

# CASE TEACHING NOTES for “On a Clear Day You Can See Forever”

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## **INTRODUCTION / BACKGROUND**

This case was developed for a four-credit introductory environmental studies course for undergraduates that meets for 65 minutes three days a week. The course typically has between 30 to 40 students, a manageable number when teaching via case studies. The students range from incoming freshmen to graduating seniors and represent all of the majors offered at my institution. This is the first of a series of environmental courses for students majoring in environmental studies at St. Thomas, though many students take it as an elective. Typically, there is a required textbook for the course, *Environmental Science: Working with the Earth* (by G. Tyler Miller, Thompson Learning, Inc.), but any introductory text on the subject would work.

Although the class is diverse in terms of the students' backgrounds and experience, most of them have had little or no exposure to all the topics discussed in this course, which surveys the range of environmental issues from large to small in scale and chronic to acute in scope. Consequently, there is little overall redundancy with material learned in other courses. A case study approach works well with such survey courses, and I have found that there is no lack of material from which to draw.

## **Objectives**

The goal of this particular case study is to give students a taste of a real-world situation while dealing with course-related facts and issues. The case is set in northern Minnesota and the information comes largely from the website of the Minnesota Pollution Control Agency (<http://www.pca.state.mn.us/>) and the publication *Minnesota Environment* (see References). The case has been scripted to facilitate students' exposure to authentic problems in their own backyard, but with wider implications (federal rights to establish standards and impose them on states, state rights to impose rules on industries or individuals, interstate and international cooperation on health issues that share airsheds). Specifically, the case explores the causes and effects of haze and smog as ubiquitous, persistent air quality problems that plague urban and rural areas alike, regardless of where people (students) choose to live or recreate.

## **CLASSROOM MANAGEMENT**

The case generally takes two class periods to complete. On Day 1 of the case, I begin by presenting a lecture covering definitions, sources, and types of air pollution. I then hand out Part I—It's a Small, Small World and give the students a few minutes to read it. We then answer the questions associated with this part of the case as a class. At the end of class I give the students Part II—Life's Better at the Cabin and ask them to read it for homework and come prepared to discuss it during the next class period.

I begin Day 2 by asking students for their answers to the questions in Part II. Running this as a class discussion keeps all the students actively involved. While enough information is given in Parts I and II to answer the questions, the discussion will be deeper if these and related concepts have been addressed in the lecture or text.

To end the case study, students divide themselves into groups of three to four (by counting off) and answer a series of questions that are handed in for a grade. One student in each group should be selected as note-taker to record the answers for each question as agreed upon by the group. Names of all group members are put on this sheet. Make sure that everyone in the group agrees on the wording and content of the answers, since they will all receive the same grade for the exercise (tell them this in advance).

The last two group discussion questions should have prompted the students to think about ways to limit PM<sub>2.5</sub> emissions, and by this point they should have developed some recommendations. After the groups complete the questions and hand them in, I ask each group to read their recommendations, which are written in list form on the board. After the list is complete, a vote is taken on the recommendations put forth by each group (there should be at least 8 to 12 recommendations on the board).

The recommendations with the most votes are marked to indicate which ones should be considered by the MPCA to address the fine particulate problem. The instructor can use the last few minutes of class time to comment on the recommendations and relate these to state or local actions to reduce PM<sub>2.5</sub> emissions.

To conclude the case study, the Follow-up—Governor, Outgoing EPA Director Tout Clean Air Minnesota is handed out for students to take home for their information.

## **BLOCKS OF ANALYSIS**

The questions for each section are meant to dispel common misconceptions regarding the difference between haze and smog. The questions also ensure that the students know how haze and smog are generated and why PM<sub>2.5</sub> emissions are being targeted for reduction. Students learn about some of the issues and concerns regarding PM<sub>2.5</sub> reduction by discussing alternatives with classmates and voting on final suggestions that they think would work to reduce PM<sub>2.5</sub> in Minnesota. Finally, the students are given the opportunity to create a list of possibilities for PM<sub>2.5</sub> reduction and recommend things that *they* can do in response to the problem.

Answers to the questions posed in the case study are provided in a separate answer key to the case. Those answers are password-protected. To access the answers for this case, go to **the key**. You will be prompted for a username and password. If you have not yet registered with us, you can see whether you are eligible for an account by reviewing our **password policy and then apply online** or write to **answerkey@sciencecases.org**.

I give students these answers as handouts after we discuss them as a class so that they have some reference material for the rest of the case study.

### **Additional Questions for Groups**

1. Explain how airborne particulate matter is formed (describe factors such as names of the reactants, season of year most prevalent, air transport phenomena).
2. What are PM<sub>10</sub> and PM<sub>2.5</sub>, and what are their major sources?
3. How does this haze problem differ from the urban “smog” problem?
4. List four ways PM<sub>2.5</sub> emissions could be reduced. Determine possible consequences if these PM<sub>2.5</sub> control measures are applied.
5. What can you do about PM?

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## **FOLLOW-UP — GOVERNOR, OUTGOING EPA DIRECTOR TOUT CLEAN AIR MINNESOTA**

It was a rarified atmosphere at the Science Museum of Minnesota on June 3, 2003, as Governor Tim Pawlenty and outgoing U.S. Environmental Protection Agency Director Christie Todd Whitman joined representatives of industry, government, and the environmental community to promote Clean Air Minnesota.

Clean Air Minnesota, a program of the Minnesota Environmental Initiative (MEI), is a partnership to voluntarily reduce air pollution. The partnership (including major companies such as 3M, Andersen Corporation, Ford Motor Company, and Flint Hills Resources) was formed in response to recent air-quality alerts in the Twin Cities Metro area related to ground-level ozone.

If the Metro area exceeds federal pollution standards for ground-level ozone, it may be designated a “nonattainment area.” This designation triggers mandatory pollution controls that, according to the Minnesota Chamber of Commerce, could cost industry and consumers \$189-\$266 million each year.

“[Clean Air Minnesota has] recognized, with increased smog, with increased alerts, there’s a problem coming down the road,” Whitman was quoted as saying in the St. Paul Pioneer Press. “But instead of waiting for that problem to become a crisis, which would put you in violation of clean-air standards, you’re taking action.”

The partnership’s initial efforts will focus on:

- Educating the public about air-quality threats and how to address them;
- Working with industries and small businesses (point and area sources of air pollution) to identify ways to reduce emissions;
- Lowering emissions from mobile sources; and
- Encouraging natural landscaping as an alternative to mowing.

Businesses and organizations ready to sign on to the Clean Air Minnesota approach can do so, if ready to commit to:

- Taking one or more actions to reduce emissions on days when an air pollution alert is forecast;
- Implementing one or more long-term activities to permanently reduce air emissions; and
- Assisting Clean Air Minnesota’s efforts to educate others about the importance of reducing air pollution and protecting air quality.

Find out more by visiting MEI’s web page at <http://www.cleanairminnesota.org>.