

Floating Smokestacks



A CALL FOR ACTION TO CLEAN UP MARINE SHIPPING POLLUTION

EXECUTIVE SUMMARY

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ENVIRONMENTAL DEFENSE FUND

finding the ways that work

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AUTHORS

Janea Scott

Hilary Sinnamon



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Environmental Defense Fund does not endorse any particular air pollution control technology or method. This report factually describes air pollution control technologies and methods based on published reports.

Our mission

Environmental Defense Fund is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

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Executive summary

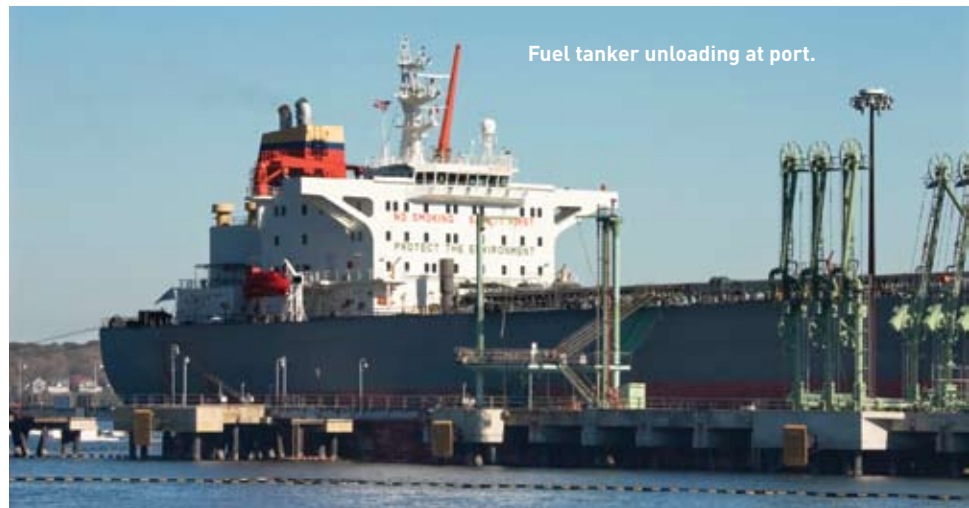
Ocean-going ships like cruise ships, container ships and tankers travel all over the world transporting people and cargo from one destination to another. These ships, also known as Category 3 ships, travel primarily on the open ocean but also up deeper rivers and inlets as well as on the Great Lakes. These ships are very large. For example, some of the biggest cruise ships range between 800–1100 feet in length—the length of more than three football fields. Not surprisingly, it takes very large engines to power such large ships. And while shipping is one of the most efficient ways to move people and goods from place to place, the ships themselves are huge polluters delivering staggering amounts of smog-forming oxides of nitrogen, small sooty particles, and the pollution that contributes to acid rain and global warming, in addition to their cargo. These ships are also poorly controlled and the adoption of clean air standards for these high-emitting engines has lagged far behind other major sources in the transportation sector.

A call to action

The International Maritime Organization (IMO), the body responsible for regulating international air pollution standards for ocean-going ships, is poised to adopt more protective emission standards in October 2008. This report examines why deep reductions in ship pollution are so important in our nation's quest to achieve cleaner, healthier air and protect the environment. Many ports, communities, cities and states across the United States are working hard to protect human health from the air pollution associated with ports, and the U.S. Environmental Protection Agency (EPA) has recently issued strong clean-up standards for smaller ships, like ferries and tugs. To ensure that meaningful clean-up standards are put in place for ocean-going ships, Environmental Defense Fund calls on the United States and the international community to finalize the stronger standards that will be on the table at the October 2008 IMO meeting. Working together, from the local level to the international level, we will be able to achieve cleaner, healthier air by reducing ship and port-related pollution.



ISTOCKPHOTO



Big ocean-going ships are big polluters

The exhaust emitted from the large diesel engines on ocean-going vessels is among the most dangerous and pervasive sources of air pollution. Its constituents include particulate matter (PM or PM_{2.5}), implicated in a host of respiratory problems and thousands of premature deaths every year; smog-forming oxides of nitrogen (NO_x); sulfur dioxide (SO₂), which forms harmful fine particles and falls back to earth as acid rain; and a noxious brew of toxic chemicals that together pose a cancer risk greater than that of any other air pollutant. EPA estimated that in 2001, ocean-going ships emitted:

- more than 54,000 tons of fine particulate matter, which is equivalent to the pollution from 117 coal-fired power plants,
- approximately 745,000 tons of smog-forming NO_x pollution—comparable to the NO_x emissions from over *800 million* of today's new cars, and
- about 450,000 tons of SO₂, which is more than 40% of the total SO₂ from the mobile source sector.¹

Furthermore EPA estimates that in 2006, ocean-going ships emitted about 55.6 million metric tons of carbon dioxide (CO₂).² Shipping-related PM emissions contribute to approximately 60,000 global deaths annually, with impacts concentrated in coastal regions on major trade routes.³

Despite the high levels of air pollution associated with these large ships, they are currently subject only to weak international emissions standards by the International Maritime Organization, which are enforced by EPA. These out-of-date standards are not based on advances in emissions control technology or improvements in fuel quality. Instead current international and national regulations simply codify emissions rates already being met by most international ships. The United States has the opportunity to collaborate with nations from around the world to secure the adoption of comprehensive and rigorous new clean-up standards for large ocean-going ships at the IMO's upcoming meeting in October 2008.

Pollution from ocean-going ships impacts local air quality

As ocean-going ships travel along our coastlines and dock at our nation's ports, their emissions threaten the health of the communities they float past. Many of these communities are not meeting the basic public health standards for fine particulates, ozone or both. Reducing pollution from ships is one of the essential tools needed to help restore healthy air in these communities. All across the country, ships deliver pollution in addition to goods and people. Table 1 below provides a sampling of ship pollution in various areas across the United States.

TABLE 1
Smog-forming oxides of nitrogen from ocean-going vessels in 6 busy port areas and comparable number of today's new automobiles

Port/coastal area	2002 NO _x emissions (metric tons) ⁴	Comparable # of today's cars ⁵
Seattle/Tacoma ports	12,400	13,300,000
Los Angeles/Long Beach ports	10,200	11,000,000
Houston/Galveston ports	5,600	6,000,000
Lower Mississippi ports ^a	16,800	18,100,000
Great Lakes ports ^b	550	590,000
New York/New Jersey ports	7,300	7,800,000

^a Includes ports of Baton Rouge, South Louisiana, New Orleans, Plaquemine and Lake Charles

^b Includes top 28 Great Lakes ports

Solutions exist

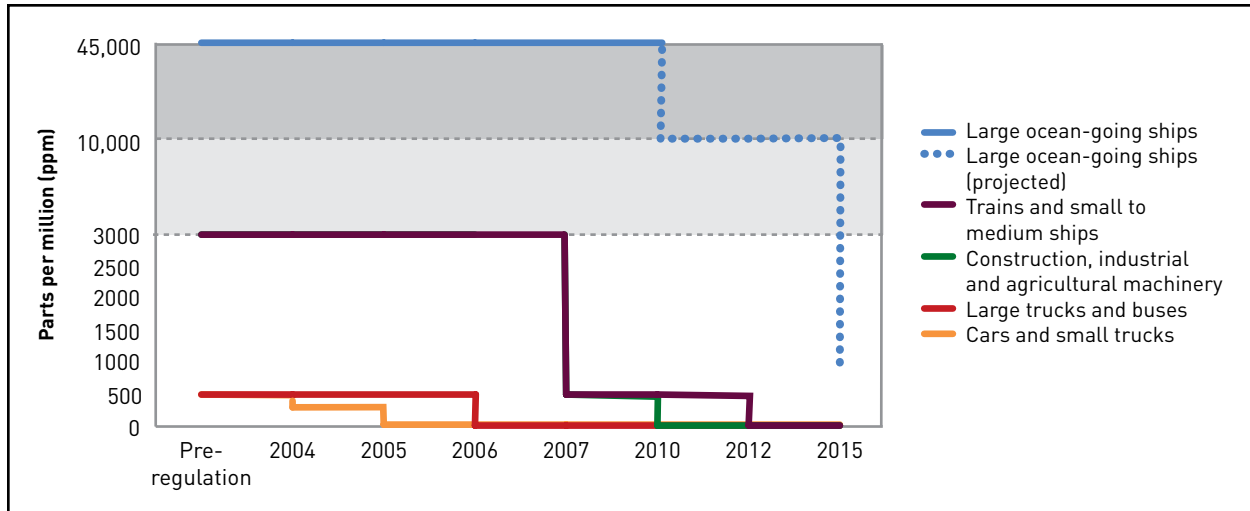
LOW SULFUR FUELS

Ships currently run on residual fuels that have extraordinarily high levels of sulfur. Residual fuel is the tar-like product left behind after the lighter petroleum products have been refined and is so viscous that it requires heating before it can be used for fuel in the ship. Depending on the sulfur content of the crude oil, residual fuel sulfur levels can be as high as 45,000 parts per million (ppm)—an astonishing 4.5% sulfur.⁶ EPA reports that the worldwide *average* sulfur content of residual fuel is 27,000 ppm, or a remarkable 1,800 times the 15ppm required for nearly all other diesel engines already, or in the near future.⁷ Using cleaner fuels can have a significant impact on the amount of pollution emitted, nearly eliminating harmful SO₂ emissions and significantly reducing toxic fine particle, or PM, emissions.

EMISSIONS-REDUCING TECHNOLOGIES

Numerous pollution control technology options are available to reduce pollution from ships. Many can be applied to existing ships as well as to new ships. For example, engine optimization and hull and propeller modifications can be made to reduce CO₂ emissions by 5–20%, while seawater scrubbers can reduce SO₂ emissions by up to 99%. Other technologies like slide valve fuel injectors and selective catalytic reduction (SCR) can significantly reduce smog-forming NO_x emissions.

FIGURE 1
Regulated fuel sulfur levels for mobile source engines⁸



Recommendations

Through leadership and collaboration, the opportunity to secure deep reductions in ship pollution is here. The IMO is poised to adopt a comprehensive and rigorous program in October 2008. EPA and IMO must reject the delays of the past and step forward in October to help restore cleaner, healthier air to our communities by cleaning up pollution from these large ocean-going ships. Therefore, Environmental Defense Fund respectfully recommends the following policy actions to protect human health and the environment from shipping pollution:

1. Immediately set rigorous, protective standards to clean up pollution from all ships in U.S. waters

Neither EPA nor the IMO have updated the standards that apply to ocean-going ships in several years. During this period of time, shipping has increased dramatically, clean-up technologies have advanced by leaps and bounds, and other diesel-fueled engines in the United States are being required to make 80–90% reductions in their pollution. The IMO must secure protective standards at their upcoming meeting in October or the EPA must set an example for the world by establishing protective standards at home. The U.S. proposal to the IMO includes well-designed clean air standards that:

- Reduce PM and SO₂ from new and existing Category 3 engines by at least 90% percent no later than 2011
- Make interim reductions in NO_x from new engines by at least 15–25% from current levels no later than 2011
- Require deeper NO_x reductions from new engines of at least 80% of the interim standards no later than 2016
- Require existing ships to reduce NO_x by at least 20% beginning no later than 2012

2. Establish an Emission Control Area along North American coastlines

Stronger international air pollution standards are enforced in Emission Control Areas (ECAs), established by the IMO, to protect areas particularly sensitive to shipping emissions. To protect communities and ecosystems in America, the U.S. EPA should apply to the IMO to establish an ECA for the entire United States coastline. The ECA must extend at least 200 nautical miles off the coast, the same distance as our economic zone, in order to be more fully protective. In addition, the United States should coordinate its efforts with the governments of Canada and Mexico to establish a North American ECA as many of our coastlines are impacted by ships traveling to and from Canadian and Mexican ports and many ships travel on routes that take them to ports in both countries as they unload their cargo from foreign destinations.

3. Address greenhouse gas emissions from ocean-going ships

Ocean-going ships are responsible for about 3% of *global* CO₂ emissions. Only the United States, China, Russia, India and Japan emit more carbon dioxide than the global marine shipping fleet. And in 2006, in U.S. waters alone, they released about 55.6 million metric tons of CO₂. To address global climate change, every sector must do its share. As an initial step, it is important to complete greenhouse gas inventories and establish fleet baselines. Environmental Defense Fund strongly encourages policymakers and legislators to adopt greenhouse gas emissions standards for ships, encourage innovative and creative solutions like container light weighting, and increase use of “anti-idling” measures, like shore side power. Additionally, Environmental Defense Fund strongly recommends addressing non-CO₂ greenhouse gases, like black carbon, from ships.

4. Reduce or eliminate in-port emissions from ships.

In-port emissions from ocean-going ships are of special concern for public health because ships travel near land and in ports, emitting pollution close to people. The exhaust from these ships is among the most dangerous and pervasive sources of air pollution. To reduce exposure to this pollution, Environmental Defense Fund recommends policymakers carry out available solutions today including:

- Fuel switching from dirty, high sulfur fuels to cleaner grades of diesel fuel.
- Putting in place pollution control technologies, like shore power.
- Operational changes, like vessel speed reduction, which can significantly reduce fuel use.

• • •

Environmental Defense Fund calls on the United States to lead the way nationally and internationally by encouraging the IMO to adopt rigorous international standards for NO_x, PM, and SO₂ no later than October 2008. In the mean time, EPA must not delay in preparing protective national standards for all ships entering U.S. waters. Additionally, Environmental Defense Fund calls for standards to reduce global warming pollution from these ships to be in place no later than fall 2009.

Notes

- ¹ Control of Emissions From New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder; Proposed Rule (December 7, 2007). 72 Fed. Reg. 69522, page 69545-69546.
- ² Regulating Greenhouse Gas Emissions Under the Clean Air Act; Proposed Rule (July 30, 2008) 73 Fed. Reg. 44354 at 44466
- ³ Corbett JJ, Winebrake JJ, Green EH, Kasibhatla P, Eyring V, Lauer A. 2007. Mortality from Ship Emissions: A Global Assessment. *Environ Sci Technol.* 41:8512-8518
- ⁴ EPA, "Emission Inventories for Ocean-Going Vessels Using Category 3 Propulsion Engines In or Near the United States; Draft Technical Support Document," EPA420-D-07-007; December 2007. Tables 3-16 and 3-34.
- ⁵ Calculations based on Tier 2 NO_x emissions standard (0.07g NO_x/mile) for highway vehicles and 12,000 vehicle miles/year. Bureau of Automotive Repair, Engineering and Research Branch, State of California, "Methodology for Calculating Vehicle Miles Traveled (VMT)," September 30, 2000, Report 2000-06, available at <http://www.epa.gov/otaq/regs/im/vmt.pdf>
- ⁶ Control of Emissions From New Marine Compression-Ignition Engines at or Above 30 Liters Per Cylinder; Final Rule (February 28, 2003) 68 Fed. Reg. 9746 at 9749
- ⁷ 72 Fed. Reg. 69,522 (December 7, 2007) "Control of Emissions From New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder; Proposed Rule," at 69,541.



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NATIONAL HEADQUARTERS

257 Park Avenue South
New York, NY 10010
212-505-2100

AUSTIN, TX

44 East Avenue
Austin, TX 78701
512-478-5161

BOSTON, MA

18 Tremont Street
Boston, MA 02108
617-723-2996

BOULDER, CO

2334 North Broadway
Boulder, CO 80304
303-440-4901

LOS ANGELES, CA

633 West 5th Street
Los Angeles, CA 90071
213-223-2190

RALEIGH, NC

4000 Westchase Boulevard
Raleigh, NC 27607
919-881-2601

SACRAMENTO, CA

1107 9th Street
Sacramento, CA 95814
916-492-7070

SAN FRANCISCO, CA

123 Mission Street
San Francisco, CA 94105
415-293-6050

WASHINGTON, DC

1875 Connecticut Avenue, NW
Washington, DC 20009
202-387-3500

Project offices

BEIJING, CHINA

East C-501
No. 28 East Andingmen Street
Beijing 100007 China
+86 10 6409 7088

BENTONVILLE, AR

1116 South Walton Blvd.
Bentonville, AR 72712
479-845-3816