

I. Private Environmental Problems?

- i. Perhaps the most local of environmental problems are those that individuals deal with in their own life.
 - a. Here one may note that air quality within most homes in the West are below that of the air quality outside, because of home construction and products brought home.
 - b. Similar, although larger, problems occur for firms who must deal with the quality of air and water within their factories, offices, mines, etc.
- ii. Individual's clearly have incentives to take account of such environmental costs when selecting homes, products, jobs, and production methods.
 - a. Such environmental costs should thus be **internalized** by those making the decision.
 - b. In such cases, there will be no "policy relevant" private environmental problems.
- iii. "Relevant" private problems can emerge only if individuals are unaware of risks and opportunities, and so fail to adjust their plans to properly take account of environmental costs or opportunities.
 - a. For example, individuals may be **ignorant** of some environmental risks or of more cost-effective and environmentally friendly methods of living and/or producing.
 - b. Such informational problems are most likely to emerge when new discoveries of risks are made or when technologies change in a manner that creates new opportunities that are widely unrecognized.
- iv. People are at least occasionally somewhat ignorant of their true opportunity set and of the *private* costs and benefits of their activities.
 - a. However, they tend to be more aware of long-standing risks and opportunities, because information about such risks and opportunities tends to be **freely available** from friends, family, teachers, and the mass media.
 - b. (As possible examples of unrecognized costs, consider the costs and benefits of florescent light bulbs and economy cars tabulated in a spreadsheet on the class website.)
 - c. Other cases, for example on geothermal heat pumps, could also have been developed.

II. Local Problems and Environmental Regulation

A. Local environmental problems have historically been the greatest factor in health risks and sustainability.

- i. A village that does not assure fresh water and dispose of waste products will not long be viable. A hunter gatherer or farming society that does not over uses its forest and fields because of commons problems will not last long.

- a. It is for such reasons that villages tend to be located near rivers, streams, and large lakes.
 - b. It is for such reasons that nomadic tribes move from place to place during the year, and that settled agriculture adopt a variety of institutions (including variations of private property) to solve commons problems.
- ii. A town that does not take care of its waste products will soon be a rather unattractive place (odors) and also tends to be a relatively unhealthy place insofar as human and animal wastes transmit diseases among humans (and among farm animals and pets).
 - iii. An industrial town that does not take care of its waste products may become blackened with soot and populated by folks with various respiratory problems.
 - a. In extreme cases, an industry with very toxic waste products may poison those who live in surrounding areas.
 - b. The "love canal" waste disposal site is an example of the later, but there are historically many other examples in the 20th century.
 - iv. In much of the third world, local environmental problems--especially those associated with water pollution--are the most deadly.
 - v. Examples of Local Environmental Problems and Public Goods:
 - a. water quality
 - b. air quality
 - c. solid waste disposal

B. Through much of history, addressing these problems were the responsibility of local governments.

- i. Typical local responses included a variety of regulations controlling opportunities for waste disposal:
 - a. Disposal of solid wastes downstream instead of upstream from cities/towns
 - b. Design standards for septic systems
 - c. Rules restricting the accumulation of waste products (most trash and sewer services were originally private)
 - d. smokestack heights
 - e. zoning laws placing factories at the edge of communities (preferably down wind)
 - f. water treatment plants and public water systems
- ii. (It bears noting that many local environmental problems that are addressed by local governments are **caused by nature** as might be said of: flood control, fires, and threats from predators and rodents.)

C. Local governance has long been democratic--or at least somewhat representative, and so the politics of such local regulations can be modeled using the tools previously in the course:

Applications: Local and Regional Environmental Problems and Solutions (Handout 7)

- i. Elected politicians will take account of the environmental interests of the median voter which tends to be affected by income and "expected" costs associated with environmental problems and their solutions.
 - a. Local political pressures also include the effects of industrial lobbying and mobility.
 - b. Such mobility may also affect the size of the local tax base and thus the tax price of government services.
- ii. Residents will leave towns that fail to address significant environmental problems and move to ones that do a more effective job.
 - a. Note that mobility may also induce sorting by environmental preferences.
 - b. Towns that are "green" will tend to attract residents with relatively intense demands for environmental quality.
 - c. Industrial towns will tend to attract folks who care relatively more about income (or net tax burden) than environmental quality.
- iii. Resident mobility tends to make the overall pattern of environmental regulation more efficient--as long as the problems addressed are truly local, and there are no "regulatory externalities." (See the discussion of centralization below.)

III. Limits to Local Solutions of Environmental Problems: Regulatory Externalities among Local Governments

- A.** It bears noting, however, that not every environmental problem is a local problem or a problem that can be addressed by a single government.
- i. In many cases there are "spillovers" among communities.
 - Regional environmental externalities often arise from the use of air and water systems as a methods of disposing of undesirable substances (pollution).
 - ii. Such spillovers imply that the regulations of one community tends to affect those of other communities.
 - Recall that a community's regulations tend to affect the behavior of firms and consumers who produce effluents, but only those that are directly affected by its regulation.
 - Regional regulatory externalities, consequently, arise from a community's environmental regulatory choices.
 - The more stringent a community's regulations are, the less likely it is that effluents are emitted in a way that affects other communities.
- B.** As a consequence of regulatory externalities, regional externalities are unlikely to be properly addressed.
- C.** For example, a "race to the bottom" may emerge if towns compete to attract (polluting) industry (and tax base) by lowering environmental regulations to attract firms to their communities.

- D.** A 3x3 game matrix can be used to illustrate the problem (see below).

		Community B's environmental Regulations		
		weak	moderate	strong
A's env regs	weak	A,B 6,6	A,B 8,4	A,B 9,2
	moderate	4,8	7,7	8,5
	strong	2,9	5,8	6,6

- i. The payoffs can be thought of as (i) social surplus if governments are benevolent social net benefit maximizers, (ii) votes if they are competitors in democratic community elections, or (iii) as utility levels of the median voter if the strong form of the median voter theorem holds in the two communities, states, or nations.
 - The payoffs have been constructed to illustrate the problem of interest.
 - Note that both communities have pure dominant strategies (weak regulations).
 - The (weak, weak) cell is, consequently, the Nash equilibrium of the game.
- ii. The Nash equilibrium involves too little environmental regulation in the sense that a Pareto superior move exists at the Nash equilibrium.
 - a. Note that there is a Pareto superior move (at the level of governments) from (weak weak) to (moderate moderate) regulations.
 - b. The median voter of both these communities could potentially benefit by coordinating their regulations and agreeing to adopt somewhat stronger regulations.
- iii. Note that this problem is very much like the free rider problem associated with private efforts to adopt pollution reducing products, and could be represented geometrically as well.
 - In such a diagram, the regulation would be set at the median voter's optimal level, but there would be a spillover external benefit from the regulation that affects neighboring communities.
 - (Try drawing such a diagram as an exercise.)

- E.** The opposite regulatory externality problem--**over regulation**--can also occur.

Applications: Local and Regional Environmental Problems and Solutions (Handout 7)

- i. A "race to the top" (NIMBY) tends to emerge if towns compete to discourage polluting industries from locating in their communities by enacting strict environmental regulations.
 - **NIMBY** is an acronym for **Not In My Back Yard**.
 - For example, towns (etc.) may want to discourage land fills, incinerators, water treatment plans, or nuclear waste facilities from locating in their jurisdictions.
- ii. A 3x3 game matrix can be used to illustrate the problem (see below).

The Race to the Top Dilemma				
NIMBY				
		Community B's environmental Regulations		
		weak	medium	strong
A's env regs	A,B	A,B	A,B	A,B
	weak	6,6	4,8	2,9
	medium	8,4	7,7	5,8
	strong	9,2	8,5	6,6

- iii. The Nash equilibrium involves too much environmental regulation in the sense that a Pareto superior move exists at the Nash equilibrium
 - Note that there is a Pareto superior move from (strong strong) to (medium medium) regulations.
 - The median voters of both these communities could potentially benefit by coordinating their regulations and agreeing to adopt somewhat weaker regulations.
- iv. Similar NIMBY-type regulatory problems also occur for locating power plants, refineries, airports, shopping malls, and interstate highways.
 - Such "political prisoner's dilemma games" are sometimes called instances of "**government failure**" as opposed to "market failure," because they arise because of the actions of government (rather than inaction).

IV. Other problems with local regulation of regional environmental problems.

- A. Some externality problems are "too large" to be dealt with by a single local government, but are not reciprocal (symmetrical) in the sense of the previous illustrations.
 - In some cases, the regulatory externality is "one way," because all of the benefits of additional regulations or costs of effluents fall entirely on persons outside the community.
 - And, none of the other communities' environmental regulations affect the community of interest.
 - (Such might be the case in the tall smoke stack example discussed in class if the wind always blows in one direction.)
- B. Such asymmetric cases, resemble the "race to the bottom" game, because each community has an incentive to underregulate the externality in question.
 - i. However, in this case the decision is one-sided rather than a "race."
 - Underregulation in this case may have nothing to do with the mobility of taxpayers, firms, or other sources of tax base.
 - ii. Communities in asymmetric cases have no interest in regulating the emission.
 - There will again be unrealized gains from coordinating regulations within the communities affected by the externalities, but they cannot be realized by simply "trading regulations."
 - In such cases, the affected communities down wind or down stream will have to compensate the community that can potentially regulate the emissions source for the cost of doing so. (Some form of "sidepayment" will be necessary.)
 - (Use a diagram and a game matrix to illustrate the nature of this regulatory externality problem.)

V. Solutions to Regulatory Externality Problems

- A. One solution for regulatory externality problems is for the towns to meet and work out a "**Coasian**" agreement to internalize the externality problem.
 - In the cases of regulatory externalities, the communities can agree to tighten up or relax the relevant environmental regulations.
 - In the case of asymmetric externalities, communities downwind or down stream can make cash payments or provide other services to the community that controls the externality.
 - Note that the such agreements are struck by governments rather than all affected parties, and so are Pareto superior moves only at the level of governments.
 - (In the case of nation states, these Coasian contracts are called treaties.)

B. Another solution to such "regulatory externality" problems is **to shift policy responsibility to higher levels of government** that can "coordinate" the selection of environmental regulations or mandate regulations across the communities of interest.

- i. A county or state government should, in principle, take account of county or statewide benefits.
- ii. Electoral pressures may induce higher levels of government to adopt policies that affect all the emissions sources and all of the benefits and costs, rather than just a subset of them.
- iii. Higher levels of government may also attempt to induce the local government to coordinate their regulatory policies.
 - For example, governments state governments may mandate particular local regulations or provide Pigovian subsidies or taxes that induce communities to coordinate their regulatory decisions.
- iv. They may also support agreements between communities by granting authority to negotiate such agreements and by enforcing the agreements in state or national court systems.

C. Note that these arguments for centralization are **not** based on the properties of the environmental problems, but on **defects in political decision** making associate with addressing those problems.

- It is an attempt to address government rather than market failures.

D. Centralization, however, has a cost.

- i. Centralization often implies that environmental regulations that address local problems will become **uniform** among the communities, which tends to be inefficient if "average" preferences for environmental quality differs among communities.
 - a. If communities differ in their demand for environmental quality because their tastes or income differ then a uniform regulation will tend to generate fewer net benefits for the state than a pattern of regulations that reflect differences in demand.
 - b. In this case, there is a conflict (tradeoff) between avoiding Nimby and "race to the bottom" problems, and benefiting from decentralization.
 - c. (Use two community SMB curves facing the same MC to show the losses from uniform rules that address local environmental problems.)
- ii. In cases in which demands for environmental quality differ and there are regulatory externalities, the level of government that can best deliver environmental quality is not always clear.

VI. Evidence of Progress on Local Pollution Problems

A. The economics of production tends to imply that local pollution problems worsen as economic development takes place.

- i. More intensive use of natural resources tends to create new common problems.
- ii. Industrialization tends to produce larger firms that produce more goods and services at lower costs, but also generate more concentrated and larger flows of effluents.
 - More concentrated or larger flows of effluents means that more air and water will be required to "dilute" the effluents down to densities that are less toxic and/or less annoying.
 - Consequently, other things being equal, economic growth will be associated with greater environmental problems.

B. If a community's net benefits or median net benefits drive environmental regulations, industrialization will also imply that more stringent regulation are adopted by higher and higher levels of government.

- i. Within democracies, as perceived environmental risks and median income rises so does the demand local environmental regulation.
 - a. The same factors also tend to increase lobbying by environmental interest groups.
 - b. Note that *if that voter demand for environmental quality increases faster than effluents from production, the local environment may actually become cleaner (and more healthy) as production expands!*
- ii. Improved scientific understanding of many local and regional environmental problems has also allowed more subtle environmental problems to be recognized and more effective regulations to be adopted.

C. Objective measures of local environmental quality for the OECD (democratic developed) countries suggests that environmental regulations have been increasing in rigor for three or four decades in a manner that tends to increase local air and water quality.

- a. Measured air and water quality have been increasing through out the West for decades.
- b. See slides from EPA and associated websites.