

## Death from shipping

**R**esearchers report that international shipping emissions could be responsible for more than 60,000 deaths a year. The new results, published in *ES&T* (pp 8512–8518) by a team led by James Corbett of the University of Delaware and James Winebrake of the Rochester Institute of Technology, provide some of the first estimates of premature mortality from exposure to particulate matter, nitrogen oxides ( $\text{NO}_x$ ), and sulfate in global ship emissions.

The work “is quite interesting and—in spite of large uncertainties in emission estimates and other information used in the analysis—sends an important policy signal,” says Janusz Cofala of the internationally sponsored policy and science research center International Institute for Applied Systems Analysis (Austria). Cofala co-lead research for the European Commission that examined sulfate emissions effects in the North Sea. “We used different data sets and different models, [but] our findings seem to be consistent” with those of the new research, he says.

The *ES&T* research was commissioned in part by the environmental groups Clean Air Task Force and Friends of the Earth International, which is a party to International Maritime Organization (IMO) discussions. In November, IMO participants discussed data on ship emissions and whether to require emissions controls or a switch to cleaner fuels. Ships plying international waters tend to burn “dirty” fuels that contain high amounts of sulfur. Under an international agreement adopted by IMO in

2005, sulfate emissions from any ship entering the North Sea must be controlled to prevent acidification of local soils and ocean waters. California is considering similar measures for its ports.

Corbett, Winebrake, and colleagues estimated seafaring-ship

years, the authors estimate.

The reported range of deaths “reflects a lot of the uncertainties in the original mortality studies” on particulate matter exposure and its effects, comments Bart Ostro of the California Office of Environmental Health Hazard

Assessment. Ostro modeled health effects for the port city of Long Beach with higher-resolution models, the results of which the researchers use for comparison. He says that their assumptions and model results seem “reasonably robust.” Ostro also notes that mortality rates hint at the hidden damage from shipping emissions, including asthma and other problems, which contribute to higher costs for health care and the

economy.

Observers from within the shipping industry argue that the IMO’s current emissions controls are sufficient and that more stringent rules, called for by environmental groups and others, would create heavy cost burdens for shipping companies. Corbett and Winebrake reported further modeling results in a paper coauthored with Chengfeng Wang of the University of Delaware, published in *ES&T* (pp 8233–8239), in which they argue that measures for controlling sulfur emissions could be more cost-effective than previously assumed. Using emissions data from international oceangoing ships making port in the U.S., they calculate that low-sulfur fuels, onboard scrubbers, and market-based emissions trading programs could save up to \$260 million in costs needed to meet control targets.

—NAOMI LUBICK



**Emissions from oceangoing ships do reach the air over land, usually around port cities.**

emissions of  $\text{PM}_{2.5}$  and other pollutants, including sulfate and  $\text{NO}_x$ . Using global circulation models combined with a variety of emissions scenarios, they mapped out how emissions would drift over land. After folding in regional demographic data, they could pinpoint areas with a higher likelihood of deaths from cardiopulmonary and lung cancer that are attributable to  $\text{PM}_{2.5}$  exposure.

Depending on the scenarios and models used, the number of such premature deaths in 2002 ranged from about 19,000 to 64,000. Southeast Asia, India, and Europe bore the brunt of the mortality along coastlines and near ports, but inland France also saw high mortality rates due to atmospheric circulation patterns and population density, the models show. Without emissions controls, the number of premature deaths could increase by 40% in the next 5