Environmental Studies
FACT SHEET
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Economics of Pollution Control

This Factsheet will consider

- how pollution control is imposed
- who pays for it
- the economic benefits

Pollution is any discharge of energy/material into the environment that has the potential to do harm. This can mean discharges into the atmosphere, water bodies or onto land. In the UK, pollution control and monitoring is undertaken by the Environment Agency.

How does economics deal with pollution?

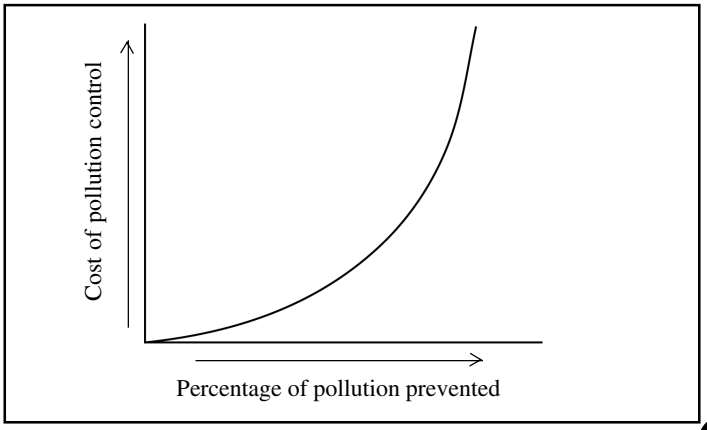
A company is only really interested in the difference between what it costs to make something and the price it can get for it. This is the profit. In Economics these are called *private* costs and revenue.

A company usually makes production decisions on the basis of how much extra it costs to make one more unit compared to the price gained for that unit. These are known as *marginal* costs and revenue. Any pollution emitted from the operation normally has no cost or benefit to the company, but obviously it is a cost to the environment and the people living in it. These are therefore known as *social* costs, or *externalities.* So the additional pollution from making one more unit is known as the *marginal social cost.*

If emitting pollution does not count towards a company's costs and revenue, there is little incentive for companies to control it. Governments therefore have to either impose regulations, with the threat of fines, or find other ways of converting social costs into private costs, though taxes, for example. In this way, the price of any good produced will include its environmental cost. The more expensive a good is, the less it should sell and so the less is made and pollution is reduced. That's the theory!

Government, however, cannot impose regulations that would mean the cost of making an additional item would exceed the price - otherwise the company would go out of business. The principle that is used in pollution control is known as BATNEEC - **Best Available Technology Not Entailing Excessive Cost**. Additionally, it is rare that 100% removal of pollutants is expected as costs of removal rise exponentially (Fig 1).

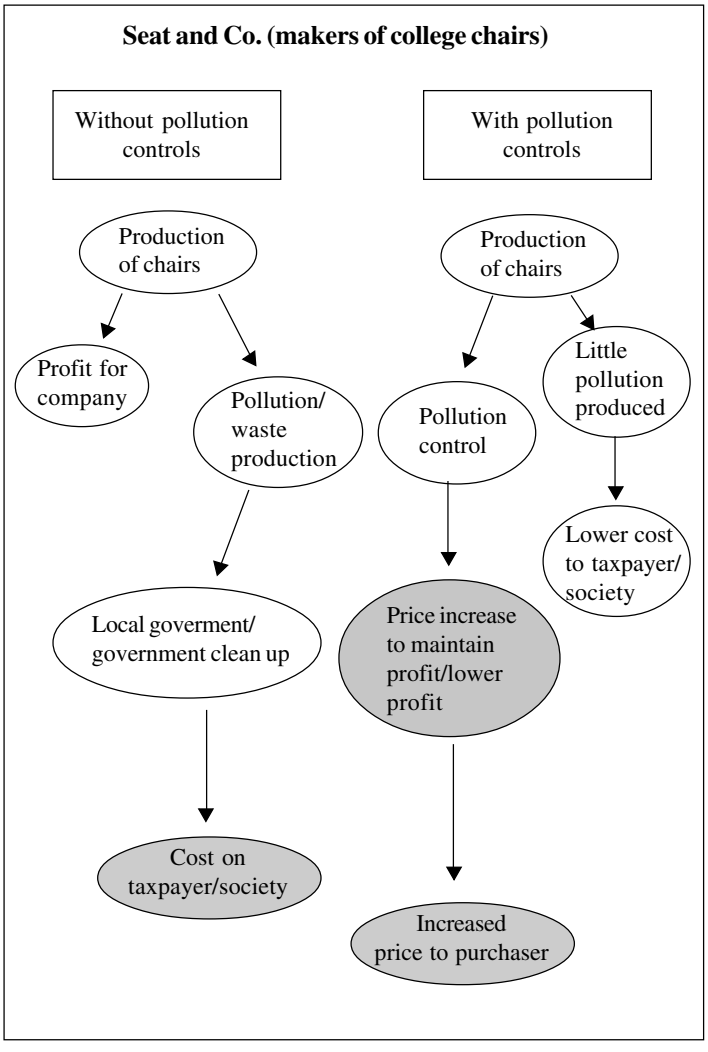
Fig 1. Cost of preventing pollution



Who Pays For the Pollution?

Fig 2 illustrates who would pay for the environmental damage. If there is no pollution control the costs fall to the taxpayer. If there is pollution control the costs are shared between the purchaser of the product because it is built into the price, and the producer who may make less profit.

Fig 2. Who pays for pollution?



The social cost of pollution

Society may pay for the environmental damage of pollution in two ways. Taxpayers may have to pay the costs of remediation, e.g. the cleaning up of a river, or they may incur non-monetary costs in terms of poorer health or a degraded environment. The non-monetary costs are less visible, but can still be converted into money values.

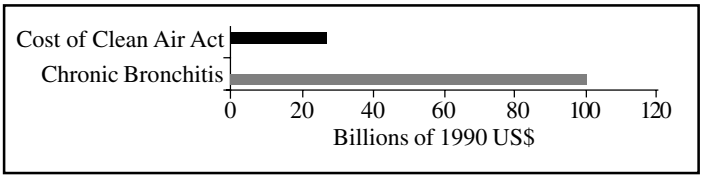
A recent study in the US attempted to assess the health gains from the Clean Air Act. Firstly, they expected assessed the reduction in numbers of cases up to 2010 as a result of the Clean Air Act (Table 1)

Table 1. Effect of Clean Air Act in the US

Health Endpoint	Pollutant	2010 Mean reduction in number of cases
Mortality Age 30+	PM et al	23,000
Chronic Illness Chronic bronchitis Chronic asthma	 PM Ozone	 20,000 7,200
Hospitalization Respirator admissions	PM, CO, NO_2, SO_2, Ozone	22,000
Cardiovascular admissions	PM, CO, NO_2, SO_2, Ozone	42,000
Asthma-related emergency room visits	PM, Ozone	4,800
Minor Illness Avoided respiratory illnesses and symptom-days, asthma attacks, work loss days, etc	PM, NO_2, SO_2, Ozone	Millions of cases/ incidence

The savings on chronic bronchitis cases up to 2010 was calculated in US dollars against the cost of enforcing the Clean Air Act. Poor air quality would have represented a cost on society of US$75 billion.

Fig 3. Cost of Clean Air Act makes economic sence



Ways in which firms pay for their pollution

There are 3 main ways in which the social costs of pollution can be included into a firm's private costs:

1. By imposing taxes
2. By selling permits
3. By imposing technical regulations

1. Emissions Taxes

Firms have to pay a fixed tax for each unit of pollution they emit into the environment. So, firms can choose their level of emissions, but will have to pay for it. This is often called the **'polluter pays'** principle. Because of this, polluters will have an incentive to find ways to reduce emissions and will be allowed to choose their own methods of pollution control. The advantage of this form of control over regulation (which prescribes a form of control) is that there is a constant search for better ways.

2. Transferable Emissions Permits

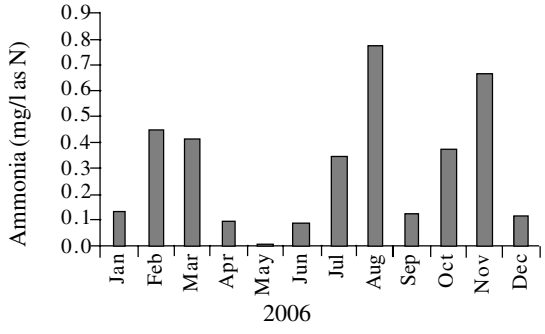
Used where the Government has already determined a target level of emissions and distributes permits to firms in the area that sum up to that level. Each firm would then turn in a permit each time it emitted a given unit of pollution. If a firm needs more permits it can buy them from firms that have successfully reduced their emissions and need less. These efficient firms can then earn more profit from the permits they sell. As with taxes, this provides an on-going incentive to reduce pollution. This system is currently being used to control effluent into Britain's rivers and coastal waters with an estimated 110,000 permits held (www.environment-agency.gov.uk)

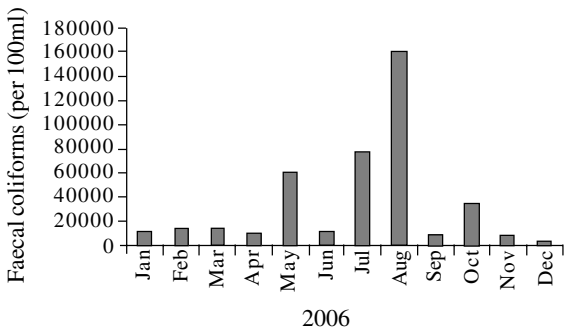
3. Technical regulations

Where there is an available and affordable technology, governments can insist that it is used. A good example here are **catalytic converters** on cars. Car manufacturers were obliged to fit all new cars with catalytic converters to reduce emissions of nitrous oxides, volatile organics compounds (VOCs) and carbon monoxide. This became a legal requirement in Europe in 1993. The benefit of this type of regulation is that it is efficient in reducing emissions across the industry and can be regulated easily. The disadvantage however, is that it reduces incentives to improve the technology. Car manufacturers are not encouraged to invest in research into better catalytic converters or alternatives.

Self Assessment Questions

1. Who is responsible for monitoring pollution in the UK?
2. Study the following graphs which shows levels of ammonia and Faecal Coliforms (untreated sewage)in Pigeonhouse Stream, Bristol

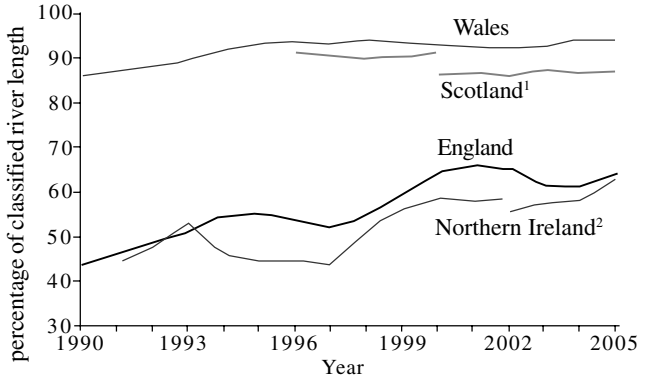




At which points in the year is water quality at its best and at which point in the year is it at its worst?

Self Assessment Questions

3. Why, in practice, is 100% removal of pollutants rarely attempted?
4. Why are producers often reluctant to invest in pollution control?
5. The graph below show the lengths of rivers in the UK classified as good quality between 1990 and 2005. Describe the changes.



[1] Scottish combined classification changed in 2000
[2] Northern Ireland classification network significantly expanded in 2002

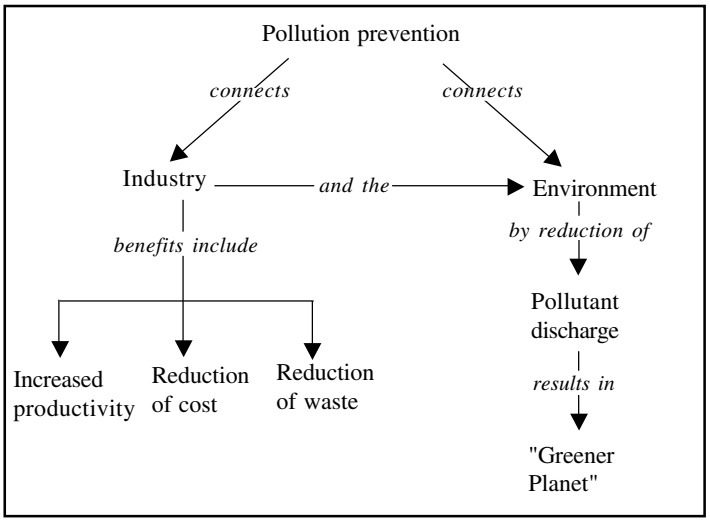
6. Why is it important to maintain clean rivers?

Economic benefits of pollution control

As well as the benefits of an improved environment, improved health and reduced costs on society, it has been shown that pollution control can be an economic benefit to companies and can result in increased profit.

Pollution is a form of wasted resources and so where companies have reduced their waste they have found that they can reduce costs and so increase profit (Fig 4).

Fig 4. Pollution and profit



So, potentially both the environment and the company can be 'winners'.

Self Assessment Question

Read the following article:

A recovering Cheshire river will take another step toward being brought back to life with thousands of fish given a new home over the next few months.
More than 1,000 fish - including barbel, chub and roach - died back in the summer of 2005 when a tributary of the River Dane in Middlewich was polluted with raw sewage.

Now the Environment Agency has begun work on restocking the river with fish to give nature a helping hand.

Two thousand roach have already been added, with a further 4,000 chub and dace this week and plans for more fish in 2007.

Fisheries officer Stephen Cartledge said: "River that have suffered serious pollution incidents can take years to recover if left to do so on their own.

"As this river is such a popular spot with anglers, we felt we needed to do something to help bring it back to life again so this is why we are working with Winsford Angling Club.

"Although we are putting fish into the river, it will still take time for the Dane to be back to how it was before the pollution incident because a lot of the fish that died were larger adults which we cannot replace."
(www.environment-agency.gov.uk/news/1512455)

7. What action can be taken against companies that pollute waterways?
8. What effect would raw sewage have upon an aquatic ecosystem?

Answers to self assessment questions

1. The Environment Agency (see www.environment-agency.gov.uk/ for further information)
2. Water quality is at its best between April and June and in December when both faecal coliform and ammonia are at their lowest. The worst time of year is in August when both are at their highest. (see www.bristol.gov.uk/ccm/content/Environment-Planning/Pollution/bristol-living-rivers—watercourses.en?page=6 for further information on Bristol's watercourses and pollution monitoring
3. Because costs of removing pollutants rises exponentially
4. Producers are reluctant because they see this as adding to their costs of production which may mean increasing prices and losing sales.
5. English rivers have become cleaner over the period, from 45% of their length being considered chemically clean in 1990, to about 65% in 2005. There was a reduction in quality in 2001 and a recovery up to 2005. Northern Irish rivers have seen similar improvement, though were marginally less clean that English rivers up to 2005. Welsh rivers have been the cleanest over the period and have shown further improvement from 87% being considered clean to 93%. Scottish rivers have been of a similar quality to Welsh watercourses, though data is less complete.
6. Rivers are habitats for diverse aquatic species and so pollution will cause habitat damage and loss of diversity. Rivers are sites for recreation and leisure and so can cause health problems. Rivers can be sources for domestic water supply and so would add to the costs of treatment.
7. They can take companies to court and impose fines. (In this case the company concerned was fined £35,000 and ordered to pay costs of £6,883)
8. Raw sewage can cause eutrophication. Ammonia acts as a fertilizer and encourages the growth of algae. Algae have a short life cycle and so this also increases the amount of decomposing organic matter. Decomposing bacteria remove oxygen fro the water, which causes other aquatic organisms to die, thus increasing the oxygen demand by decomposers. Oxygen levels continue to decrease causing more organisms to die.

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