



# The Policy Objectives of the Lake Michigan Ozone Study

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## Abstract

The Lake Michigan Ozone Study (LMOS) is a cooperative state and federal effort to study ambient air quality levels of ozone on a regional scale in the Lake Michigan area. The primary policy objectives of the project are to develop an improved understanding of the formation and transport of ozone in the area (based on field data and a comprehensive mathematical modeling system), and to use this information to design effective and equitable control strategies. To meet these objectives within the regulatory framework of the Clean Air Act Amendments of 1990, technically credible answers are needed to issues such as the relative contribution from certain geographic areas and source sectors, the effectiveness of hydrocarbon v. oxides of nitrogen control, and the amount of ozone precursor reduction needed to provide for attainment. The paper addresses the importance of the project from the perspective of the responsible regulatory agencies.

## Introduction

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The Lake Michigan Region encompasses those parts of Illinois, Indiana, Michigan and Wisconsin that are adjacent to the Lake. This area suffers from high tropospheric ozone concentrations in the summer months. From 1983 through 1992 the Lake Michigan region had the third highest frequency of ambient ozone air quality violations in the country. Only the South Coast Region in California and the area surrounding New York City reported more frequent violations. There are 22 counties and 2 partial counties in the region that are

designated ozone nonattainment areas by the USEPA. The ozone nonattainment area classifications range from severe in the Chicago, Gary, Milwaukee metropolitan areas to marginal-rural transport for Door County Wisconsin.

To appreciate the policy objectives of the LMOS, it is important to understand the origins of the study. In April 1987, Wisconsin filed a law suit against USEPA that accused USEPA of failure to require Illinois and Indiana to submit approvable ozone control plans. Wisconsin argued that excess emissions in the Chicago/Gary area were adversely impacting the air quality in eastern Wisconsin. Illinois intervened in the lawsuit on USEPA's side. In January 1989, a federal court ruled that USEPA had been recalcitrant in enforcing requirements of the Clean Air Act in Illinois and Indiana and ordered USEPA to develop a federal implementation plan for the Chicago/Gary area<sup>1</sup>.

Since the parties in the lawsuit were concerned about the impact of the court order and USEPA's approach to developing the federal implementation plan, they began negotiating a settlement that would replace the court's January 1989 order. In September of 1989 a Settlement Agreement<sup>2</sup> was signed by the parties involved in the lawsuit. This Agreement provides distinct advantages to the participants:

- 1) The states recognized that the ozone problem in the area around Lake Michigan was regional in nature. The Agreement provides the basis for a regional solution to a regional problem.
- 2) The Agreement provides the basis for a cooperative effort which would be more efficient in solving the ozone problem.
- 3) The Agreement specifies interim emission reductions while a comprehensive attainment strategy is under development.
- 4) Without the Agreement, there would be continued litigation without air quality improvements.
- 5) The Agreement requires the use of the best available ozone modeling technique such as a photochemical grid model and allow sufficient time to complete the analysis.
- 6) Since the court order did not set a time frame for emission reductions, there might have been significant time delays for implementing the federal implementation plan. The Agreement established specific milestones in the development of a regional attainment plan.

In November 1989, the court vacated its prior order and ordered the parties to comply with the terms of the Settlement Agreement. The Settlement Agreement led to a Memorandum of Agreement<sup>3</sup> (MOA) among all four states surrounding Lake Michigan and the USEPA. This

MOA created the LMOS, specified an organizational structure, created a funding mechanism, specified a schedule and outlined the scope of the project.

## LMOS Policy Objectives

This paper divides the LMOS policy objectives into administrative and technical objectives. Administrative objectives are aimed at meeting organizational or financial goals of the project. Technical objectives are aimed at meeting the scientific goals of the project.

Administrative objectives are less well defined and tend to be more controversial than technical objectives. The administrative objectives for the LMOS are outlined below:

- 1) To meet the legal obligations, specified in the Settlement Agreement, it's important for the states to work cooperatively to solve the problem. A control strategy developed in a cooperative setting is more likely to result in efficient, effective and equitable control measure than control strategies created in a contentious atmosphere.
- 2) To accomplish such an aggressive and wide-ranging goals, it was necessary for the States to combine both fiscal and staff resources. None of the governmental agencies could have provided the resources to complete the study on its own.
- 3) The LMOS provides the States with the strongest possible scientific basis for developing control strategies. The LMOS will provide the answers to the fundamental questions of ozone transport and transformation, which will be important information if the effort to develop a regional ozone control agreement should dissolve. The study will also provide the basis for defense against non-LMOS participants mounting a technical argument against ozone control measure resulting from the efforts on the project.
- 4) The LMOS gives the four States a stronger voice nationally and within our their states. The State air quality officials realized that the four states working together would be more effective in changing USEPA'S policies and guidance. The States also recognized the midwestern states would need a strong voice in shaping national policy on the impending Clean Air Act negotiations in Congress.

The LMOS technical objectives are more straight forward and are the administrative objectives. The technical objectives are as follows:

- 1) Create the tools - a photochemical model, meteorological model and emissions model - needed to answer the fundamental questions on ozone formation and transport in the region.
- 2) Collect the necessary data to support the model evaluation and application in the Lake Michigan Region.

- 3) Develop a conceptual model of ozone transport and transformation in the region and answer the fundamental questions related to issues such as: hydrocarbon v. NO<sub>x</sub> control, relative contribution from certain geographic source areas and source sectors, and the amount of emission reduction needed to achieve attainment in the region.

## LMOS Accomplishments

State and federal policy makers set ambitious goals for the LMOS project. The LMOS has been particularly successful in achieving many of the objectives that were initially identified in creating the study. The keys to success were a strong organizational structure, strong project management and a structure that created a cooperative relationship between the governmental policy makers and the participating technical staff.

The LMOS efforts to achieve the policy objectives have been impressive. The States overcame the contentious start to the project and are now working together extremely well. Although there have been some rough spots, all important decisions have been made on a consensus basis. Disagreements have been addressed through discussions of the issues and a consideration of the available facts.

The States and USEPA have combined resources and staff to account for about \$18,000,000 in direct and in-kind contributions. Over and above the numerous consultants that participated in the project, more than 100 different people from USEPA, various state agencies and local planning organizations participated on the project.

The LMOS has been successful at influencing USEPA policy on a number of issues, particularly episode selection and emissions issues. Top government officials in each Lake Michigan State are well aware of the LMOS project and they are anxiously waiting the results.

The LMOS has also achieved most of the project's technical objectives. Extensive field programs were conducted in 1990 and 1991. A very large data base consisting of meteorological, air quality and emissions data was collected for the field programs. Data analyses, which are just about complete, have uncovered some significant issues such as the underestimation of ozone concentrations at upper levels in the ROM model, underestimation of VOC and CO emissions, and high carbonyl concentrations at upper levels along the region's southern and western boundaries.

Several models have been developed to support control strategy assessment. The UAM-V model, a significant advancement in photochemical modeling, was developed as part of the LMOS. To provide the necessary input data to UAM-V, an emissions model and a prognostic meteorological model were developed. The emissions model employs new geographical information system technology to provide flexibility in rapidly gridding emission estimates. The LMOS combination of a photochemical model and a prognostic meteorological model was a significant advancement. This advancement proved to be invaluable since there is a significant discontinuity in meteorological and air quality fields in

the middle of the modeling domain. The discontinuities, created by the very large cold body of water (Lake Michigan), could not be simulated by a simpler meteorological model.

The LMOS has completed some nationally recognized research. Using the results of LMOS research, USEPA made a significant correction to the biogenic VOC emissions factor for corn. A downward looking remote sensing ozone profiler was used to collect lower tropospheric ozone concentrations. In addition, some significant advancements were made in the understanding of pollutant transport in a lake breeze environment.

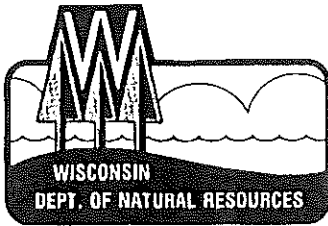
## Summary

The LMOS is a regional effort to solve an important regional air quality problem. The project has met important administrative objectives: work cooperatively; combine the states' and USEPA resources; and have a strong voice in developing state and national policies. The LMOS has also achieved its technical objectives. The modeling tools have been developed to assess the impact of ozone control strategies in the Lake Michigan Region and extensive data bases needed to support the models have been compiled.

The keys to the success of the LMOS project are the spirit of cooperation between the states and strong project management. The process has worked so well, a second memorandum of agreement was established in 1992 to provide for the regulatory continuation of the LMOS<sup>4</sup>. This next phase of the ozone control effort, the Lake Michigan Ozone Control Program (LMOP) is designed to identify and evaluate various ozone control strategies, and to demonstrate attainment of the ozone standard.

## References

- 1) Wisconsin v. Rielly, U.S. District Court for the Eastern District of Wisconsin, Case Number 87-C-0395, January 18, 1989.
- 2) Settlement Agreement, Case Number 87-C-0395, In the United States District Court for the Eastern District of Wisconsin, September 21, 1989.
- 3) Memorandum of Agreement for the Southern Lake Michigan Ozone Modeling Project, September 28, 1989.
- 4) Memorandum of Agreement for Development of Interstate Ozone Control Strategies, May 5, 1992.



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Paul Solomon  
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SUBJECT: A&WMA's International Specialty Conference "Regional Photochemical Measurement and Modeling Studies"

Dear Mr. Solomon:

I've enclosed the original and three copies of the paper that I presented to the A&WMA International Specialty Conference "Regional Photochemical Measurements and Modeling Studies". I've also enclosed a magnetic version of the paper on a 3.5" diskette in Wordperfect 5.1 format. I would like the paper to be published in the book on policy issues. (The paper was presented in the Plenary Session.)

If you have any questions, please let me know. You can reach me at 608/267-7543.

Sincerely,

Larry Bruss, Ozone Section Chief

pc: Mike Koerber - LADCO  
Dennis Lawler - Illinois EPA