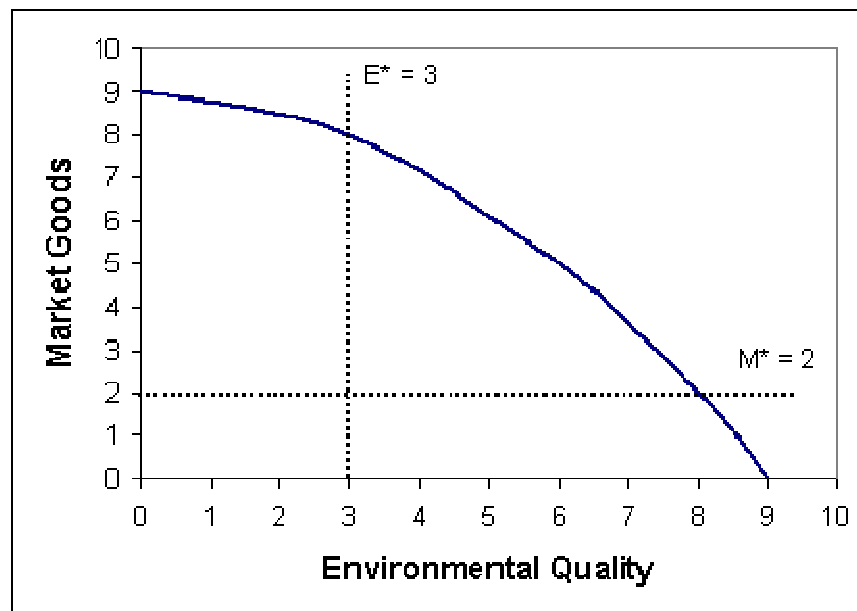


1. What considerations come into play when considering whether the US or any other political entity is spending the "right" amount for environmental quality improvements?
2. A given quantity of a residual, discharged at one time and place, can be a pollutant; whereas if it is discharged at another time or place it may not constitute a pollutant. Why is this true? Give an example.
3. In your view, should employment in the forest industry be sacrificed to save the northern spotted owl? If so, by how much, and how should the extent of employment loss be determined? If not, why not?
4. Use economic analysis to evaluate the following statement: "The only amount of acceptable pollution is no pollution at all."
5. Consider the production possibilities curve below. M^* represents the economy's subsistence level of market goods; if the quantity of market goods drops below M^* , some people will starve. E^* represents the sustainable level of environmental quality necessary to keep the PPC in its present position; with less environmental quality, the PPC will shrink next year.



- a) Redraw the above diagram on the answer sheet. Make sure you label your graph completely. Indicate where the economy will produce for each of the following goals:
 - i) Achieve as much environmental quality as possible without starving its citizens.
 - ii) Enjoy as much market goods as possible without reducing its PPC in the future.
 - ii) Produce M^* or more of market goods and E^* or more of environmental quality.
- b) Suppose that a severe disaster forces the country's PPC to shift in until it is barely possible to produce the combination of E^* and M^* . Draw the economy's new PPC, and answer the questions for part (a) again. (Draw the new PPC on the same chart used above.)
6. Suppose that for a certain production process it is technically impossible to increase output beyond a level of 1000 units per month. What would the marginal cost curve look like if all inputs were free?

7. Faced with the oil crisis of the mid 1970s, the U.S. Congress instituted Corporate Average-Fuel Economy (CAFE) standards, which were intended to increase the miles per gallon (MPG) of automobiles.
- Briefly describe the expected environmental effect of increasing the MPG of autos, holding all else constant.
 - There has been serious criticism lodged against these standards because U.S. automakers responded by using more plastic in autos to make cars lighter in weight as a way to meet the more restrictive CAFE standards. Explain how the use of this particular technology affects your answer to part (a). Are there any other relevant issues associated with this manufacturing decision?
8. Suppose in a given market, the following equations describe the market demand and supply:
 $Q^d = 200 - 4P$ and
 $Q^s = 100$.
- Using algebra, solve for the equilibrium price and quantity and support your answers graphically.
 - What is unusual about this market? Give an example of a good or service that might be characterized by this unusual market attribute.
9. Suppose the following equations represent the inverse demand and supply functions for recycled paper:
 $P^d = 400 - 5Q$ and
 $P^s = 40 + 3Q$,
 where P is the price and Q is the quantity (measured in tons).
- Using algebra, solve for the equilibrium price and quantity of recycled paper. Support your answers with a graph of the market.
 - Calculate the value of consumer and producer surplus at the market equilibrium. Show these areas on your graph.
 - Suppose the government imposes a price floor of \$200 per ton for recycled paper. What impact would this have on the market outcome? Recalculate consumer and producer surplus and compare the answer to part (b) above.
 - Suppose the government imposes a price ceiling of \$100 per ton for recycled paper. What impact would this have on the market outcome? Recalculate consumer and producer surplus and compare the answer to part (b) above.
10. Some have argued that removing government controls that keep food prices down is a necessary step to insure food security. In addition, some maintain, the subsequent increase in price will also reduce soil erosion by giving farmers stronger incentives (and access to capital) to invest in long term erosion control measures. It seems counterintuitive to argue that increasing the price that consumers face for food will, in many cases, actually improve access to food. How can you explain this line of reasoning? In the short run, who would suffer most from lifting price controls on food? How can this problem be addressed? Can you think of a reason why rising food prices might actually increase soil erosion?
11. Recently, the FDA proposed tougher labeling standards for bottled water. Until now, bottlers could sell regular tap water under a bottled water label. As a matter of fact, the FDA estimates that approximately 25% of the current supply of bottled water is nothing more than ordinary tap water. Assume that these tougher standards are successful in eliminating this 25% of current supply. If market demand is unaffected, what directional impact would this labeling change have on the equilibrium price and quantity for bottled water? Support your answer with a graphical model.
12. Reconsider the implications of the change in labeling standards from the previous question in the context of the hypothetical market for bottled water modeled by the following equations:
 $Q^d = 1,150 - 100P$ and $Q^s = 400P - 100$.
- Algebraically, find equilibrium price and quantity and support your answers graphically.
 - Now, suppose the change in standards results in a new market supply of $Q_s = 400P - 350$, with no change in market demand. Determine the new equilibrium price and quantity. Do the results agree with your intuitive answers to question 11?
 - Compare the values of consumer and producer surplus before and after the change in labeling standards. Is this result expected? Why or why not?

13. What is the difference between an open-access resource and a common property resource?
14. Surrounding the Great Lake are four paper-mills, each producing 100 tons of paper per year. The paper is sold on the national market for \$2 per ton, and including all the costs of production, costs for each firm are \$1 per ton. Thus each firm earns a pure economic profit of \$1 per ton. These paper mills require fresh water to operate, and also produce a pollutant called gunk, which they dump into the Great Lake. New paper mills can also locate on the Great Lake, and produce at a base cost of \$1 per ton. However, for each new paper mill which arrives, the water will become more polluted with gunk, and each firm will have to install a water treatment facility to obtain fresh water. This externality associated with new plants will raise the cost of paper production at all facilities, including the new one, by \$0.15 per ton for each new mill.
- a) Assume there is free access to the Great Lake. If paper mills will continue to locate as long as there is any economic profit to be earned, how many new mills will be built? What is the number of mills that maximizes total combined profits for the paper producers? (Hint: Average revenue remains constant at \$2. Create a table, which compares the average revenues with average and marginal costs as new firms locate around the lake. Also include total industry costs and total industry revenue.)
- b) Draw a diagram of the marginal cost and marginal revenue curves with the number of mills on the horizontal axis. Assume that government regulation restricts lake access to the profit-maximizing number of firms. Show the producer surplus that would be earned by the mills that are allowed to operate.
- c) Suppose that government regulation reduced the number of mills by one from the number that would have resulted given free access. Show that the increase in profits to the remaining mills (the resource rent) is sufficient to compensate the firm that is denied access to its lost profits.
15. Assume that the demand curve for a particular good is fully coincident with the marginal social benefit function and can be described by $MSB = MPB = 24 - 2Q$, where Q refers to the quantity of the good. Assume that the marginal private cost function can be described by $MPC = Q$, and that marginal social costs are always double the marginal private cost. Graph the functions and algebraically determine the market level of output and the socially optimal level of output.
16. Consider a crowded room with an equal number of smokers and nonsmokers. Each smoker would be willing to pay \$1.00 to have the right to smoke. Each nonsmoker would be willing to pay \$0.50 to have the room free from smoke. Assume there is a rule that says that no smoking is allowed. Could everyone be made better off if smoking is allowed? How? If property rights to clean air are assigned to the nonsmokers, how might the efficient outcome be obtained? What difference does it make to the outcome whether there is initially a rule that smoking is allowed or smoking is not allowed? What problems might you envision occurring if no smoking is allowed unless all the nonsmokers agree to allow smoking?
17. Property rights over the world's oceans are not well-defined. Recently, experts have noted that fishing stocks are declining as the seas' resources are overused.
- a) Explain, in economic terms, why this might have happened.
- b) Commercial fishing firms in countries all over the world are complaining about the decline in their industry. The response of many governments has been to subsidize the fleets in their countries. Explain this as an example of government failure.

18. Below are portions of the demand curves for three individuals for air quality in their neighborhood. Air quality (integer values only) is measured in terms of $\mu\text{g}/\text{m}^3$ (micrograms of SO_2 per cubic meter of air). If the marginal cost of reducing ambient SO_2 is \$40 per $\mu\text{g}/\text{m}^3$, what is the socially efficient level of air quality, assuming that “society” in this case consists of just these three people?

Marginal Benefit of sulfur removal (dollars per $\mu\text{g}/\text{m}^3$)	Quantity Demanded			Price of orange juice (cents per oz.)
	Anna	Heidi	Sean	
60	1400	1200	1500	0
50	1300	1100	1400	10
40	1200	1000	1300	20
30	1100	900	1200	30
20	1000	800	1100	40
10	900	700	1000	50
0	800	600	900	60

19. Suppose that the previous question referred not to air quality but to ounces of orange juice demanded per year by the three individuals. In this case the price (shown on the right) refers to cents per ounce. Suppose the marginal cost of orange juice production is 40¢. What is the efficient aggregate level of orange juice production for these three people?
20. Suppose that the market for tuna fish can be described by the following equations:
 $P^d = 1000 - 8Q$
 $P^s = 100 + Q$
- Using algebra, solve for the market equilibrium price and quantity.
 - Calculate the consumer and producer surplus at the market equilibrium. What is the value of social welfare?
 - Suppose that the harvesting of tuna imposes an external cost on dolphins (and, consequently, the people who value dolphins). In particular, for each ton of tuna caught, \$6 worth of dolphin is lost. In other words, the marginal external cost of tuna is $\text{MEC} = 6Q$. Write an equation for the marginal social cost of tuna. What is the total external cost of tuna at the market quantity? What is the net social welfare at the market quantity? (Hint: Subtract the total external cost from the value of social welfare calculated in part (b) above.)
 - What is the socially optimal tuna harvest and at what price? Recalculate consumer and producer surplus at this output level. What is the value of the net social welfare? How does this compare to part (c) above?