



Simulation of Ship Owner/operators' Decision

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Problem Statement:

Air emissions from ships make significant contribution to air pollution problems locally, regionally and globally. Globally, ships account for some 31% and 7% of nitrogen and sulfur emissions from fuel combustion respectively. Shipping makes even greater contribution to air pollution problems in areas with heavy sea traffic, and where land based sources have been well regulated.

Due to a number of unique characteristics of the shipping industry, controlling air pollution from ships is not easy. Command-and-control regulation is currently the dominant form of policy for reducing air emissions from ships. Incentive-based instruments, however, have also been introduced in some countries and ports around the world to induce ships to behave environmental-friendly.

While the progress of command-and-control policy are considered by environmental advocates to be not satisfactory, some economic instruments are said to be successful. This research is endeavoring to assess the potential and the feasibility of, and forecast the cost-effectiveness of incentive-based instruments for reducing air pollution from ships by simulating carriers' environmental behavior under various policy packages.

Policy Questions:

- How will economic instruments work for reducing air pollution from ships?
- Will economic instruments be more cost-effective than command-and-control regulations?

Tools and Techniques:

Since both command-and-control regulation and incentive-based instruments have pros and cons for controlling air emissions from ships, whether continue to depend on regulation or introduce more economic instruments is not an easy decision. The first step of this research is to establish a scheme for evaluating the performance

of control policy. This scheme will help policy makers chose the "right" control policy package.

Modeling ship owner/operators' decisions, which significantly affect the emission of air pollutants from ships, is the second task of this research. What are the objectives of their decisions? What are the criteria for their decision-making? How do they take environment into account? What are the mechanisms of their decision-making? These are the fundamental questions that this research is going to address.

Then the research is going to simulate ship owner/operators' decisions with their decision models under various policy packages. The simulation results are the important inputs for evaluating and comparing the command-and-control policy and the economic instruments.

Expected Results of the Research:

The main results of this research would include the evaluating scheme for ship air emissions control policy, ship owner/operators' decision model and the simulation of the decision under different policy package. Since ship owner/operators play an important role in determining the outcome of the ship air pollution control policy, either for a command & control or an incentive-based policy, especially for the latter, the findings of this study would significantly contribute to the evaluation of control policy. Understanding their decision-making mechanisms could contribute to formulating more cost-effective policy and help policy makers foresee the possible outcome of policy with more confidence. The methodology developed in this research can be generalized and applied to other environmental issues, like ballast water, harmful anti-fouling system, etc., in the shipping industry.

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