Economics 461
Institutions and the Control of Air Pollution

1. Policy evolves over time as new information is obtained and the regulator, The Environment Protection Agency (EPA) gains experience.

2. Basic Issues
   a. Which pollutants should be controlled? Which air pollutants are most dangerous for human health and the environment? Answer to these questions will allow priorities to be set for abatement programs.
   b. How clean should the air be? Answering this question requires knowing the effects of polluted air on people, and their environment and the cost of abatement.
   c. How can emission-control strategies be made cost-effective?
   d. What should be the goals for areas where air quality is good?
   e. What should the federal and state roles in air pollution control?

3. Conventional Pollutants are relatively common substances found in almost all parts of the country, and are presumed to be dangerous only in high concentrations. These pollutants are called criteria pollutants because the Clean Air Act requires the EPA to produce 'criteria documents' to be used in setting acceptable standards for these pollutants.

4. For each of the conventional pollutants the first step is to set ambient air quality standards. These standards are legal ceilings on the allowable concentrations of the pollutants in the outdoor air over a specific period of time. The primary standard is designed to protect human health. The secondary standard is designed to protect other aspects of human welfare from these pollutants. The ambient standards are required by statute to be determined without any consideration given to the cost of meeting them. What this means is that the choice of the standard should not consider costs. But this does not mean that once the standards are chosen that cost-effectiveness should not be a consideration in meeting these standards.

5. The methods of identifying human health effects epidemiology, clinical investigation, toxicology. All methods used by these disciplines are insensitive in detecting health effects at the low level of exposure in the range at which air quality are set. Uncertainties about the statistical and biological significances of observed physiological effects in a small number of test subjects have plagued attempts to uncover the effects of pollution. EPA memos gave heavy weight to studies in which ozone effects were not distinguished from other pollutants present. Clinical studies in which low-dose effects were observed in only two subjects and with strenuous exercise (generally a ozone exposures several times the standard). And certain effects in animals could not be extrapolated with confidence to human exposure.

6. The standards apply to measurement of air at a monitoring station not air at the point of being inhaled by people. The standards must be set with an "adequate margin of safety" below whatever level would be expected to produce adverse effects in the most susceptible subgroup of the population. For ozone, the EPA designated people with asthma, chronic bronchitis and emphysema as most susceptible, 5% of the population. The EPA then estimated the level of ozone that would leave no more than 1% of this group vulnerable, about 135,000 out of 270 million. This was estimated as .15 parts per million, the standard was set lower at .12. Commentators have noted that the level from which the margin of safety should be subtracted is not clear. Perhaps, a more reliable reference point than the most sensitive 1% of the most sensitive group would be the level that produces adverse health effects in half the sensitive population. Also the EPA should consider cost of control and the feasibility of identifying and protecting the most sensitive through preventive health measures rather than setting the national standard to protect the most sensitive group from reversible physiological change. The absence of a cost-benefit test for setting mandatory air quality standards has been criticized widely. But, acknowledging that the benefits and costs of control should be balanced is difficult for an administrator.

7. Implementing the air quality standards. While the EPA sets the air quality standards, the state control agencies implement the standards. State Implementation Plans (SIP), which must be approved by the EPA, divides the state into different air quality control regions (AQCR). The EPA has little real power to insist that SIP's be reasonable though it can disapprove a SIP. More important, the EPA cannot compel a state to enforce a SIP. It may suspend federal grants for sewage treatment or transportation facilities. But in practice, the EPA lacks the manpower, the budget and the political clout to enforce standards in a state, which does not want them enforced.

8. Non-Attainment regions. The original plan was that the Air Quality Standards would be met by 1975. When this goal was not achieved, new legislation introduced non-attainment regions. To prod states into action the EPA was given the power to halt construction of major new or modified pollution sources and to deny federal grants to states not submitting a plan showing how attainment would be achieved. Also, new or modified sources must control their own emissions to the lowest achievable emission rate (LAER). It is the lowest rate found in any state implementation plan.

   The offset. In order to permit construction in non-attainment areas, the EPA allow for offsets where the additional pollution would be offset by additional clean up from some appropriate baseline. One baseline might be the level in the SIP though the EPA tried to use reasonable available control technology. RACT is the baseline. For automobiles, non-attainment leads to a regional inspection and maintenance program.

9. Attainment regions. Areas with air quality as high as the standards were subject to another set of controls known as prevention of significant deterioration of air in cleaner regions (PSD). These regulations specify the maximum allowable increases or increments in pollutions beyond some baseline. Three types of regions are specified with a different increment. Class I includes national parks and wilderness areas. Class II has a relatively small increment; Class III has a larger one. New sources seeking to locate in PSD must secure permits. These sources must install best available control technology BACT. The specific technology is determined on a case-by-case basis. Once the increment is consumed, no further deterioration is allowed. There are some who claim that this legislation was enacted by representatives of the older than dirt parts of the country to protect the movement of industry to the cleaner more rural parts of the west and south. There is evidence that when PSD was passed, the prices of companies owning mining smelter rose, increasing the value of old firms.

10. Non-compliance penalty. Stating regulations was not enough; non-compliance was a significant problem with delays of up to six years being common. The sanction of non-compliance was introduced, firms had to pay large fines if they did not comply.

11. New source performance standards. The EPA itself has established a national uniform emission standard for new source criteria pollutants or major modifications of existing sources. The standards are supposed to be performance standards, but the choice of technique is generally rather explicit in the EPA's standards. But these new-source standards impose a much higher cost per unit of pollution removed than most SIP standards for existing standards. The definition of new source has created confusion. Is a new piece of equipment a new source? Should it be a new-source if it does not increase total pollution from the plant? If a large piece of equipment is installed, is the entire plant subject to new-source standards?

The cost of sulfur abatement in a western coal plant is four times the incremental cost in existing power plants. Utilities are induced to postpone replacement of older, obsolete plants thereby, saddling customers with higher generating costs. The new-source standards increase the cost of the new plants and postpone the retirement of dirty older plants. This is referred to as new-source bias. One of the objectives of the new-source performance standard is to set a standard or floor for the technological standards set by states.

The Efficiency of command and control. While there are a number of disadvantages to command and control, there are a number of advantages: (1) flexibility in regulating complex environmental processes, (2) more certainty, and simplicity in monitoring.

The threshold concept and the level of pollution. This standard is somewhat arbitrary. We really do not know what the health benefits are at low levels of pollution. There are health effects below the standard. An EPA study of the Clean Air act estimated that between 1970-1990 the percent value of benefit was 22 trillion at a cost of .5 trillion. This looks like a great investment. But the estimates of the benefit depend on the number of lives saved, which may be somewhat speculative.

Uniformity. No account is taken of the number of people exposed, the sensitivity of the local ecology or the costs of compliance in various areas.

Timing of emission flows. Thermal inversions stop the dispersion of pollution. Flexibility in abatement over time when the climate is appropriate decreases abatement costs.

Innovative approaches. The emissions trading program.

The emission reduction credit (ERC). A source receives credit if it decides to control any emission point to a higher degree to fulfill its legal obligation. It can apply to the regulator; it is needed for an emission reduction credit.

The offset policy. New sources in non-attainment areas by Eric's from old sources, they have to buy 20% more than they emit.

The bubble policy. The bubble policy allows existing sources to use emission reduction credits to satisfy their SIP. For example, existing sources in non-attainment areas can meet their assigned standards either by adopting the control technology or by adopting another technology and using an emission reduction credit. Or, since 1978, all sources from a plant are imagined to be encased in a physical bubble. A Dupont plant in New Jersey was ordered to reduce its emission from 119 sources by 85%. Operating under a bubble program, the engineers proposed instead that emissions from several large states be cut by 99%. The reduction exceeded the state's requirement by 2,300 tons per year and Dupont saved $12 million in capital costs and $3 million in operating costs. This is an excellent example of whose the firm knows more about the relative costs of abating the point sources of its pollution. For other examples, the applications of the bubble policy see the Xeroxed handout.

Netting. The firm can avoid new-source review, which will involve permits and the adoption of BACT and LAER.

Banking. Firms can bank their emission credits.

Last time we began discussing actual environmental policy.

12. The Clean Air Act first defined national goals in terms of ambient standards. Secondly, it directed the EPA to set national standards for controlling emissions of toxic air pollutants. Thirdly, it set limits for emissions from cars and trucks.

13. The command and control system (C and C) is described on pages 139-143 in the textbook. In essence, to reach the air quality standards, emission standards are imposed on a large number of emission points. Such as stacks, vents or storage tanks. Following a survey of the technology options of control, the control authority selects a favored control technology and calculates the amount of emission reduction achievable by that technology as the basis for setting the emission standard. Technologies yielding larger amounts of control are chosen for new enmities and for existing enmities in areas where it is very difficult to meet the ambient standard (non-attainment areas).

14. So controls are stricter in non-attainment areas. Also, recall the problem of new source bias, which is related to grandfathering of old plants. Although there is a considerable amount of information that over a range of abatement pollution from old plants is cheaper to clean up than the incremental cost of abatement requirements on new plants are often minimal: (1) The rationale for this policy is that the cost of retrofitting old cars or factories to emit less pollution is generally higher than the marginal cost of building new sources with cleaner characteristics. (2) Another reason involves fairness to owners of existing sources in the face of changing norms. Scientific understanding of pollution and government standards. (3) Also, existing polluters may be less opposed to regulations from which they will be largely exempt. Some have even suggested that existing polluters may actively support grandfather regulations because they act as barred to entry and result in non-competive excess profits. "New source bias" refers to the fact that grandfather rules provide an incentive to maintain existing productive capital in lieu of new investments. By decreasing investment in new sources, pollution will be increased temporarily. Some research has found that elective utilities facing new source performance standards tend to use older plants at higher capacities relative to old plants. Specifically, one study used a panel of 44 elective utilities from 1969 to 1983 to show that regulation increased capital age by 25%. Also, there is evidence that when the average fuel economy for new cars was increased the rising price of new cars increased the average age of the vehicle being driven.

15. The cost effectiveness of command and control. As the technology varies over industry to industry or from firm to firm the overall costs are not minimized. Also, the firm typically has little incentive to perform better than the standard.

16. The introduction of emission reduction credits (ERC). Certain types of trades were not allowed. New sources for example, are not allowed to satisfy the

new source performance standards by choosing less stringent technologies and making up the difference with emission credits. The critical issue is what should be the allowable trading area, the plant, the firm, the industry within a state, across states. It should be emphasized that the credits arise spontaneously within the system. The total quantity is not imposed from the outside. One study of utilities found that even allowing a plant to trade among discharge points within the plant could save from 30-60% of the cost of complying with new sulfur oxide regulations. Expanding trade, same utilities over the same state permitted a further reduction of 20% while interstate trading permitted another 15% reduction in costs. One of the great advantages of the trading system is that it encourages new technologies to meet increasingly tight standards. Leasing offers an element of flexibility when an old plant is replaced in large measure by a new plant. Its demand for emission credits falls and it can lease its unneeded credits. Then as demand increases and it has to use the older plant, it will reassign the credits it has leased.