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Economics Revision Focus: 2004

AS & A2 Economics

# Government Policy and the Environment

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## Revision Focus on the Government Policy and the Environment

### AS Syllabus Requirements

Candidates should be able to apply economic models to assess the role of markets and the government in areas such as the environment.

### A2 Syllabus Requirements

Candidates will be expected to extend and develop the models of market failure introduced in Module 1. For example, they will be expected to be able to use the marginalist model to explain why externalities result in a misallocation of resources and to help them evaluate policies to deal with problems, such as pollution. They should also be able to assess the consequences of the variety of government policies that are used to deal with market failure

The environment plays an absolutely essential role in shaping our economic and social welfare. The environment

1. **Provides services to consumers** in the form of living and recreational spaces and the opportunity to enjoy utility from experiencing natural landscapes and habitats
2. It provides us with the **natural resources necessary to sustain production and consumption** including the basis for renewable and non-renewable sources of energy
3. **It is a dumping ground for the waste products of our society** - be it waste from producers in different industries or from households and consumers

The link between economic activity and our environment is fundamental. We hear constantly about the need for sustainable economic welfare, for growth to take into account the direct and indirect effects on our resources. And increasingly we, as producers and consumers, are affected by many government policies and strategies designed to promote environmental protection and improvement.

### What is the commonly accepted definition of sustainability?

Development which meets the needs of the present without compromising the ability of future generations to meet their own needs

World Commission on Environment and Development Our Common Future (1987)

### Externalities and the environment – the basics

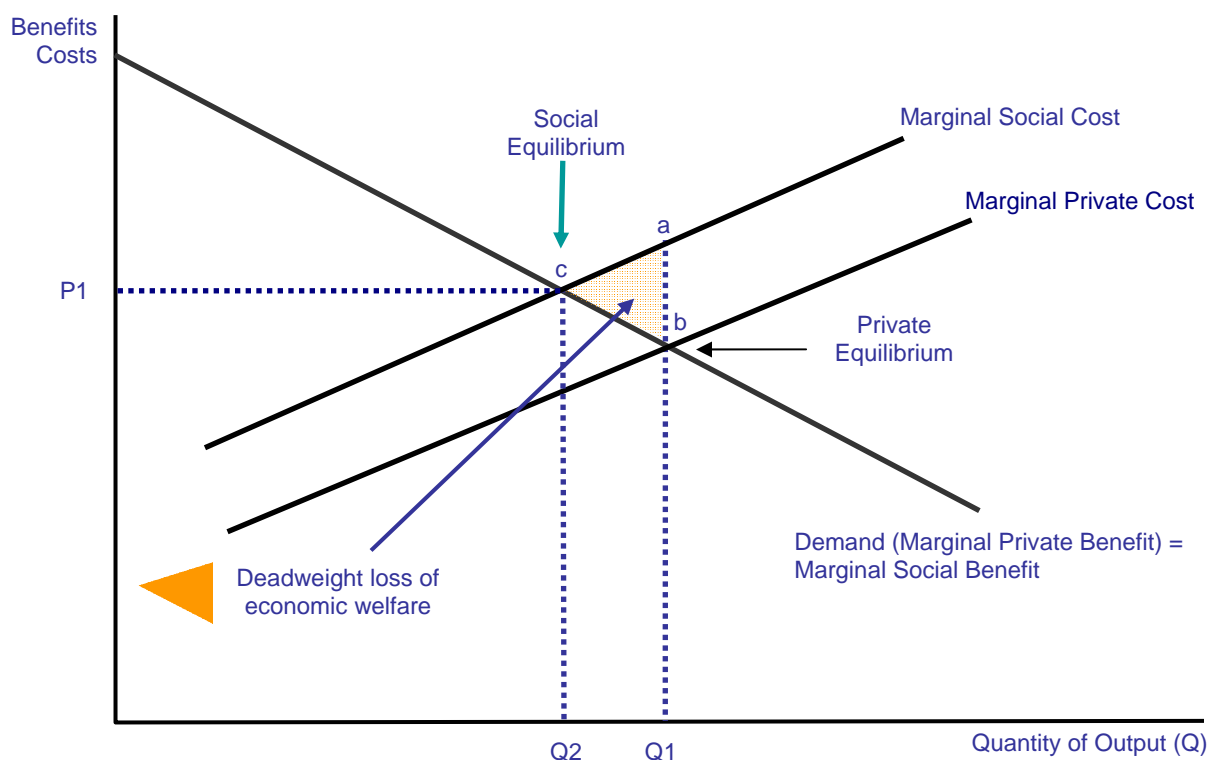
For environmental economics, one of the most important market failures is caused by negative externalities arising from either production or consumption of goods and services.

A negative externality occurs where a transaction imposes external costs on a third party (not the buyer or seller) who is not compensated by the market. The result is a loss of allocative efficiency and shown by a reduction in economic welfare

Environmental externalities generally arise for three reasons:

1. **Common resources** (not privately owned - e.g. ocean fisheries) – commonly owned resources may lack the protection of property rights and are susceptible to over-exploitation because the marginal cost of extracting the resource for a private economic agent is close to zero. This is known as the “tragedy of the commons”
2. **Public goods** (indivisible common resources - e.g. the air)
3. **Future generations** (sources of externality including carbon emissions – greenhouse effects – contributions to global warming which threatens future sustainability)

In these cases, the **private equilibrium of supply and demand** is not the same as the social equilibrium which includes all costs. In a completely free market, a producer will have no incentive to control pollution because it is external – i.e. the producer only considers his/her own private costs and benefits. The market failure arising from negative externalities is shown in the diagram below.



Because of negative externalities:  
 The output of the commodity is too large for society's welfare to be maximised  
 The prices of the products responsible for pollution are too low  
 Too much pollution is produced  
 No incentives are provided to industry to search for ways to reduce pollution, or to move production to a less damaging site  
 Recycling and reuse of the polluting substances is discouraged as it is cheaper to pollute

Economists argue that **market failures provide a rationale for policy intervention** to improve economic efficiency. But since market failures are pervasive, **intervention is only justified if the benefits exceed the costs**

Traditionally, government policy towards the environment has concentrated in two main areas

1. **Intervention in the price mechanism** – for example through environmental taxes
2. **Command and control measures** – for example direct regulation and legislation

These policies are designed to:

- Achieve a more efficient use of resources
- Promote substitution between resources (e.g. abundant for scarce, renewable for non-renewable)
- Provide incentives for a reduction of pollution emissions or change from harmful to benign

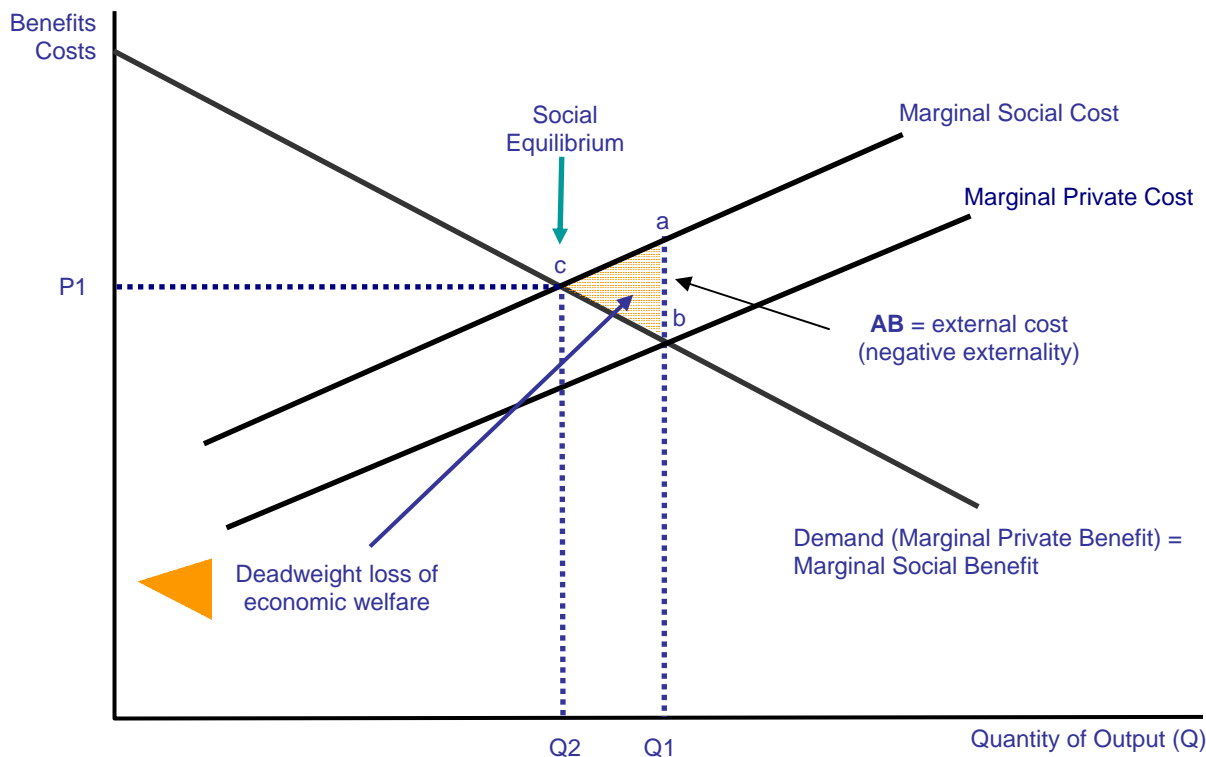
### Environmental taxation

An environmental tax is a tax on a good or service which is judged to be detrimental to the environment. It may also be a tax on a factor input used to produce (supply) that final product. The main aim of environmental taxation is to

- (i) **Increase the private cost** of producing goods and services so that the producer / consumer is paying for some of the negative externalities that their actions are creating (i.e. **the externality is internalised**) – this promotes **allocative efficiency**
- (ii) In this way, the government is providing a **continuous incentive** for the producer / consumer to take the externalities into account, thereby correcting a failure of the signalling function of the price mechanism
- (iii) Raise the final cost / price of the product so that the **level of demand contracts** (there is normally a direct link between the level of output / consumption and the total amount of pollution created)
- (iv) Reduce output levels towards the **estimated social optimum level of production** – which contributes to a more sustainable economy in the long term
- (v) Well designed environmental taxes may **encourage innovation and the development of new technology** which reduces the dependency of an economy on pollution inefficient forms of energy. This can help to promote **dynamic efficiency**
- (vi) **Revenue** derived from these taxes can be earmarked for lower taxes elsewhere in the economy (e.g. a reduction in employers' national insurance contributions) or to fund increased government spending on environmental projects / an expansion of provision of public and merit goods. Well designed environmental taxes can provide a source of revenue while correcting an economic distortion
- (vii) **Inter-generational equity justification:** Consider what might happen if the government refuses to introduce some environmental taxes so that current producers and consumers do not pay directly for some of the external costs they create. A refusal to impose tax displaces the environmental costs to future generations (implying a lack of intergenerational equity)

Examples of environmental taxes include: petrol tax, vehicle excise duty, landfill tax, the new carbon tax and the London Congestion Charge. The Irish Government also recently introduced a tax on plastic bags in a bid to reduce consumption and encourage recycling. The total revenue received by the British Government in 2001 from environmental taxation was just under £32 billion, which is equivalent to 3.2% of GDP. The measures of environmental taxation include: the climate change levy, other taxes and duties on energy products and VAT on duty, taxes on road vehicles, air passenger duty, and the landfill tax.

The main aim of an environmental tax is to increase the firm's private marginal cost (PMC) until it equates with the social marginal cost curve (SMC).



### Evaluation – problems with environmental taxation

There is a growing body of economists who argue that reliance on environmental taxation is an ineffective way of promoting environmental improvement, indeed that some taxes are prone to government failure. And, that the focus should now switch to alternatives ways of changing the incentives of producers and consumers through the market mechanism. The main criticisms of environmental taxes are discussed below:

1. **Valuing the environment:** There are fundamental problems in setting taxes so that marginal private costs will equate with the marginal social costs. The government cannot accurately value the private benefits and cost of firms let alone put a monetary value on externalities such as the cost to natural habitat, the long-term effects of resource depletion and the value of human life. Frequent adjustments of tax levels may be required and this involves substantial organisational costs
2. **Consumer welfare effects:** Taxes reduce output and raise prices, and this might have an adverse effect on consumer welfare. Producers may be able to pass on the tax to the consumers if the demand for the good is inelastic and, as result, the tax may only have a marginal effect in reducing demand and final output
3. **Achieving a target quantity of pollution reduction:** Taxes do not lend themselves to the government achieving an accurate reduction in total pollution. This is because no government can ever predict how consumers and or producers will respond to higher costs and prices. The elasticity of demand may vary over time.
4. **Income distribution:** Taxes on some de-merit goods (for example cigarettes) may have a regressive effect on low-income consumers and lead to greater inequalities in the distribution of income. Having said this, it should be possible for authorities to develop “smart tariffs or taxes” where account is taken of the impact of pollution taxes on vulnerable households such as low low-

income consumers. The current Labour government has reduced the rate of VAT on domestic fuel to the EU minimum rate of 5%, but the government has no plans to introduce a domestic energy tax (which would be an explicit environmental tax) because of the huge numbers of low-income households that currently live in fuel poverty. In the UK, the poorest 10% of households spends 13.2% of income on energy whereas the richest spends 3.5%.

5. **Employment and investment consequences:** If pollution taxes are raised in one country, producers may shift production to countries with lower taxes. This will not reduce global pollution, and may create problems such as structural unemployment and a loss of international competitiveness. Similarly, higher taxation might lead to a decline in profits and a fall in the volume of investment projects that in the long term might have beneficial spill-over effects in reducing the energy intensity of an industry or might lead to innovation which enhance the environment
6. **More efficient alternatives?** It might be more cost effective for governments to switch away from pollution taxation to direct subsidies to encourage greater innovation in designing cleaner production technologies. 'Eco-tax' reformers often argue that pollution taxes should be revenue neutral – so for example, an increase in environmental taxation might be accompanied by reductions in employment taxes such as National Insurance Contributions so that the employment consequences of higher taxation are minimised. The impact of green taxes depends crucially on what is done with the revenues. If they are balanced by reducing other taxes through 'revenue recycling', research suggests that green taxes could result in an overall economic improvement

## Alternatives to environmental taxes

### Emission Trading

Emission trading is regarded by many as the future of environmental protection and improvement in the UK, European and international economy. It is another form of pollution control that uses the market mechanism to change relative prices and the incentives of producers and consumers.

1. A fixed number of emission permits is allocated each year to polluting factories
2. Usual denomination: 1 permit = 1 tonne (e.g. of CO<sub>2</sub> emissions)
3. Total number of permits is the limit on pollution "the cap"
4. Annual emissions of each factory must be less than or equal to permit holdings
5. Permits can be traded – i.e. "cap and trade"
6. Factories which can reduce (abate) pollution for less than the price of a permit can sell spare ones for a profit
7. Factories which find it more expensive to reduce pollution can buy extra permits instead
8. Gradually the supply of permits is reduced – the market price rises. This gives firms who find it expensive to cut pollution, more of an incentive to seek new technologies / process that will reduce their pollution emissions

A **marketable pollution permit** gives a business the right to emit a given volume of waste or pollution into the environment. Ideally, the number of permits that are issued corresponds with the total level of pollution that is admissible at the social optimum level of output i.e. where the MSB = MSC. Once this has been determined the **permits are issued by auction** and firms that pollute the environment can bid for them and then buy and sell them amongst themselves.

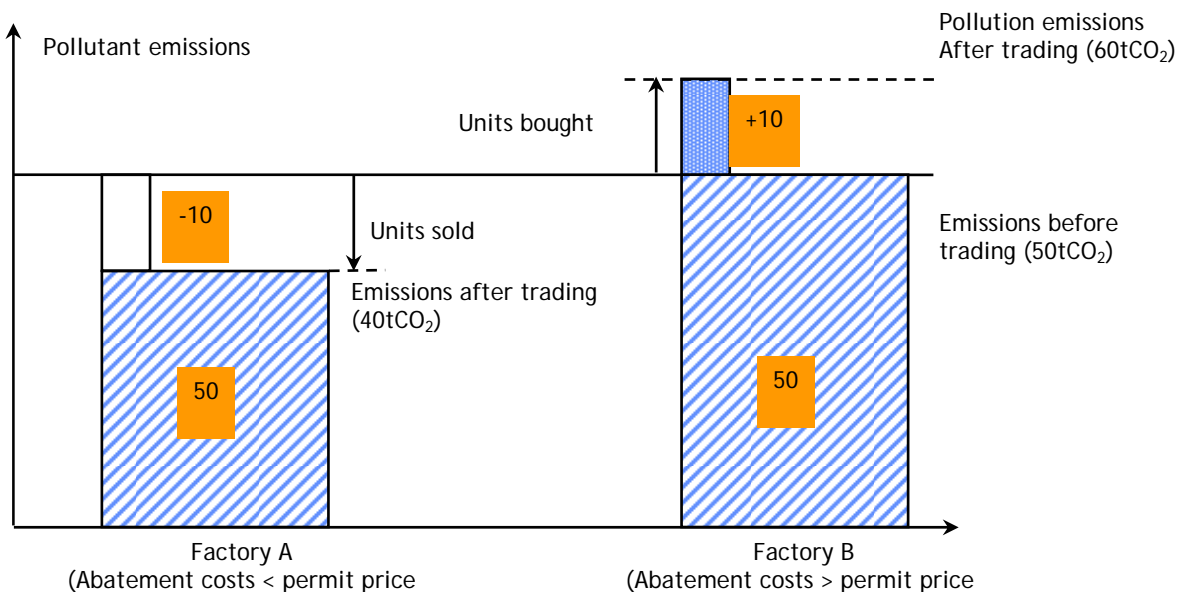
Pollution permits should, in theory, give firms an incentive to control pollution emissions for less than it would cost to buy permits, and there is evidence from “cap and trade” pollution permit schemes in the UK and the United States that the costs of monitoring pollution reduction and administration of the permits system is smaller than when an industry is subject to direct regulation. In the United States cap and trade scheme, it was found that many high-polluting businesses invested in fitting new pollution control equipment (e.g. Flue Gas Desulphurisation) and other polluters switched from high to low sulphur coal.

Consequently the use of marketable permits allows the cost of pollution control to be minimised. Another advantage is that the revenue from a traded pollution permits scheme can be re-cycled into other schemes for environmental improvement.

**Incentives matter – create a market in the “right to pollute”** - The basic idea behind traded pollution permits is to through the incentive to cut pollution directly to the producers themselves. Companies can then make their own decisions about the costs and benefits to them of particular routes to emission reductions. In other words, market forces are brought to bear on the issue of pollution and potential market failure.

Emission trading is likely to be most effective when

1. There is an easily measurable pollutant
2. The government sets a clearly defined and stable emissions target
3. There are a large number of participant firms, with companies sufficiently sophisticated to deal with the technicalities of trading at auction
4. Wide variation in costs of reducing pollution so that trading of surplus permits can take place
5. The transactions costs of trading permits are low and there is clear pollution data availability at the start and during trading
6. Strict enforcement of permits (i.e. a high compliance rate among participating businesses)

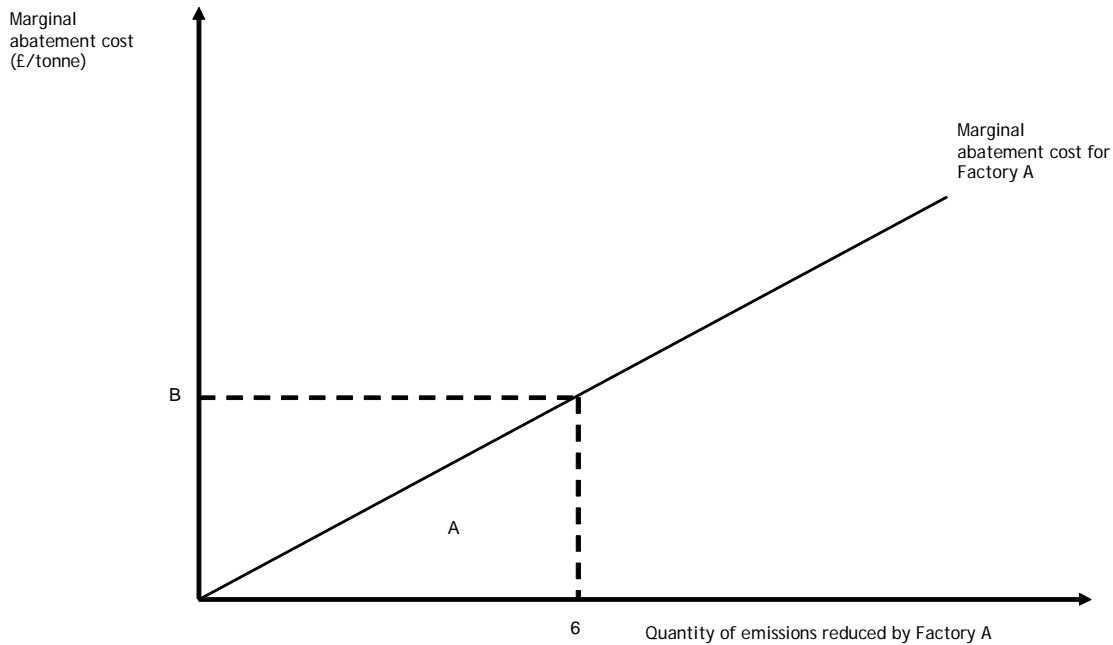


The figure above provides one way of showing how pollution permits can work. Factory A has lower pollution abatement costs and it can sell some of its unused permits to Factory B whose pollution control costs are higher.

### The basic theory of emission trading

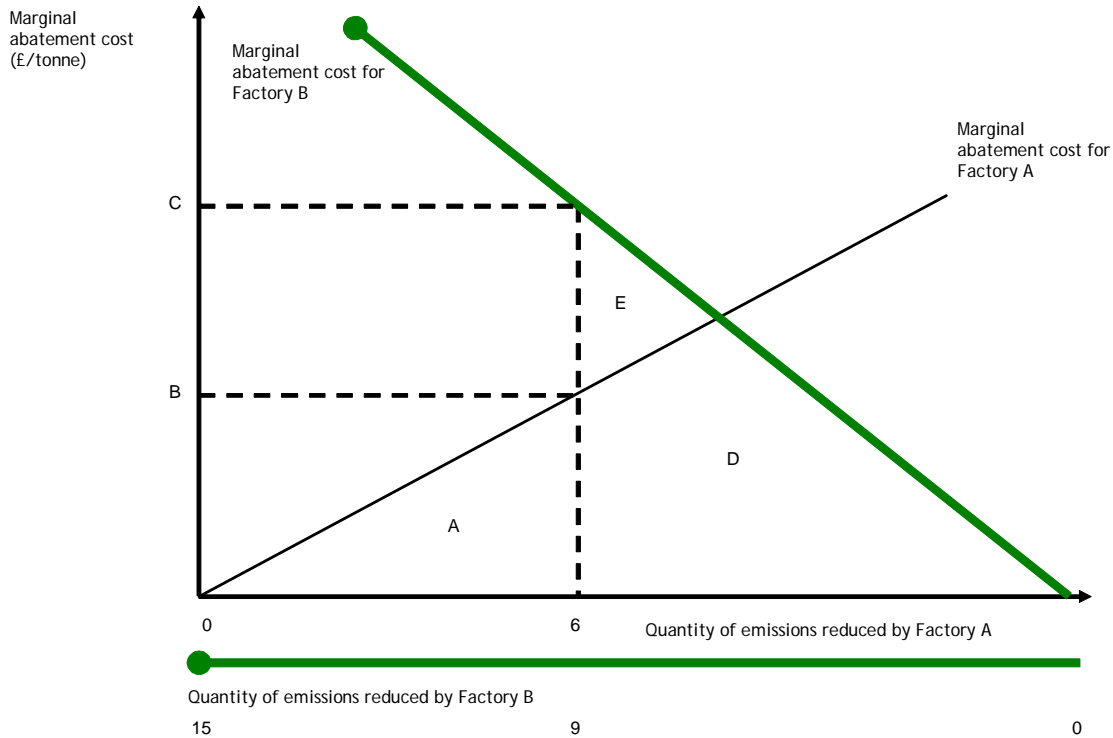
The key to understanding how emission trading can reduce pollution and provide factories with incentives to trade their permits and reduce pollution is the concept of marginal cost. Marginal cost is the extra cost of one more unit – in this case, the extra cost of reducing pollution by one unit (e.g. a tonne)

The diagrams below indicate how permit trading can be used



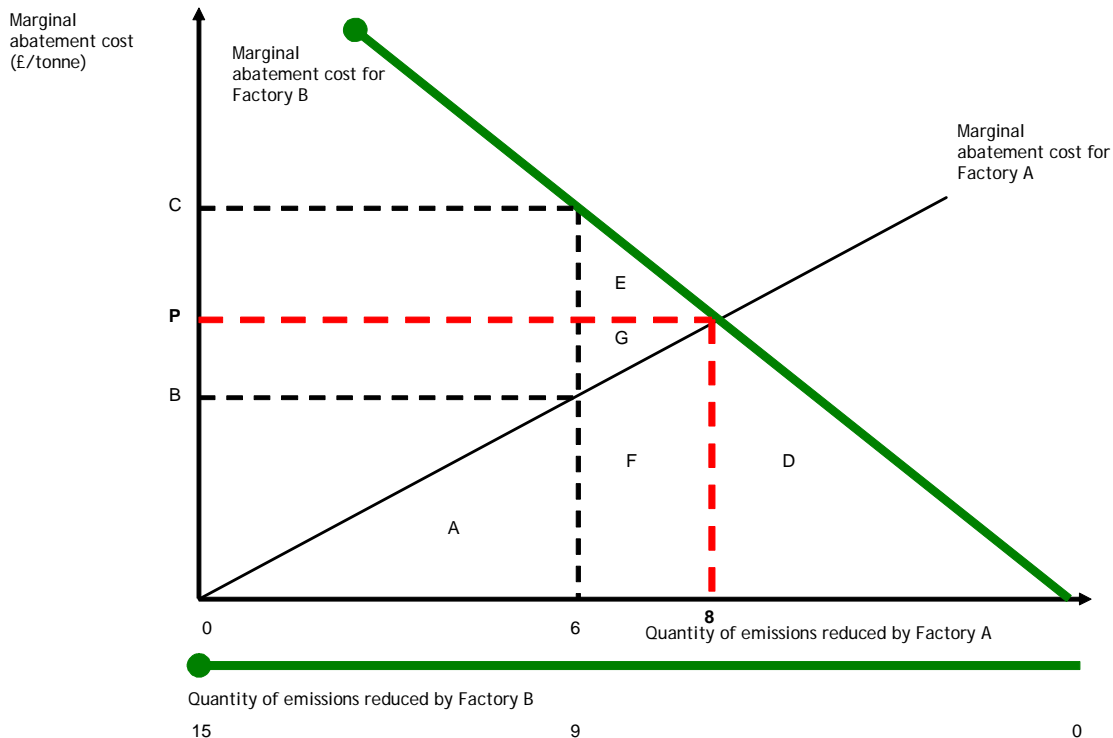
Factor A is allocated a fixed quantity of pollution permits. To keep pollution emissions less than its permit allocation, it must reduce emissions by six tonnes. This leads to a marginal cost equal to B, and a total cost equal to area A





Factory B is also allocated a quantity of permits. To keep emissions less than its permit allocation, it must reduce emissions by nine tonnes. This leads to a marginal cost equal to C, and a total cost equal to area D + E

When the total reduction of pollution emissions is the same from each x-axis (i.e. 15 tonnes), we find that the marginal cost of pollution abatement for Factory A is less than for Factor B  
 Factory A (A) < Factory B (E+D) .... It makes sense for both factories to trade their permits



Factor A can reduce an extra 2t of pollution at marginal cost F

It can sell this to Factory B for revenue  $> F$

Source 2 can buy these 2t and thereby avoid costs  $E + G$ . Both sources gain from the trade

The total cost of achieving a 15 unit reduction in pollution is  $A + F + D$

### **Kyoto**

Emission trading was a key feature of the Kyoto Protocol on climate change in 1997. Kyoto allows trading of permits for carbon dioxide between industrialised countries but the United States withdrew from the agreement in 2001 and since the USA represents 32% of emissions amongst developed countries with emission targets, the absence of the USA from an embryonic trading system will seriously reduce demand for permits and therefore drive down their price and effectiveness.

### **Pollution regulation**

Instead of relying on intervention in the market mechanism by using taxation, subsidies or pollution permits, the government and its appointed agencies can regulate the level of output and pollution in a market. In theory, the government could set a quota so that output is set at the social optimum. More frequently, minimum or environmental / emission standards are widespread in many industries. This requires regulatory bodies to monitor (inspect) and fine firms that do not meet the standards set for water and air quality. The 1989 Environmental Protection Act for example set standards on emissions for firms that carried out chemical processes, waste incineration and oil refining.

Compliance with environmental regulations can be very costly to enforce and it may be impossible to monitor all firms accurately because of imperfect information. Regulation also does not bring in any direct revenue flows that can be used to fund environmental improvement schemes or compensate those who have been negatively affected by pollution.