CHAPTER 2

Pollution control instruments

Introduction

- Here we consider how could attain a predetermined pollution target by investigating the instruments that could be used.

Table 6.1 Criteria for selection of pollution control instruments

Criterion	Brief description
Cost-effectiveness	Does the instrument attain the target at least cost?
Long-run effects	Does the influence of the instrument strengthen, weaken or remain constant over time?
Dynamic efficiency	Does the instrument create continual incentives to improve products or production processes in pollution-reducing ways?
Ancillary benefits	Does the use of the instrument allow for a 'double dividend' to be achieved?
Equity	What implications does the use of an instrument have for the distribution of income or wealth?
Dependability	To what extent can the instrument be relied upon to achieve the target?
Flexibility	Is the instrument capable of being adapted quickly and cheaply as new information arises, as conditions change, or as targets are altered?
Costs of use under uncertainty	How large are the efficiency losses when the instrument is used with incorrect information?
Information requirements	How much information does the instrument require that the control authority possess, and what are the costs of acquiring it?

Cost efficiency and cost-effective pollution abatement instruments

- Suppose a list is available of all instruments which are capable of achieving some predetermined pollution abatement target.

- If one particular instrument can attain that target at lower real cost than any other can then that instrument is cost-effective.

- Cost-effectiveness is clearly a desirable attribute of an instrument.
  - Using a cost-effective instrument involves allocating the smallest amount of resources to pollution control, conditional on a given target being achieved.
  - It has the minimum opportunity cost.
  - Hence, the use of cost-effective instruments is a prerequisite for achieving an economically efficient allocation of resources.

Instruments for achieving pollution abatement targets

Table 6.2 Classification of pollution control instruments

Instrument category
Command and control instruments
Economic incentive (market-based) instruments

Instrument category	Description
Command and control instruments	
Input controls over quantity and/or mix of inputs	Requirements to use particular inputs, or prohibitions/restrictions on use of others
Technology controls	Requirements to use particular methods or standards
Output quotas or prohibitions	Non-transferable ceilings on product outputs
Emissions licences	Non-transferable ceilings on emission quantities
Location controls (zoning, planning controls, relocation)	Regulations relating to admissible location of activities

Instrument category	Description
Economic incentive (market-based) instruments	
Emissions charges/taxes	Direct charges based on quantity and/or quality of a pollutant
User charges/fees/natural resource taxes	Payment for cost of collective services (charges), or for use of a natural resource (fees or resource taxes)
Product charges/taxes	Applied to polluting products
Emissions abatement and resource management subsidies	Financial payments designed to reduce damaging emissions or conserve scarce resources
Marketable (transferable, marketable) emissions permits	Two systems: those based on emissions reduction credits (ERCs) or cap-and-trade
Deposit-refund systems	A fully or partially reimbursable payment incurred at purchase of a product
Non-compliance fees	Payments made by polluters or resource users for non-compliance, usually proportional to damage or to profit gains
Performance bonds	A deposit paid, repayable on achieving compliance
Liability payments	Payments in compensation for damage

Approaches which facilitate voluntary, decentralised internalisation of externalities

- One approach to achieving emissions, or other environmental policy, targets is to improve existing social or institutional arrangements that facilitate environmental damage-reducing voluntary decentralised behaviour.

- Two variants of this approach:
  - Improve the effectiveness of property rights regimes in bringing about socially efficient allocations of resources;
  - Encourage greater social responsibility in making choices and taking decisions.

Role of government

- If bargaining does offer the prospect of substantial efficiency gains, then government should facilitate it wherever that is cost-effective.
- It could do so by clearly defining and explicitly allocating property rights where that is practicable (and ethically acceptable).
- Where environmental problems spill over national boundaries, as in the case of biodiversity decline or greenhouse gas emissions, further complications arise.
- Government might seek to develop and sustain an institutional structure that maximises the scope for bargaining behaviour.
- Gains may also derive from government's taking some responsibility for environmental monitoring so as to identify pollution producers and recipients, and disclosing information from this to affected parties.
- Access to the judicial system should be easy and cheap, and also equitable as between different classes of parties. This will facilitate use of the liability principle.

Development of social responsibility

- Pollution problems happen, in the final analysis, because of self-interested but uncoordinated behaviour.
- Encouraging people – either as individuals or in their roles within organisations - to behave as socially responsible citizens can help to attain environmental goals.
- Government has limited influence over the cultural context of human behaviour.
- But it would be wrong to ignore the opportunities that exist for using educational institutions and the mass communications media to help achieve specific targets and to promote ethical behaviour.
- The evidence that individuals do not exclusively act in a narrowly utilitarian way suggests that this objective may be more than just wishful thinking.
- Perhaps the strongest evidence is to be found in our family and social lives, where much of what we think and do has a social – rather than purely self-interested – basis.
- Given this, ‘cultural’ instruments that promote ‘social responsibility’ may be powerful ways of achieving general environmental goals.

Command and control instruments

- The dominant method of reducing pollution in most countries has been the use of direct controls over polluters.
- This set of controls is commonly known as *command and control* instruments.
- Figure 6.4 provides a schema by which these instruments can be classified.

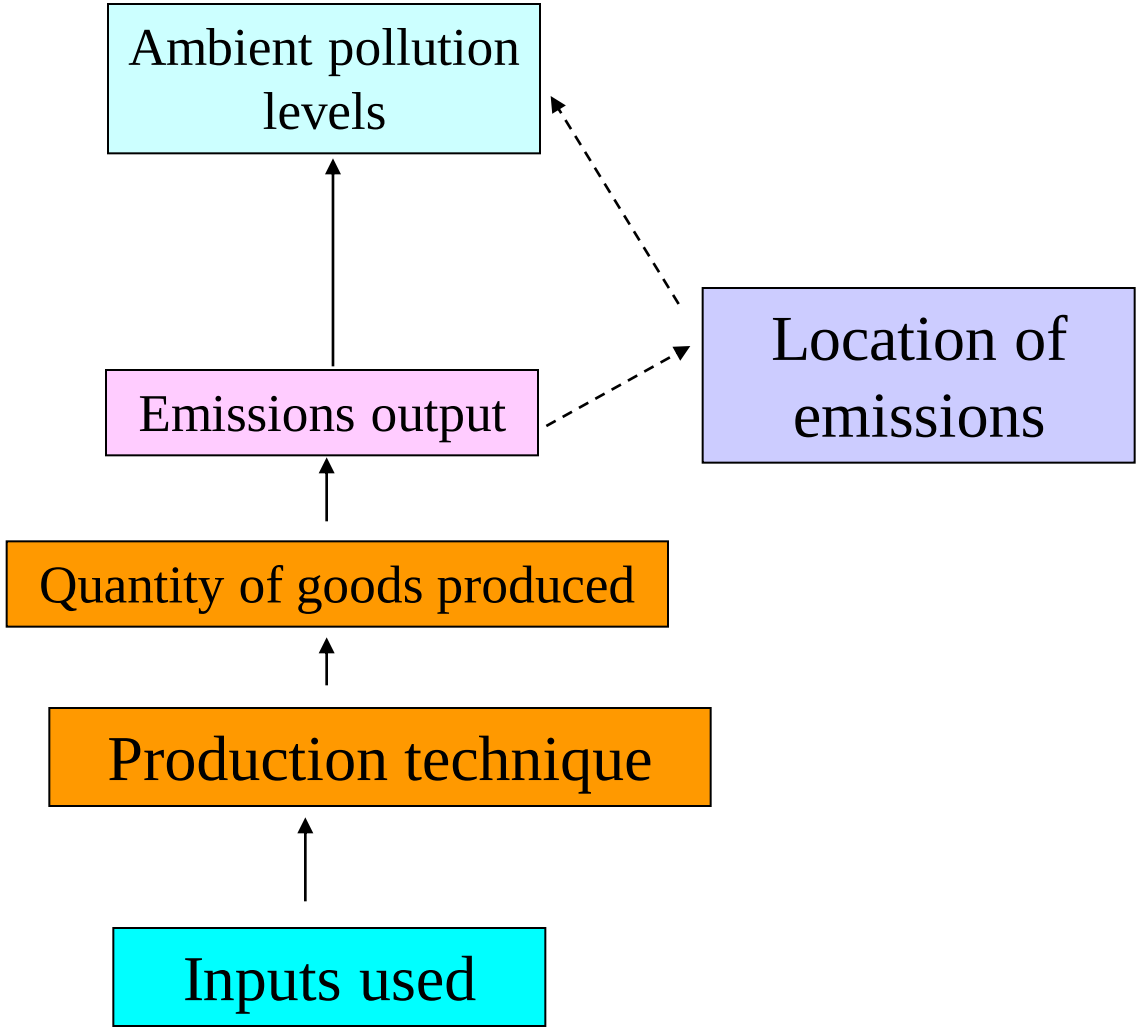

Figure 6.4a The pollution process

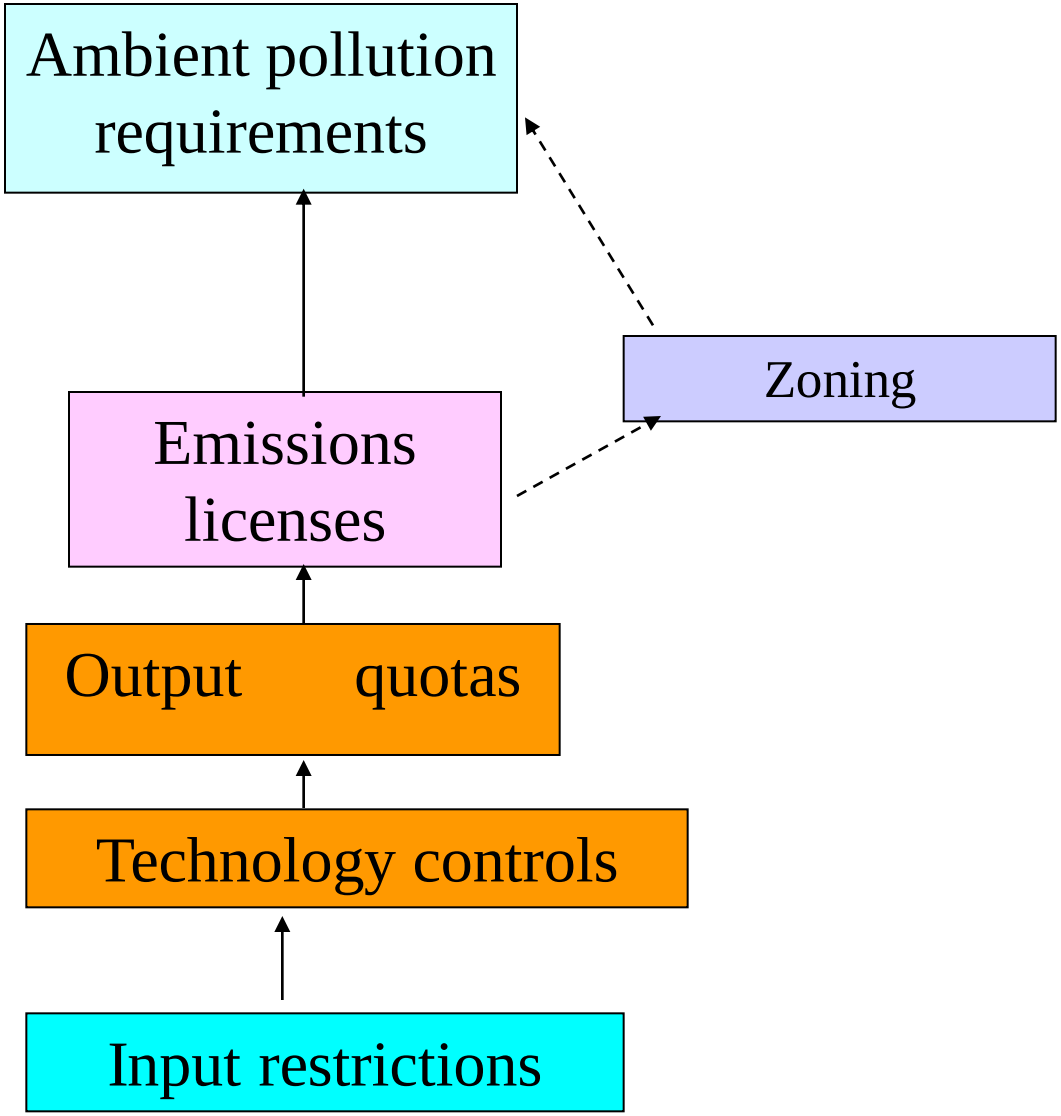

Figure 6.4b Command and control instruments

Non-transferable emissions licences

- Suppose that the EPA is committed to attaining some overall emissions target for a particular pollutant. It creates licences (also known as permits or quotas) for that total allowable quantity.
  - After adopting some criterion for apportioning licences among the individual sources, the EPA distributes licences to emissions sources.
  - These licenses are *non-transferable*; that is, the licences cannot be transferred (exchanged) between firms.
  - Therefore, each firm's initial allocation of pollution licences sets the maximum amount of emissions that it is allowed.

- Successful operation of licence schemes is unlikely if polluters believe their actions are not observed, or if the penalties on polluters not meeting licence restrictions are low relative to the cost of abatement.
  - Licence schemes will have to be supported, therefore, by monitoring systems and by sufficiently harsh penalties for non-compliance.

Economic incentive (quasi-market) instruments

Basic Principle

- Incentive-based instruments work by altering the structure of pay-offs that agents face, thereby creating incentives for individuals or firms to *voluntarily* change their behaviour.

- The pay-off structures are altered by changing relative prices. This can be done in many ways. We focus on two of them:
  1. By the imposition of taxes on polluting emissions (or on outputs or activities deemed to be environmentally harmful), **or** by the payment of subsidies for emissions abatement (or reduction of outputs or activities deemed to be environmentally harmful).
  2. By the use of tradable emission permit (or allowance) systems in which permits command a market price. Those prices are, in effect, the cost of emitting pollutants.

- More generally, any instrument which manipulates the price system in such a way as to alter relative prices could also be regarded as an incentive-based instrument.

Key results

- The tax instrument - at rate μ^* - brings about a socially efficient *aggregate* level of pollution

- It will also achieve that aggregate target in a cost-effective way.
  - Cost-efficiency requires that the marginal abatement cost be equal over all abaters.
  - Under the tax regime all firms adjust their firm-specific abatement levels to equate their marginal abatement cost with the tax rate.
  - But as the tax rate is identical for all firms, so are their marginal costs.

- Knowledge of both the **aggregate** marginal pollution damage function and the **aggregate** emissions abatement cost function are necessary for achieving a socially-efficient emissions target at least real resource cost to the economy as a whole. But it is ***not*** necessary to know *each firm's* marginal abatement cost function.

Marketable emissions permits

Marketable permit systems are based on the principle than any increase in emissions must be offset by an equivalent decrease elsewhere.

There is a limit set on the total quantity of emissions allowed, but the regulator does not attempt to determine how that total allowed quantity is allocated among individual sources.

Pros and cons of offset systems

ADVANTAGE

- A financial incentive is required to induce a non-controlled organisation to reduce its emissions when the offsets accrue to a large controlled emitter.
- This consists of the controlled emitter paying for the CO_2 reduction by the uncontrolled source.
  - The controlled source will be willing to do so provided that the necessary payment for any given amount of emission reduction is smaller than the cost of purchasing the corresponding quantity of permits on the permits market.

- This ability to make offset arrangements turns out to be the main advantage of the flexible permits with offsets system over pure cap and trade: it allows a given total quantity of emissions reduction to be achieved at lower total cost.
  - This greater cost-effectiveness can only be possible if emissions reduction has a lower marginal cost outside the controlled zone than inside the zone.

Pros and cons of offset systems

DISADVANTAGE

- The EPA may no longer be certain that net emissions are actually being reduced.
  - Clearly, the offsets regime leads to the controlled firms emitting a greater amount than their total cap.
  - Are emission reductions taking place by uncontrolled organisations genuinely additional (being reductions which would not have taken place in the absence of this flexible permits regime)?
  - Ensuring that offsets are only awarded when reductions are genuinely additional is extremely difficult to ensure.
  - It requires that the EPA has an explicit projection of the future time paths of uncontrolled sources emissions under a 'business-as-usual' (BAU) or non-interventionist scenario.
  - It also requires that the EPA is able to monitor the time paths of emissions of outsiders with whom offset arrangements are made, to compare these with the BAU paths, and that it can impose sufficiently strong deterrents to prevent spurious offset agreements from taking place.