

ESA 21: Environmental Science Activities

Activity Sheet
Ground-Level Ozone

Name:

Lecture Professor:

Examining Weather Factors:

For each of the following, vary only the parameter listed - keep the rest on the default setting. Make sure you hit the **Reset** button after each run to ensure the settings are returned to the default before the next run. For all of the charts except the Default, put both of the profiles (e.g. 80° F and 120° F) on the same chart, identifying each curve with a label and a different line type (solid line or dotted line) or color (red line or blue line).

Defaults:

100° F
Mild Inversion
Light wind
Partly cloudy



Temperature:

(a.) 80° F
(b.) 120° F



Inversion:

(a.) No inversion
(b.) Strong inversion
(lowest box)



Wind Speed:

(a.) No wind
(b.) Max wind



Sunlight:

(a.) Cloudy skies
(b.) Full sun



Evaluating the Factors:

Through your runs you've seen that some of these factors have a greater effect on ozone levels than others. List the four factors from most important to least important in the space below, and explain why you listed them in the order you did.

Most important ----- Least important

The Ultimate Smog Situation:

Describe the settings for each factor, and sketch the smog profile in the space below.

	Temperature	Inversion Layer	Wind Speed	Sunlight
Setting				



Examining the Sources of Pollutants:

Toggle the dials at the bottom of the page and observe how they affect the bar graph showing the relative contributions of the four different sources of pollutants. Once you've done this, increase or decrease the population, and see how the magnitude of the outputs are changed with greater or fewer people. Rank the four categories (dials) from greatest to least contributor, and describe the effects of population on pollutant outputs.

Greatest contributor ----- Least contributor

The Value of Simulations:

Smog City is in trouble. True to its name, it has routinely exceeded federal air quality standards, and the city must take immediate steps to improve air quality. For the sake of this exercise, we will use the default settings as the current situation in Smog City (hitting **Reset** will restore these settings as before). Two competing proposals are on the table for improving air quality. Use the simulation to evaluate each one.

Proposal 1: The city develops a comprehensive mass transit system that reduces the number of passenger vehicles by developing a subway-rail system to ferry commuters around the city. This would reduce the **Cars and Truck** dial to its lowest setting, but increase the **Off Road** dial to its maximum setting.

Proposal 2: The city enacts a comprehensive plan that addresses pollution from multiple sources. The city's subway-rail system is modestly improved, and major initiatives are undertaken to reduce pollutant outputs from Industry and Consumer Products. This would reduce the **Cars and Truck, Industry, and Consumer Products** dials by one increment each, and increase the **Off Road** dial by one increment.

Run the simulations with the default weather conditions, show the profiles for each below, and make a recommendation to the city council on which proposal to adopt, providing justification for your answer. Be sure to address both maximum pollutant levels and length of exposure.

Proposal 1:
Cars -2
Off Road +2



Proposal 2:
Cars -1
Off Road +1
Industry -1
Consumer -1



Recommendation and Justification: