

The Cost of Pollution



Target Grade Levels

Seventh - Twelfth

Time

30-40 minutes

Materials (one per student group)

- vinegar
- water
- 2 medium sized eggshell pieces
- 2 small green leaves
- two paper clips
- two containers with lids
- guest presenters

Knowledge and Skills (TEKS)

- Science:
 - Acquire data through the senses;
 - The student shall be given opportunities to observe properties and patterns of objects, organisms, and events in the environment; and
 - The student shall be given opportunities to describe objects, organisms, and events from the environment, describe changes that occur to objects and organisms in the environment.
- Language Arts:
 - Uses writing as a tool for reflection, exploration, learning, problem-solving, and personal growth.
 - Communicate data and information in appropriate oral and written form.

Overview

Though there are many laws restricting pollution, there are still polluters. This activity sheds light on why this occurs, focusing on the decisions that lawmakers and regulators have to make on the severity of penalties for violation of environmental laws. The lesson outlines the considerations leading up to the imposition of a non-compliance penalty so that will students will be able to understand how the government determines the severity of those penalties.

Background Information

The primary goal of pollution control laws is to protect human health. There are several different types of pollution control measures that the government imposes on polluters to achieve compliance with environmental regulations. "Point source" controls impose standards on the discharge coming out of any facility (such as a factory), typically through the issuance of a permit and a compliance monitoring system. Other types of pollution control measures may focus on overall environmental quality. One such overall environmental quality protection system is the set of National Ambient Air Quality Standards (NAAQS) set forth by the Clean Air Act. This set of standards places limits on the amount of certain pollutants, called "criteria pollutants", allowed in the ambient air in order to protect human health. The criteria pollutants are ground-level ozone, lead, nitrogen oxides, carbon monoxide, particulate matter, and sulfur dioxide. The amount of Hazardous Air Pollutants (HAPs), or "air toxics" allowed in the ambient air is also regulated. The one thing all pollution control methods share are penalties imposed on violators of environmental laws and regulations.

Although most of the regulated community complies or intends to comply with environmental laws and regulations, each year there are cases where regulated entities violate regulations and risk being caught and penalized, or fail to make themselves aware of the laws and regulations and are penalized. Penalties usually serve three functions: restitution, retribution, and deterrence. Restitution, usually through compensation, serves to cover any damage caused by the violation. Retribution is the penalty imposed for the violation itself, while deterrence is meant to prevent future violations. In environmental regulatory practice, restitution can be difficult or impossible to quantify, since damage to the environment is not easily reduced to dollars. Most penalties for environmental law violations are meant to punish bad behavior and serve to deter others from the same behavior.

Monetary fines are the most common type of penalty for violating environmental regulations, though jail terms for more egregious violations (willful circumvention, outright fraud) serve as an important deterrent. Specific penalties are not written into the law, but are set by government officials that weigh a variety of factors in determining a penalty. To serve as an important deterrence signal to the regulated community, a penalty should reflect the degree of harm or potential harm to the environment. At a minimum, monetary penalties should recover any economic benefit a violator may have gained by ignoring the law. This type of penalty ensures that facilities are not economically disadvantaged for complying with the law. Other factors affect a penalty include the ability to pay, degree of cooperation with agencies, whether the violation was self-reported, and the strength of the case if litigation is likely.

Suggested Reading

- The Oil Game (Apple II computer program). AV System (1988).
- Sheridan, John H. "Pollution Prevention Picks Up Steam." Industry Week, 241 (17 February 1992) p. 36.
- U.S. EPA. Principles of Environmental Enforcement. Washington, DC: U.S. EPA, Office of Enforcement (February 1992).

Procedure

1) Vocabulary

- | | |
|--|------------------------------------|
| a) avoided costs | l) regulations |
| b) compliance | m) restitution |
| c) compliance monitoring | n) retribution |
| d) deterrence | o) ground-level ozone |
| e) laws | p) lead |
| f) litigation | q) nitrogen oxides |
| g) nitrogen dioxide (NO ₂) | r) carbon monoxide |
| h) non-compliance | s) particulate matter |
| i) permit | t) sulfur dioxide |
| j) point source | u) Hazardous Air Pollutants (HAPs) |
| k) postponed costs | |

2) Activities

- a) Before class begins the following “Problem Statement” on the chalk board:
It has been discovered that Anytown Light and Power Company has been releasing nitrogen dioxide (NO₂) from its smokestack in concentrations of 75 parts per million (ppm) for the last 15 days. The company’s permit allows the release of NO₂ in concentrations not to exceed 60 ppm.
- b) When class begins:
 - i) Explain how environmental regulations are enforced like other laws, through the imposition of penalties, including fines and imprisonment.
 - ii) Call students attention to the “Problem Statement,” containing the basic facts and circumstances surrounding a fictitious violation of an environmental regulation. Explain that the students will serve as government regulators and use this class period to determine a penalty to be imposed.
 - iii) Inform students that they will be limited to imposition of monetary fines. Ask the class to identify any other information that they would like to have about the situation before making this decision. List these on the chalkboard. If necessary, prompt students by suggesting they might want to know something about the seriousness of the violation.
 - iv) For example, did the violation cause potential or actual harm? The completed list could include any or all of the following considerations (which are actually weighed in determining penalties):
 - (1) Factor 1: Seriousness of the violation
 - (a) extent of deviation from requirements
 - (b) potential or actual harm
 - (2) Factor 2: Economic benefit for non-compliance
 - (a) costs avoided
 - (b) costs postponed
 - (3) Factor 3: Duration of the violation
 - (4) Factor 4: Degree of cooperation with regulators
 - (5) Factor 5: History of compliance
 - (6) Factor 6: Ability to pay
 - v) After the students have completed their list, compare it with the factors actually used by government regulators. (Use the list above, but the presenter should feel free to supplement it based on his/her own experience.) Discuss how the lists differ (if they do) and why. Then come to a consensus on the factors to be used in this class to determine the penalty for the problem violation.
 - vi) Hand out the worksheet. Divide the class into small groups if you wish. Explain that students should use the worksheet to compute the fine (or range of fines) to be

imposed. In order to do that, however, discuss how to quantify or attach a value to each factor. For each step in this process, ask students to suggest appropriate values, discuss the pros and cons of suggestions, and come to a consensus on the amount to be used. (If the class is working in small groups, each group should come to its own consensus.) The presenter's role should be to facilitate the discussion. The presenter also may add facts and circumstances to the case study, if required, to introduce more real-world issues into the decision-making experience.

- vii) In facilitating the discussions, the presenter should introduce the following ideas if they do not surface on their own:
- (1) In determining the seriousness of the violation, the class should consider what indicators or evidence it would use to determine potential harm. (More than any other element, this may be a judgment call since environmental damage is not easily quantified.) Students should recognize that seriousness is a function of personal judgment based on the two elements listed under Factor 1 above. On the chalkboard, you may want to draw the following payment calculation matrix bringing the two elements together. Have students decide the penalty amount to enter in each box.

Extent of Deviation from Requirements

		High	Medium	Low
Potential or Actual Harm	High			
	Medium			
	Low			

- (2) In determining any economic benefits that may have accrued for non-compliance, the class should recognize the difference between avoided costs (for example, the cost of required pollution reduction equipment), and postponed costs. Students also may want to consider other recoverable costs: costs the government has incurred in enforcing the law or the value of other advantages the violator may have held over competitors that complied with regulations. All economic benefits are simply added together.
- (3) To help students in determining the relevance of the duration of the violation, explain that some environmental laws apply “seriousness” penalties for each day of non-compliance. In some cases, the total penalty attributed to the seriousness of the violation may be discounted for the number of days of non-compliance. For this activity, students should assume that 10 percent of the penalty accrues for each day of non-compliance. This means that 30 days of non-compliance would triple the penalty assessed for the seriousness of the violation.
- (4) The other factors listed in step iv above are less important than the first three. The students should use them to fine-tune the penalty to reward good behavior or further punish bad behavior.
- (5) It is important to understand that ability to pay is a baseline element. That is, it presumes that the violator has the ability to pay.

- viii) When students have completed the worksheet, ask students if their decision might have changed for a case in which a business was unaware of the regulations and the risks of failing to act. Explain why, in reality, “ignorance of the law” is not a valid excuse. (If an EPA or TCEQ employee is a guest presenter, he or she may wish to cite examples of actual penalties assessed and discuss the factors EPA considered in setting the penalties, especially if factors, other than those cited in this activity, were considered.)
- c) For grades 10 through 12, ask students to consider and suggest alternatives to the current penalty system. Sample questions: Why wouldn’t all violators be automatically shut down? Why are environmental damages difficult to quantify?
- 3) Review
- a) Discuss whether penalties system is working
 - b) Ask how the system might deal with a violation that is short, but extremely bad, and whether or not the penalties for such an accident are stringent enough.
- 4) Evaluation
- Include actual noncompliance story, have students read and write why it was done and what they would or would not have done differently.
- 5) Extension
- a) Have students discuss the following two questions:
 - i) If no penalties could be imposed, why would a business comply with regulations?
 - ii) Are there other “penalties” that may be associated with violating environmental regulations, such as damage to reputations, that serve as incentives for compliance?
 - iii) Discuss the implications of their answers in the context of “being a good citizen.”
 - b) Discussion: are cars point sources? Why or Why not? How are they (or are they not) regulated like point sources, and why?

STUDENT WORKSHEET 1
THE COST OF POLLUTING
Calculate a Monetary Penalty

Facility Name: Anytown Light and Power Company

Money the Facility Saved by Not Complying with Regulations

Costs avoided _____
Costs postponed _____
Total (a) _____

Seriousness of the Violation

Penalty required based on potential for harm
and extent of deviation from requirement (b) _____

Adjustment for the Duration of the Violation

Number of days of non-compliance (c) _____
Total = [(b) x (10%)] x (c) (d) _____

SUBTOTAL
Subtotal = (a) + (d) (e) _____

Penalty Adjustment Factors

1. Degree of cooperation (+/-) (f) _____
2. History of compliance (+/-) (g) _____
3. Supplemental environmental projects (+/-) (h) _____
4. Ability to pay (-) (i) _____
Total = [(f) + (g) + (h) + (i)] x (e) (j) _____

TOTAL PENALTY
Total Penalty = (e) + (j) _____