>
> 1. marine gas oil, as defined in subsection (d); or

In fact, EPA has already interpreted the scope of its regulatory authority quite broadly in the context of regulating greenhouse gas emissions. In its initial rejection of the petition to regulate motor vehicle greenhouse gas emissions, EPA noted that, "[n]o technology currently exists or is under development that can capture and destroy or reduce emissions of carbon dioxide, unlike other emissions from motor vehicle tailpipes. At present, the only practical way to reduce tailpipe emissions of carbon dioxide is to improve fuel economy." 68 Fed. Reg. 52,929 (Sept. 8, 2003). The EPA did not claim that it did not have the authority, all other things being equal, to regulate fuel economy. Instead, the EPA resisted promulgating regulations by claiming that regulation of fuel economy would conflict with the existing CAFE program. *Id.* ("[t]he only way for EPA to proceed with carbon dioxide emissions standards without upsetting this statutory scheme would be to set a standard less stringent than CAFE for cars and light duty trucks. But such an approach would be meaningless in terms of reducing [greenhouse gas] emissions from the U.S. motor vehicle fleet."). The Court rejected the EPA's argument. *See Massachusetts v. EPA*, 127 S.Ct. at 1462.[113]

Congress wisely provided EPA with expansive authority to craft emissions standards for mobile sources that make optimal use of existing technological and operational capabilities. Although EPA is free to issue standards establishing numerical emissions limits for greenhouse gas and black carbon, nothing in the Clean Air Act prevents EPA from creating multiple compliance alternatives for marine engines and vehicles subject to such regulations.

2. Regulations Limiting Marine Shipping Vessel Speed Would Significantly Reduce Global Climate Change Emissions from Ships.

EPA should adopt restrictions on vessel speed to reduce carbon dioxide, nitrous oxide, and black carbon emissions from marine engines and vessels. Such restrictions would have minimal impact on the global shipping industry and would greatly improve the fuel efficiency of water transport. Reducing vessel speed would also result in a reduction in the emissions of nitrogen oxides from ships, leading to additional climate change benefits.

Studies have shown that the most cost effective, feasible method to reduce emissions from ships is to slow the global fleet.[114] Global climate change emissions are directly

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> 2. marine diesel oil, as defined in subsection (d), with a sulfur content of no more than 0.5 percent by weight;
>
> (B) Beginning January 1, 2010: marine gas oil with a sulfur content of no more than 0.1 percent by weight.

13 C.C.R. § 2299.1(e) (as in effect on Aug. 30, 2007). The court concluded that these regulations, "on their face, impose standards relating to the control of emissions." *Pac. Merchant Shipping Ass'n*, 2007 WL 2492681, at *9.

[113] For a more detailed discussion of the Supreme Court's rejection of this argument, see section I(C)(5)(c) of the Argument section of this petition.

[114] FOEI, *supra* note 1, at 6.

proportional to fuel consumption, and the amount of fuel ships consume is directly and exponentially related to vessel speed. Thus, slowing down results in significant savings in fuel.[115] Indeed, the IMO reports that a ten percent reduction in speed would result in a 23.3 percent decrease in emissions.[116] At low speeds, ships are one order of magnitude more efficient than land transport and two orders more efficient than air transport.[117] However, as ship speeds increase much of these efficiencies are lost. Very fast ships have been found to have similar energy demands to airplanes.[118]

In many cases, ships run at high speed to the port of destination and have to wait for days or even weeks to have their cargo loaded or unloaded. Increasing the efficiency at these ports, perhaps by giving ships berthing times as happens at airports, would allow ships to operate at slower speeds without imposing a heavy financial burden.[119]

Recently, George Gratsos, the President of the Hellenic Chamber of Shipping, said at the Bunkerworld Forum in Athens that there would be "few repercussions" to the world economy from a 20 percent reduction in ocean-going ship speeds close to the European Union. This 20 percent reduction in speed however, would result in a 55-65 percent reduction in emissions.[120]

Since the fuel consumption of a ship does not depend primarily on its size, but rather on its speed, the same amount of transport work can be achieved by more slower ships, rather than fewer faster ships.[121] One case study compared the fuel consumption of two fleets, each providing the same transport capacity. The first fleet was made up of ten ships of 16 knot design speed, while the second was comprised of 14 ships of 10.5 knots design speed. The faster fleet consumed 140,000 tons of fuel in comparison to the slower fleet that consumed 60,000 tons of fuel (a decrease of 57 percent in fuel consumption and therefore emissions). [122]

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[115] Ottar Maestad, et al., *International Climate Policy – Consequences for Shipping*, at 39, SNF-Report No.82/2000, Foundation for Research in Economics and Business Administration, (2000) *available at* http://bora.nhh.no/bitstream/2330/1032/1/R82_00.pdf.

[116] IMO, *supra* note 27, at 17, Table 1-5.

[117] J Isensee and V Bertram, *Quantifying External Costs of Emissions Due to Ship Operation*, 218 PROC. INST. MECH. ENGRS. Part M: J. ENGINEERING FOR THE MARITIME ENVIRONMENT 41 (2004) 44.

[118] *Id.*

[119] FOEI Submission to MEPC (IMO), *Market-based Measures Combined with Other Emissions Reductions Initiatives Have the Potential to Control GHG Emissions from International Shipping.* (Aug. 22, 2007) at 2.

[120] George Gratsos, President of the Hellenic Chamber of Shipping, at the Welcome Address at the Bunkerworld Forum in Athens on Bunkering in the Mediterranean and Black Sea, May 2007. From the standpoint of the shipping firm, it is economically optimal to reduce speed when freight rates are relatively low compared to the cost of fuel. Maestad, et al., *supra* note 114, at 41-42. Thus, recent increases in fuel prices are likely to make reductions in fuel consumption more attractive. Further, as the refining process has developed, the remaining residual fuel has become poorer quality. IMO, *supra* note 27, at 107. This declining fuel quality not only imposes environmental costs, but also imposes additional costs on shipping firms, because it reduces engine longevity. *Id.* at 108. Thus, speed reductions will become more attractive as ships are required to use less polluting, higher quality, more expensive fuels. Isensee and Bertram, *supra* note 116, at 48.

[121] Isensee and Bertram, *supra* note 116, at 49.

[122] *Id.* at 49-50.

A second case study showed that for bulkers[123] carrying coal between ports over a distance of 120 nautical miles, a fleet of five faster ships (16.0 knot) used 77,170 tons of fuel per year, while a fleet of six slower ships (12.6 knot) used only 43,310 tons of fuel. The slower fleet consumed 44 percent less fuel and emitted the equivalent amount of fewer emissions than the faster fleet.[124]

A third case study looked at a Roll-On-Roll-Off[125] ship, with a service speed of 19.5 knots, transporting cars from the port of Gothenburg to the port of Nagoya. The study suggested that although cutting its speed to 17 knots (12.8 percent) would result in a delay of three days (increasing the travel time to 37 days), this lost time could be made up by more efficient handling in the ports.[126]

The Ports of Los Angeles and Long Beach already have a speed reduction scheme in place, providing incentives for ships to remain below a speed of 12 knots. The ports are aiming for 100 percent compliance, which would result in significant reductions in ship emissions. For example, the Port of Los Angeles would see reductions of 37 percent for nitrogen oxides and 49 percent for particulate matter.[127] These figures illustrate another important point regarding regulations limiting vessel speed – they would have pollution reduction benefits extending to nitrogen oxides emissions as well. As discussed above, emissions of nitrogen oxides from ships also contributes to global climate change, and because restrictions on vessel speed would improve the fuel efficiency of ships, they would reduce the emissions of this pollutant per ton of cargo carried.

3. Regulations Requiring the Use of Cleaner Fuels Would Significantly Reduce Climate Change Emissions from Marine Shipping Vessels.

In addition to its authority to regulate the manufacture and sale of fuels under section 211 of the Clean Air Act, EPA also has the authority to mandate the *use* of cleaner fuels in ships pursuant to its authority to set emissions standards under section 213. As noted above, the United States District Court for the Eastern District of California recently concluded that regulations limiting ship emissions to no more than levels that would be obtained when combusting specified fuels fits squarely within the Act's definition of an emissions standard. *Pacific Merchant Shipping Association*, 2007 WL 2492681, at *9.

[123] A bulk carrier, bulk freighter, or bulker is a merchant ship used to transport unpackaged bulk cargo such as cereals, coal, ore, and cement.

[124] Isensee and Bertram, *supra* note 116, at 50.

[125] Roll-on/roll-off (RORO or ro-ro) ships are designed to carry wheeled cargo such as automobiles, trailers or railway carriages. This is in contrast to lo-lo (lift on-lift off) vessels which use a crane to load and unload cargo.

[126] Gloria Gerilla, et al., *Environmental Assessment of International Transportation of Products*, 6 JOURNAL OF THE EASTERN ASIA SOCIETY FOR TRANSPORTATION STUDIES 3167 (2005) 3178.

[127] Guy Wilson-Roberts, *California Vessel Speed, Shore Power Meetings Tomorrow*, SUSTAINABLESHIPPING.COM, July 11, 2007, http://www.sustainableshipping.com/news/2007/07/68431.

Adopting stringent restrictions on fuel sulfur content will result in a net reduction in the emissions of several global climate change related air pollutants.[128] Ships commonly use "residual fuels" which are high in sulfur content. By adopting regulations, the EPA could require ships to use more refined fuels, such as marine diesel oil or marine gas oil, that burn cleaner, as a means of reducing marine shipping vessels' contribution to global climate change emissions. Therefore, the EPA should move expeditiously to adopt such limits and prohibit the use of non-complying fuels.

Residual fuel oil is of low quality. It is used because of its low cost, approximately $385 per metric tonne.[129] Even so, its use is not unproblematic for ship operators. Residual fuels must be heated to about 140^{o}C before being used on board. A proportion of the fuel, the sludge which cannot be put through the engine, must be removed and is regularly burnt on board.[130]

The sulfur content of residual fuels varies according to the crude stock, but globally averages about 2.7 percent.[131] In contrast, cleaner fuels such as marine diesel oil contain 0.5 percent sulfur content, while marine gas oil is composed of 0.1 percent sulfur.[132]

Switching to low-sulfur fuels would reduce emissions of fine particles, including black carbon, as well as carbon dioxide, nitrogen oxides, and nitrous oxides, and enable the use of other emissions control equipment that the sulfur levels in residual fuel would otherwise impede.[133] Marine diesel oil and marine gas oil have shown significant decreases in particulate matter and nitrogen oxides compared to heavy fuel oil.[134] A switch from heavy fuel oil to marine diesel oil would result in a 2.86 percent reduction in carbon dioxide emitted per ton of fuel consumed.[135] The IMO suggests that this switch could reduce carbon dioxide emissions from shipping by 1.6 percent by 2010 and three percent by 2020.[136] This switch would also result in reductions of over 91 percent in nitrous oxide, 63 percent in particulate matter (of which black carbon is a component), and nearly five percent in nitrogen oxide emissions.[137]

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[128] Regulations setting emissions standards for marine shipping vessel engines based on the levels of sulfur emissions that would result from burning low-sulfur fuels would limit global climate change emissions as well as reduce pollutants regulated under section 213(a)(1) of the Clean Air Act. As noted above, Friends of the Earth's lawsuit to compel EPA to comply with section 213(a)(3) of the Act is thus complementary to this petition. *See* Friends of the Earth v. EPA, No. 07-1572 (D. D.C. filed Sept. 5, 2007).

[129] *See* Bunkerworld.com, Fuel Prices, http://www.bunkerworld.com/markets/prices/, (last visited Oct. 1, 2007).

[130] *Id.*

[131] *Id.* at 41, Table 3-6.

[132] James Winebrake and James Corbett, *Technical Memorandum: Total Fuel Cycle Analysis for Container Ships: A Comparison of Residual Oil, Marine Gas Oil and Marine Diesel Oil*, (2007) at 3. Prepared for FOEI.

[133] ICCT, *supra* note 19, at 11.

[134] Winebrake and Corbett, *supra* note 132, at 4.

[135] IMO, *supra* note 27, at 108 (explaining that switching all ships to marine distillate fuel would reduce CO_2 emissions by approximately 36 million tons per year).

[136] *Id.* at 17, Table 1-5.

[137] Winebrake and Corbett, *supra* note131, at 6.

The switch to clean fuels would also eliminate the need for purifiers, heating of fuel tanks and sludge burning, which will reduce costs for vessel owners and operators. Loss of fuel due to sludge removal would be avoided and the energy used to refine residual oil on board could be put towards powering the ship. As mentioned above, such a switch also would allow for the use of end-of-the-pipe emission controls, enabling considerable additional reductions of greenhouse gases and other air pollutants otherwise not likely to be achieved.

The switch to low sulfur fuels could incur slight lifecycle increases (approximately two to five percent) in carbon dioxide emissions, incurred mainly at the refineries.[138] However, these emissions are more easily addressed at a stationary location rather than on board a vessel. Moreover, they could be offset by other emission reduction mechanisms such as reducing vessel speed. While refineries currently enjoy the benefits of offloading their residual oil at a profit, they are able to refine the residual oil, or if they decide to burn it, are regulated by strict emission standards (unlike the ships that burn it on board).[139] Further, some refineries are extracting the sulfur and using it for other purposes, for example as a source of gypsum.[140]

Experience shows that fuel-switching makes sense. The Danish ship owner Maersk Line voluntarily implemented a fuel switching program for all its ships calling at California ports.[141] More than 60 of the company's ships are participating in the program. The ships switch to distillate fuel in their main engines 24 nautical miles from port. A Maersk spokesperson explained that, "The fuel switch can be implemented very quickly, without the need for capital investment or additional equipment."[142] According to reports this program has reduced overall emissions by approximately 400 tons per year, including an 80 percent reduction in particulate matter and a 17 percent reduction in nitrogen oxides.[143]

It has been suggested that, since sulfur emissions from ships have an overall cooling effect on the atmosphere, moving to cleaner fuel is an unacceptable response to global climate change. But, sulfur emissions are associated with health risks in humans, such as respiratory disease.[144] Thus, any sensible analysis of the net benefit of the remedies proposed in this petition as opposed to the status quo would conclude that the benefits of reducing overall global climate change emissions and human health threats outweigh the incidental cost of forgoing the cooling effect of sulfur emissions.

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[138] *Id.* at 5.

[139] Isensee and Bertram, *supra* note 116, at 47.

[140] *Id.*

[141] Guy Wilson-Roberts, *Maersk Fuel Switching 'Very Successful'*, SUSTAINABLESHIPPING.COM, July 10, 2007, http://www.sustainableshipping.com/news/2007/07/68418.

[142] *Id.*

[143] *Id.*

[144] *See, e.g.*, EPA (2000) *Health and Environmental Impacts of SO_2*, http://www.epa.gov/air/urbanair/so2/hlth1.html (last visited Oct. 1, 2007).

Further, while emitting sulfur into the atmosphere addresses one effect of carbon dioxide pollution, global warming, it fails to address another significant effect, ocean acidification. Sulfur emissions do not remove carbon dioxide from the atmosphere. As the oceans absorb more carbon dioxide from the atmosphere, they become more acidic, having severe consequences for organisms that form shells or structure from calcium carbonate, such as corals and oysters.[145] Sulfur emissions also contribute directly to ocean acidification.[146] Thus, since there are ways of addressing carbon dioxide pollution and its effects that also reduce harmful sulfur emissions, the optimal solution is to confront both problems at once.

4. Other Readily Available Technical and Operational Measures Would Significantly Reduce Global Climate Change Emissions from Marine Shipping Vessels.

Other operational measures could be employed relatively easily and cost-effectively to further reduce emissions. These could include weather routing, improved efficiency of logistics and voyage planning, fuel-economy standards for ships, and optimal ship and engine operations.[147] Other varied technologies and methods can also be used to reduce fuel consumption. For example:

- The use of "cold ironing" at ports, where ships shut off their diesel engines and are connected to shore based power for their electrical needs.[148]
- Improved hull design can achieve reductions in emissions through reduced fuel consumption.[149]
- A bulbous bow can increase a ship's fuel efficiency by reducing its wavemaking resistance.[150] The Inui Bow – a new form of the bulbous bow developed in the late 1950s and early 1960s – is now widely used on large commercial ships, where it typically reduces fuel consumption by about five percent at cruising speeds. The Inui Bow is now also being applied to smaller commercial ships.[151]
- A stern flap, a small plate that extends behind a ship's transom, lengthening the bottom surface of the hull, can reduce a ship's resistance and thus increase fuel efficiency by a few to several percent.[152]

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[145] See discussion of ocean pH effects on corals in Section I (A)(2) within the Argument section, above.

[146] Doney, et al., *supra* note 35, at 14580.

[147] FOEI, *supra* note 119, at 1.

[148] Pacific L.A. Marine Terminal LLC, Alternative Maritime Power (AMP, cold ironing), Pier 400 Project, http://www.pacificenergypier400.com/index2.php?id=37.

[149] *See* Brian Hayman, et al., *Technologies for Reduced Environmental Impact from Ships – Ship Building, Maintenance and Dismantling Aspects*, at 3, *available at* http://www.iot.ntnu.no/users/fet/Konferanser/2000-Treship-Newcastle.pdf (last visited Oct. 1, 2007) (discussing hull form optimization).

[150] Ronald O'Rourke, *Navy Ship Propulsion Technologies: Options for Reducing Oil Use – Background for Congress* (2006) at 4, CONGRESSIONAL RESEARCH SERVICE, *available at* http://www.fas.org/sgp/crs/weapons/RL33360.pdf.

[151] *Id.*

[152] *Id.* at 6.

- The Department of Defense has recognized that applying special coatings to Navy ship propellers might reduce ship fuel use by four to five percent, while reducing maintenance requirements as well.[153] This practice might therefore pay for itself within about one year.[154]
- Sail or kite-assisted propulsion can provide zero-emissions wind power, and plans are already underway to employ such technologies on new and existing cargo vessels.[155]

5. The Scope of EPA's Regulatory Authority Is Broad Enough to Enable Significant Reductions in Global Climate Change Emissions from Marine Shipping Vessels.

As demonstrated below, EPA has the authority to regulate marine global climate change emissions over a significant amount of ship traffic and over a vast geographic area.

a. EPA Has the Authority to Regulate Global Climate Change Emissions from Both New Ships and Ships with New or Remanufactured Engines.

The Clean Air Act provides a means for EPA to regulate global climate change emissions from existing ships as well as brand new vessels. The Act permits the agency to regulate new marine engines, and because a rebuilt marine engine is functionally the same as a new one, EPA's regulation of remanufactured marine engines can swiftly reduce greenhouse gas and black carbon emissions from shipping.

Section 213(a)(4) of the Clean Air Act calls for the establishment of emission standards that apply to both new nonroad vehicles *and new nonroad engines*. 42 U.S.C. § 7547(a)(4). The statutory text thus ensures that existing ships cannot elude emissions standards by installing new engines. However, as EPA has found, installation of a newly manufactured propulsion engine in an existing commercial vessel is a rare occurrence. The engines used in such ships tend to be integral to the vessel, and because they are very difficult to remove, owners and operators of commercial vessels regularly rebuild existing engines to extend their service lives rather than install a completely new engine. *See* 72 Fed. Reg. 16,032 (Apr. 3, 2007) (explaining that "the engines are typically below deck and replacement requires cutting the hull or the deck").

Although EPA's current emissions standards apply only to marine engines that are new in the sense of being newly manufactured, EPA has proposed to begin applying such standards to marine diesel engines in excess of 800 horsepower as they are remanufactured. *Id.* This approach is eminently reasonable, given that when the remanufacturing process is complete, such marine engines are functionally new. *Id.* ("Marine engine remanufacturing procedures have improved to the point that engine performance for rebuilt engines is equivalent to that of new engines."). Furthermore, it is essential to carry this proposed approach into the regulation of global climate change emissions from new marine engines. Adopting remanufacturing standards

[153] *Id.* at 7.

[154] *Id.*

[155] *Id.* at 21-29.

that take advantage of existing and expected future technologies would significantly accelerate the benefits of EPA's regulatory program.

b. EPA Has the Authority to Apply Measures to Limit Global Climate Change Emissions from Marine Shipping Vessels to Foreign Flagged Vessels.

Foreign-flagged ships account for 90 percent of calls on U.S. ports and 80 percent of emissions in non-port coastal areas.[156] The EPA has acknowledged that "engines on foreign-flagged vessels account for the majority of emissions from Category 3 marine diesel engines impacting U.S. air quality." 68 Fed. Reg. 9750 (Feb. 28, 2003). Failure to regulate global climate change emissions from foreign-flagged vessels would dramatically limit the effectiveness of any program to regulate emissions from ships. Section 213(a)(4) of the Clean Air Act authorizes the EPA to set standards applicable to emissions from those classes or categories of new nonroad engines and new nonroad vehicles which in the Administrator's judgment cause, or contribute to air pollution. 42 U.S.C. § 7547(a)(4). Limiting greenhouse gas and black carbon emissions from foreign as well as domestic vessels is in accord with the unambiguous mandate of the Act and principles of international law.[157]

(i) The Statute Unambiguously Applies to All Vessels, Foreign or Domestic.

Once EPA makes the requisite findings concerning the impact of nonroad engines, section 213 authorizes EPA to set emissions standards for all classes of new nonroad engines that contribute to air pollution. 42 U.S.C. § 7547(a)(4). The statute makes no distinction between foreign or domestic engines, and therefore authorizes regulation of any engines that contribute to air pollution.

A statute regulating marine vessels that does not distinguish between U.S.- and foreign-flagged vessels applies to both. In *Stevens v. Premier Cruises, Inc.*, 215 F.3d 1237 (11th Cir. 2000), the court held that the Americans with Disabilities Act (ADA), which prohibits discrimination in places of public accommodation, applied to foreign-flagged vessels operating in U.S. waters even though the statute did not explicitly state that it applies to such vessels. In reaching its conclusion, the court considered whether there exists any presumption regarding the application to foreign-flagged vessels of statutes that apply generally to ships, but make no distinction between foreign- and U.S.-flagged vessels. Although acknowledging that there exists a general presumption "against the application of [U.S.] law to the internal management and affairs of a foreign-flag ship in United States water," *Stevens*, 215 F.3d at 1242 (internal citations omitted), the court concluded that no such presumption applies when the statute at issue "does not involve the 'internal management and affairs' of a foreign-flag ship." *Id.* at 1242. *See also Mali v. Keeper of the Common Jail of Hudson County, New Jersey* (Wildenhus's Case), 120 U.S. 1, 12 (1887) (under principles of international comity, "all things done on board, *which affect[] only the vessel or those belonging to her*" are to be left to the jurisdiction of the flag nation

[156] *See* EPA, *supra* note 45, at § 3.5.1.3, 3.6.

[157] In a January 2003 rulemaking EPA committed to consider the application of more stringent standards for new nonroad engines installed on foreign-flagged vessels that enter U.S. ports. 68 Fed. Reg. at 9759. Petitioners expect EPA to comply with this commitment.

(emphasis added)). The *Stevens* court found that the accommodation of a "disabled, fare-paying, American passenger" was an interest of the United States, and did not solely involve the foreign vessel's internal affairs. 215 F.3d at 1242. Indeed, because Congress has clearly intended to address harm from cruise ships, and such ships tended to be predominantly foreign-flagged ships, *id.* at 1242-43 (noting U.S. agency statement that "virtually all cruise ships serving U.S. ports are foreign flag vessels"), the court noted that it would be "strange" to conclude that Congress intended the statute to apply only to domestic vessels. *Id.* at 1243.[158]

The *Stevens* court based its conclusion on *Cunard S.S. Co. v. Mellon*, 262 U.S. 100 (1923). *Id.* at 1242. In *Cunard*, the Supreme Court considered whether the National Prohibition Act, which prohibited the possession of alcoholic beverages within territory subject to U.S. jurisdiction, could be applied to foreign-flagged vessels carrying liquor to be sold or dispensed to passengers and crews. 262 U.S. at 119. Because the statute was intended to apply throughout the territorial limits of the United States and did not distinguish between U.S. and foreign-flagged ships, *id.* at 127, the Court concluded that it applied to foreign-flagged vessels in U.S. territorial waters. *Id.* at 128-29.

Pursuant to these principles, Congress's grant of authority to establish emission standards for nonroad engines applies unambiguously to all U.S. vessels and all vessels operating in U.S. waters, whether foreign- or U.S.-flagged.[159] The statute requires emissions standards for all new nonroad engines or vehicles that contribute to air pollution, making no distinction between foreign or domestic engines or vehicles. 42 U.S.C. § 7547(a)(3), (4). Emissions from foreign vessels that contribute to pollution of the air of the United States are plainly not a matter solely concerning the internal management and affairs of the foreign vessels.[160] Moreover, in light of EPA's findings concerning the significance of foreign Category 3 engines' role in pollution in the United States, *see* 68 Fed. Reg. 9750, it would be "strange" to think that excluding such engines would be consistent with the statutory purpose of the CAA. *See Stevens*, 215 F.3d at 1243. The statute thus unambiguously requires EPA to establish emissions standards applicable to both foreign and domestic vessels operating in U.S. waters.

(ii) International Law Protects the Right of the United States to Limit Global Climate Change Emissions from Foreign Vessels Operating in U.S. Waters.

[158] The court in *Stevens* held that the ADA applies to the foreign vessel while recognizing that such application could require significant structural modification of the ship, which would clearly affect the ship's internal affairs. 215 F.3d at 1238-39 (noting that the complaint alleged ADA violations arising from the failure of the ship to "modify numerous interior and exterior doors" and to "modify and provide requisite cabins accessible for persons with disabilities").

[159] While the U.S. jurisdiction extends to foreign-flagged vessels only when those vessels are in U.S. waters (including, under some circumstances, the Exclusive Economic Zone (EEZ)), the United States has jurisdiction over U.S. flagged vessels in all waters, including foreign waters and the high seas. *See* Restatement (Third) of Foreign Relations Law § 402(h) (1986). The U.S. should exercise its jurisdiction to the full extent available under domestic and international law.

[160] *See* Erik Japp Molenaar, *Coastal State Jurisdiction over Vessel-Source Pollution*, 102 (Kluwer Law International) (1998) (ship pollution not considered a matter of internal concern to the vessel).

EPA has the authority to regulate global climate change emissions from U.S.- and foreign-flagged vessels operating in U.S. waters under international law. International law grants nations different levels of authority to regulate, depending on whether the regulated activity takes place in the nation's ports, in its territorial sea, typically out to 12 miles from shore, or in the nation's Exclusive Economic Zone ("EEZ"), 200 miles from shore in most places. The EPA has authority to regulate global climate change emissions from ships in both the territorial sea and the EEZ.

The United States has complete authority to regulate foreign vessels in its ports and other internal waters[161] in any manner, even to the extent of excluding such vessels completely.[162] The right to regulate in ports and other internal waters includes the right to prevent pollution. The United Nations Convention on the Law of the Sea (UNCLOS), the relevant provisions of which the United States has accepted as a binding expression of international law,[163] explicitly permits each nation to establish "particular requirements for the prevention, reduction and control of pollution of the marine environment as a condition for the entry of foreign vessels into

[161] Under international law, internal waters include "waters on the landward side of" the low water line on the coast. United Nations Convention on the Law of the Sea (UNCLOS), Dec. 10, 1982, 1833 U.N.T.S. 397, art. 5 & 8. This includes bays whose mouths are no more than 24 miles wide. *Id*. art. 10(4). Ports are considered equivalent to land territory. *Id*. art. 11.

[162] *See, e.g.*, *Benz v. Compania Naviera Hidalgo*, 353 U.S. 138, 142 (1957) ("It is beyond question that a ship voluntarily entering the territorial limits of another country subjects itself to the laws and jurisdiction of that country."); *Cunard*, 262 U.S. at 124 ("The merchant ship of one country voluntarily entering the territorial limits of another subjects herself to the jurisdiction of the latter. The jurisdiction attaches in virtue of her presence, just as with other objects within those limits. During her stay she is entitled to the protection of the laws of that place and correlatively is bound to yield obedience to them."); *Patterson v. Bark Eudora*, 190 U.S. 169, 178 (1903) ("[T]he implied consent to permit [foreign merchant ships] to enter our harbors may be withdrawn, and if this implied consent may be wholly withdrawn, it may be extended upon such terms and conditions as the government sees fit to impose."). *See also* Restatement § 511, cmt. e ("Under international law, a coastal state's sovereignty over its land territory extends to its internal waters, including bays ... [and] seaports."); Molenaar, *supra* note 160, at 101 (International law permits a port nation "not only to deny in principle access [to ports] but also to prescribe non-discriminatory laws and regulations that determine conditions for the entry into its ports."); *id*. at 186 (international law permits national standards in internal waters).

The Convention on the Territorial Sea and the Contiguous Zone, to which the United States is a party, authorizes the United States to impose conditions on the entry of ships to its internal waters. Art. 16(2), Apr. 29, 1958, 15 U.S.T. 1606, 516 U.N.T.S. 206 (entered into force Sept. 10, 1964) (Nations "have the right to take the necessary steps to prevent any breach of the conditions to which admission [of ships proceeding to internal waters] is subject.").

[163] Proclamation No. 5928, 54 Fed. Reg. 777 (Dec. 27, 1988) (UNCLOS reflects international law concerning territorial sea, including that "coastal nations may exercise sovereignty and jurisdiction over their territorial seas"); Proclamation No. 7219, 64 Fed. Reg. 48701 (Aug. 2, 1999) (UNCLOS reflects international law). UNCLOS's environmental provisions are recognized as an expression of customary international law, making them binding on the United States whether or not it is a party to the convention. *See* Restatement (Third), Part VI (Law of the Environment), Introductory Note at 102 ("Most of the provisions of [UNCLOS] concerning the protection of the marine environment reflect customary international law."); *id*. Part V (Law of the Sea), Introductory Note at 5 ("[B]y express or tacit agreement accompanied by consistent practice, the United States, and states generally, have accepted the substantive provisions of the Convention, other than those addressing deep sea-bed mining, as statements of customary law binding upon them apart from the Convention.").

their ports or internal waters," UNCLOS, art. 211(3), subject only to the condition that they publicize those requirements internationally. *Id.*[164]

The authority to regulate to prevent pollution extends to the entire territorial sea. In the territorial sea, UNCLOS permits nations to "adopt laws and regulations for the prevention, reduction and control of marine pollution from foreign vessels," including vessels that are only passing through U.S. territorial waters. UNCLOS., art. 211(4). Moreover, the rules delineating the right of innocent passage through the territorial sea[165] explicitly permit such passage to be regulated for "the preservation of the environment of the coastal State and the prevention, reduction and control of pollution thereof," again subject to the condition that such regulations be published. *Id*. art. 21(1)(f), (3).

The United States and other countries have repeatedly exercised their authority to regulate shipping in ports and the territorial sea. In the Deepwater Port Act of 1974, the United States prohibited foreign vessels from using U.S. deepwater ports if the flag nation had objected to the application of U.S. jurisdiction to all vessels in such ports. 33 U.S.C. § 1518(c)(2). The statute further required the promulgation of regulations governing the use of such ports. *Id*. § 1509. Such regulations include requirements about the design and construction of ships using the ports, and the equipment with which they must be fitted. *See, e.g.,* 33 C.F.R. § 149.

In the Ports and Waterways Safety Act of 1972, the United States prohibited any vessels that failed to comply with U.S. ship regulations from operating in the U.S. territorial sea or internal waters. 33 U.S.C. § 1228(a).[166] Such regulations include requirements that ships have fixed containers or enclosed deck areas to contain oil and hazardous material cargo discharges. 33 C.F.R. § 155.310.

Pursuant to a statutory mandate to assure the protection of national park resources and "leave them unimpaired for the enjoyment of future generations," 16 U.S.C. §1, the United States established standards limiting air emissions from cruise ships in Glacier Bay National Park. 36 C.F.R. § 13.65(b)(4). In developing this regulation, the National Park Service noted that "all of the cruise ships and some of the tour boats operating in [the park] are foreign-flagged vessels." 61 Fed. Reg. 27008, 27011 (May 30, 1996). The EPA has issued citations to foreign cruise ships for air emissions reported while the ships were in port in Juneau, Alaska.[167] Other nations also regulate foreign vessels in their territorial waters. For example, Canadian law

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[164] Although UNCLOS article 212 specifically addresses air pollution, scholars interpret that provision as *requiring* states to establish *minimum* air pollution standards without disturbing the right of port states, recognized in articles 25(2) and 211(3), to establish other regulations to prevent air pollution. *See* Molenaar, *supra* note 160, at 500-01 (1998). UNCLOS's provisions concerning the "marine environment" are intended to apply to the atmosphere as well as the sea. *See id*. at 499.

[165] The right of innocent passage does not include a right to enter ports or internal waters. *See id*. art. 18.

[166] The statute prohibits these operations in "the navigable waters of the United States," 33 U.S.C. § 1228(1), which include "all waters of the territorial sea of the United States." 33 U.S.C. § 1222(5).

[167] *Federal Regulators Say Cruise Ships Apparently Violated Pollution Rules*, ASSOCIATED PRESS NEWSWIRE, June 22, 2000 (also noting that state and federal officials are drafting "plans for monitoring water and air emissions from the fleet of foreign-flagged vessels").

permits the establishment of air emissions standards and design standards for ships operating on Canadian waters. Canada Shipping Act, R.S.C., ch. S-9, § 657 (1985) (Can.). Similarly, the Canada Shipping Act explicitly recognizes that the pollution regulations of a foreign country apply to Canadian ships operating in foreign waters. *Id.* § 655(4). Pursuant to this statute, Canada has established air emission standards for ships operating within one mile of its coast. Air Pollution Regulations, C.R.C. 1404, (1978) (Can.). Canada has also established design and construction standards applicable to all vessels operating within 100 nautical miles of its northern coast. Arctic Waters Pollution Prevention Act, R.S.C., ch. 2, § 12(1)(a) (1985 & Supp. 1989) (Can.); Arctic Waters Pollution Prevention Regulations, C.R.C. 354 (1978).

International organizations also recognize nations' right to impose pollution-prevention standards in territorial waters. In 1990, the Helsinki Commission, the governing body for the Convention on the Protection of the Marine Environment of the Baltic Sea Area, a convention ratified by nine countries and the European Community, recommended that the parties to the Convention implement sewage discharge regulations "with respect to ships, *irrespective of nationality*, sailing in their national waters." [168]

The United States also has authority to regulate both U.S.- and foreign-flagged vessels in the EEZ. Under international law, states have jurisdiction to regulate in the EEZ for the prevention, reduction and control of marine pollution, as long as such regulation conforms to and gives effect to generally accepted international rules and standards. UNCLOS art. 211(5). In addition, states have the authority to regulate pollution from or through the atmosphere, applicable to the air space under their sovereignty, taking into account internationally agreed rules, standards, and recommended practices and procedures. *Id.* art. 212. The United States has a specific authority to regulate the emission of pollutants from marine vessels that contribute to global climate change under the United Nations Framework Convention on Climate Change. ("UNFCCC").[169] Thus, regulating global climate change emissions from large marine vessels in the EEZ would give effect to the commitments undertaken in the UNFCCC.

U.S. law makes clear that the United States retains the authority to regulate shipping in the U.S. EEZ. The Oil Pollution Act of 1990 (OPA) requires vessels carrying oil to "be equipped with a double hull ... when operating on the waters subject to the jurisdiction of the United States, including the Exclusive Economic Zone." 46 U.S.C. § 3703a(a). Other

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[168] Helsinki Comm'n (HELCOM), Rec. 11/9, (Feb. 14, 1990), *available at* http://www.helcom.fi/Recommendations/en_GB/rec11_9/ (emphasis added).

[169] The "ultimate objective" of the UNFCCC is to "achieve … stabilization of [GHG] concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system … within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner." United Nations Framework Convention on Climate Change (UNFCCC), art. 2, March 21, 1994, 1771 UNTS 107; S. Treaty Doc No. 102-38; U.N. Doc. A/AC.237/18 (Part II)/Add.1; 31 ILM 849 (1992). In order to meet this objective, parties to the UNFCCC are bound to certain "commitments" including the commitment to "implement … national … programs containing measures to mitigate climate change by addressing anthropogenic emissions by sources … of all GHGs," *id.* art. 4(1), and to "adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of [GHGs with] the aim of returning individually or jointly to 1990 levels" of GHG emissions.

regulations implemented pursuant to the OPA requires ships operating in U.S. waters to have segregated ballast tanks, crude oil washing systems, dedicated ballast tanks, fixed pumping systems, and oil residue tanks. *See generally* 33 C.F.R. Part 157. These requirements exceeded the international standard in effect at the time the OPA was enacted.[170] The OPA also imposed on ship owners nearly unlimited liability for oil spills, 33 U.S.C. § 2702(a), (b), 2704(a), a significantly greater liability than was imposed under two international conventions that the United States had signed but not ratified.[171]

The practice of the United States and other nations regulating foreign vessels operating in national waters supports the conclusion that international law protects the right of the United States to limit global climate change emissions from foreign-flagged vessels operating in U.S. waters. In light of this authority and the unambiguous application of the CAA to all vessels, domestic and foreign, EPA should limit global climate change emissions from both U.S.- and foreign-flagged vessels.

c. Coast Guard Regulation of Ship Traffic Under the Ports and Waterways Safety Act Is No Barrier to EPA Regulation of Marine Shipping Vessel Speeds.

Although EPA has not historically regulated the speed of ships, this fact is no bar to the agency adopting such restrictions to control global climate change emissions from ships. Nor does the fact that regulation of vessel speed has historically been the province of the Coast Guard prevent EPA from promulgating such regulations. The Supreme Court's decision in *Massachusetts v. EPA* settles this issue.

The United States Coast Guard regulates vessel speeds under the Ports and Waterways Safety Act. 33 U.S.C. §§ 1221-1250. Under this Act, the Coast Guard "may control vessel traffic in areas subject to the jurisdiction of the United States which are "hazardous, or under conditions of reduced visibility, adverse weather, vessel congestion, or other hazardous circumstances, by . . . (C) establishing vessel size, speed, draft limitations and vessel operating conditions." *Id.* § 1223 (a)(4).

In *Massachusetts v. EPA*, the EPA asserted that it could not regulate carbon dioxide emissions from motor vehicles because Congress had already assigned the job of regulating

[170] International Convention on the Prevention of Pollution from Ships, as Modified by the Protocol of 1978 Relating Thereto (MARPOL), Annex I, Regulation 13, required segregated ballast tanks for new tankers and either segregated ballast tanks or a crude oil washing system for existing tankers. International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), Feb. 17, 1978, 1340 U.N.T.S. 61 & 1341 U.N.T.S. 3, reprinted in 17 I.L.M. 546.

[171] Protocol to the International Convention on Civil Liability for Oil Pollution Damage, Nov. 19, 1976, 16 I.L.M. 617; Protocol of 1984 to Amend the International Convention on Civil Liability for Oil Pollution Damage, 1969, May 25, 1984 (not in force), IMO Doc. LEG/CONF. 6/66; Protocol of 1992 to Amend the International Convention on Civil Liability for Oil Pollution Damage, 1969, IMO Doc. LEG/CONF. 9/15, Nov. 27, 1992; Protocol to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, Nov. 19, 1976, 16 I.L.M. 621 (1977); Protocol of 1984 to Amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971, IMO Doc. LEG/CONF.6/67, May 25, 1984 (not in force); Protocol of 1992 to Amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971, IMO Doc. LEG/CONF.9/16, Nov. 27, 1992.

automobile fuel efficiency to the Department of Transportation. 127 S.Ct. at 1461-62. The Supreme Court flatly rejected this argument:

> [T]hat DOT sets mileage standards in no way licenses EPA to shirk its environmental responsibilities. EPA has been charged with protecting the public's "health" and "welfare," 42 U.S.C. § 7521(a)(1), a statutory obligation wholly independent of DOT's mandate to promote energy efficiency. *See* Energy Policy and Conservation Act, § 2(5), 89 Stat. 874, 42 U.S.C. § 6201(5). The two obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency.

Id. at 1462. Similarly, that Congress has empowered the Coast Guard to regulate vessel speed does not absolve the EPA of its obligation to protect public health and welfare from the damaging effects of carbon dioxide and other pollutants emitted by ships through regulations limiting the speed at which these vehicles are permitted to travel. Moreover, there is no reason to believe that EPA and the Coast Guard cannot both administer their obligations while avoiding inconsistency.

Finally, it is worth noting that the current Administration has already signaled its recognition of the need to coordinate action among multiple federal agencies to develop effective regulatory scheme limiting global climate change emissions from mobile sources. Exec. Order No. 13432, Cooperation Among Agencies in Protecting the Environment with Respect to Greenhouse Gas Emissions From Motor Vehicles, Nonroad Vehicles, and Nonroad Engines, 72 Fed. Reg. 27717 (May 14, 2007).

II. EPA SHOULD REGULATE THE COMPOSITION OF FUEL TO CONTROL GLOBAL CLIMATE CHANGE RELATED EMISSIONS FROM MARINE SHIPPING VESSELS.

The following sections demonstrate not only that EPA has the legal authority to regulate the content of the fuel manufactured or sold for use in ships, but also that exercising this authority will substantially reduce global climate change emissions. Therefore, EPA should act swiftly to eliminate the use of "residual fuels" which are high in sulfur content, and require ships to use more refined and cleaner-burning fuels, such as marine diesel oil or marine gas oil.

A. EPA Has the Authority to Prohibit the Manufacture and Sale of Fuels Used in Marine Shipping Vessels.

Section 211 of the Clean Air Act grants broad discretion to the EPA to regulate the content of fuels manufactured or sold for use in nonroad vehicles and engines, allowing the Administrator to promulgate such regulations as he "may deem appropriate." 42 U.S.C. § 7545(c)(1).[172] The Act allows the EPA to control or ban the manufacture or sale of fuels whose

[172] Section 211 provides:

> (c) Offending fuels and fuel additives; control; prohibition

emission products cause or contribute to air pollution which may reasonably be anticipated to endanger the public health or welfare. 42 U.S.C. § 7545(c)(1). Global climate change emissions from ships satisfy this statutory test.

1. Emission Products of the Fuels Used in Marine Shipping Vessels Cause or Contribute to Global Climate Change.

Emission products of the fuels used in ships cause or contribute to global climate change. While the Clean Air Act does not define the term "emission product," by any reasonable definition of the term, global climate change emissions such as carbon dioxide, nitrous oxide, and black carbon are certainly emission products of the low quality, high sulfur content fuels used in ships, since they are produced when such fuel is combusted. Moreover, as discussed above, these pollutants all contribute to global climate change.

2. Global Climate Change May Reasonably Be Anticipated to Endanger Public Health or Welfare.

For the reasons stated in section I (A)(2) within the Argument section of this petition, above, global climate change may be reasonably anticipated to endanger public health or welfare.

B. EPA Should Exercise Its Authority To Promulgate Regulations Requiring the Manufacture and Sale of Cleaner Fuels for Use in Marine Shipping Vessels.

For the reasons stated in section I (C)(3) within the Argument section of this petition, above, adopting regulations requiring the manufacture and sale of cleaner fuels would result in global climate change emissions reduction benefits.

CONCLUSION

Based on the foregoing, Petitioners respectfully request that EPA:

(1) Make a finding that carbon dioxide, nitrous oxide, and black carbon emissions from new marine engines and vehicles significantly contribute to air pollution which may reasonably be anticipated to endanger public health and welfare;

> (1) The Administrator may, from time to time . . . , by regulation, control or prohibit the manufacture, introduction into commerce, offering for sale, or sale of any fuel or fuel additive for use in a motor vehicle, motor vehicle engine, or nonroad engine or nonroad vehicle (A) if in the judgment of the Administrator any emission product of such fuel or fuel additive causes, or contributes, to air pollution which may reasonably be anticipated to endanger the public health or welfare . . . .

42 U.S.C. § 7545(c)(1).

(2) Promulgate emission standards for carbon dioxide, nitrous oxide, and black carbon emissions from marine engines and vehicles pursuant to Section 213(a)(4) of the Clean Air Act, 42 U.S.C. § 7547(a)(4);

(3) Make a finding that climate change related pollutants are emission products of the fuels used in marine engines and vehicles, and that these emission products contribute to air pollution which may reasonably be anticipated to endanger public health and welfare;

(4) Promulgate regulations limiting the maximum sulfur content of marine diesel fuels, and prohibit the manufacture, introduction into commerce, offering for sale, or sale of any fuel with a sulfur concentration in excess of such limits for use in any marine engine or vehicle.

Sincerely,

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