**ENVIRONMENTAL ECONOMICS**

**Public Goods, Property Rights and the Tragedy of the Commons**

So far we have used the theory of ‘externalities’ to try and explain the problem free markets cause in contributing to climate change through free markets over producing (and consuming) CO2 omitting energy whilst at the same time under producing (and therefore consuming) renewable energies (which do not omit CO2). What follows are a series of other economic theories for you to learn to help explain why the environment we live in may be under threat.

**‘Goods’ and ‘Bads’**

A ‘good’ in economics is a resource or finished product that is consumed/sold/traded. Consumers are prepared to pay a price to gain the benefits of a good such as a TV set. Equally they are prepared to avoid consuming a ‘bad’. ‘Bad’s’ in Economics refer to things such as household rubbish disposal or the effects of factory emissions on the health of society or CO2 production to provide us with energy.

**Introduction to Property Rights and ‘Private Goods’**

Property rights determine how a private good is owned or used. Resources can be owned by individuals (economic agents). Therefore if someone has the right to ‘property’ then they have….

* the right to use the private good
* the right to earn income from the private good
* the right to transfer the private good to others
* the right to enforce property rights and claim what is theirs

Therefore property rights are usually considered to be the ownership of a private ‘good’. This is a good that has the following characteristics:

* ‘Rival’ (i.e. my consumption restricts your consumption)
* ‘Excludable’ (i.e. I can prevent you from having claims to my property – through physical barriers or legal means?)

Many economists argue that property rights of private goods need to be fixed (often in Law). Therefore, property rights must be:

* Defined (who owns what)
* Their use must be monitored
* Possession of rights must be enforced

The costs of doing this are called ‘transaction costs’. Depending on the level of transaction costs, various forms of property rights institutions will develop:

1. **Open access property –** is not ‘owned’ by anyone and is ‘non-excludable’ (no one can exclude anyone else from using it) but the property MAY be rival (one individuals use of it reduces the quantity available to others). Open access property is not owned by anyone and access is not controlled. Examples might include the upper atmosphere, ocean fisheries, grazing land for livestock etc. Sometimes it is called ‘Common Property’ or ‘Common Land’ if talking about ‘Land’ as a result. In the UK, there are areas of ‘Common Land’ which are not owned by anyone. Property developers cannot build on this land…. EXAMPLE? Other examples might be potential oil under the Arctic? No one traditionally owns the Arctic (although several countries are trying to claim it as their own!).
2. **Common Property –** Property that is owned by a collection or group of individuals/economic agents. Access and use are controlled by these joint owners. Often this institution breaks down due to conflicting interests or wants on how to use the property. However it is still possible for it to be excludable and rival and it is easier to manage than ‘Open access property’ as exclusion and management can be orchestrated by the owners despite possible conflicts. ‘Open access property’ has NO owners and therefore its control is very hard.
3. **Public property –** is ‘owned’ by the state or community and is therefore still excludable and rival. Please note public property is NOT classified as a ‘Public Good’. Public Goods are economic terminology to describe a form of market failure; something we discuss below. Examples of Public Property might be the National Parks of the UK like the Lake District or a state owned enterprise like the National Grid (electricity distribution).
4. **Private Property –** is both excludable and rival. It’s access, use, exclusion and management are control by the private owner. Examples include most private goods around us – land, houses, fruit, smart phones, TV’s etc etc etc.

**Introduction to ‘Public Goods’ and ‘Quasi-Public Goods’ as a Market Failure**

In distinguishing between private and public goods, it is useful to introduce two characteristics of these goods: exclusion ability and rivalry in consumption. Exclusion ability is a characteristic whereby a person can be prevented from using that good. Obviously, private goods have this quality. If you buy food at the supermarket, then it is yours to eat. You can exclude everyone else from eating it through physical strength or the backing of the law of the land. Rivalry in consumption is a quality where the use of the good diminishes the supply for others. If you chop down a tree on public land to supply your fireplace, then that is one less tree for everyone else. A private good is both excludable and rival in consumption, a public good is neither.

**PLEASE BE AWARE: Private goods are not purely defined as ‘private property’ (see above). They also include goods under common and public property (not ‘open-access’ though).**

Some ‘goods’ are free, either because they occur naturally (and are arguably plentiful - such as sand on beaches and well stocked fish supplies in the ocean), or because they have to be provided by the government (such as military protection or streetlights because the market would not provide them as consumers would ‘free ride’ – there would be a missing market). From an economic standpoint, there is a problem in analysing these free goods, which are often referred to as public goods, since they are freely available to all and consumers will ‘free ride’ on their consumption. This will lead to the natural public ‘goods’ being abused (tragedy of the commons – see below) and man-made public goods not being provided by the free market (and so having to be provided by Government intervention).

Pure public goods are considered to be both non excludable and non-rival. An example might be streetlighting for example. Another example is a countries nuclear deterrent through Trident in the UK. If it was provided by a private firm, the firm would find it very hard to exclude people in the UK from the benefits enjoyed from preventing other countries from dropping nuclear bombs on us. Equally, my ‘consumption’ of not being obliterated does not affect your chances (or benefit)….!

Non-excludability leads to ‘public goods’ being free (or valued at 0) not because they are not in demand but because consumers will free ride (i.e. be able to not pay for the good but still benefit). Therefore firms are unable to charge a price. Equally, non-rivalry suggests the good is ‘unlimited’ as my consumption does not affect yours and so there is no sense of scarcity and an unlimited supply will mean the good is a ‘free good’.

Some resources are another type of good called a ‘quasi-public good’ which may have one of the two characteristics. ‘Quasi public goods’ for example could be rival in consumption because their consumption reduces the supply for others, but they are not excludable – a real life example might be fish in the ocean. Anyone can fish in the ocean and it is very hard to stop individuals doing just that (so non-excludable) but over time my catch of fish might well mean you are unable to fish as I have taken the stock in the ocean (so a rival good).

Equally, a ‘Quasi-public good’ could be excludable but is not rival in consumption, such as the products of a natural monopoly like Microsoft. For instance, Microsoft can supply Windows and Microsoft Office for the entire market in abundance. To produce an extra copy of Microsoft office will have a very low ‘marginal cost’ (so arguably it is non-rival as my consumption of Microsoft Office does not affect yours – in some respects it is not a scarce resource!). Yet Microsoft have the right to exclude its use by ensuring that you need specific codes for it to work on your machine.

Another good example of a quasi public good is a road. Once provided, roads are non-excludable and non-rival up to a point. Your car on the road does not necessarily affect my car being on the road and it can be very costly to exclude certain cars from using that road for the firm. On the other hand, my use of a car on the road may affect your car if after a certain point there is a traffic jam! Also, private firms have levied tolls on certain roads to make them excludable. Another example is the maintenance and preservation of areas of natural beauty could be considered to be a quasi-public good. A national park is non-excludable and non-rival to some extent in that my use of the park probably wouldn’t affect yours. Equally it would be very hard for a private provider to charge a price and exclude people unless they built a giant fence and hired people at ticket booths. However it is ‘quasi’ because this could happen in reality; Jurassic Park anyone!? Also the idea that your consumption does not affect mine is put to the test if the nation decides to descend on the Lakes for their summer holidays. Think gridlocked roads, overcrowded campsites, restaurants etc.

**Why is there a market failure because of ‘Public Goods’**

These different qualities of goods are broad general descriptions, not bright line distinctions. But the pure public good and the quasi public good lead to market failure and allocative inefficiency:

1. Pure man-made public goods create ‘missing markets’ and are considered a big market failure. Despite consumers wanting the good, no one wants to pay for it once it is provided as they are able to ‘free ride’ because of the characteristics of the good (non-excludable and non rival). Therefore firms know they will not make any profit and ultimately there will be NO PRODUCTION of the good (even though it is demanded by consumers)
2. Equally, natural pure or quasi-public goods (the sea, the air) would lack property rights and therefore this would lead to negative externalities in both production and consumption. See the ‘Tragedy of the Commons’ below.
3. Man-made quasi-public goods may not be able to be provided as much because there will still be some free riders and therefore firms will not be able to make as much profit. In this instance we can say that the good is ‘underprovided’.

**Property Rights and the Environment: The Tragedy of the Commons**

**The Tragedy of the Commons**

Most common resources are public goods because they are not excludable (you cannot prevent agents from accessing them – e.g. the Sea). However over time, the characteristics of these ‘goods’ may change and there maybe elements of rivalry in consumption, because the use of this good diminishes the value (quality) or lessens the quantity available to others. This is best illustrated by the parable of the Tragedy of the Commons. In medieval times, people raised sheep and allowed them to graze on common land that was freely available to everyone. When the population was small, the land could replenish itself on its own and therefore you could argue the land was ‘non-rival’ (one shepherds’ sheep’s consumption of the grazing area did not effect another). However, as the population grew, they needed more sheep, so eventually, the land was being grazed so much, that it could not replenish itself. Eventually, there was not enough common land to support the number of sheep and the ‘good’ (grazing land for sheep) became rival. However it was still non-excludable and so negative externalities started to develop. The problem was a lack of property rights.

The reason why this occurs is clear – people will not protect what is not their own. Because anyone can use the land for grazing and there are not clearly defined property rights to the land, no one has any incentive to regrow the grass, to protect it, or to limit the number of sheep grazing on it. Eventually, the government started to allow people to enclose a specific amount of land which they could claim as their own. So it became their duty to maintain their own land and they could exclude the use of their land by anyone else, a process that began in England during the 17th century.

The tragedy of the commons not only applies to land but also applies to many wild animals, such as elephants, which are often killed for their valuable ivory. However, the most important tragedy of the commons today is the harvesting of fish using huge nets pulled behind factory ships, where the fish are processed immediately after they're caught. Because the ships can catch a huge amount of fish, the fishing stock is being rapidly depleted to the point where they will be unable to repopulate under continued fishing pressure.

Governments have responded to this tragedy through ‘command and control’ or ‘direct control’ policies by restricting the size of the fish that can be caught, by regulating the size of the holes in the fishing nets, establishing quotas that can limit the number of fish that can be caught, limiting the days that a vessel can fish, restricting fishing to specific seasons, and protecting the breeding grounds of threatened fish. Some governments, such as New Zealand, have incorporated some market mechanisms into their interventions by allowing quota shares to be bought or sold, and quotas for halibut can be traded in the United States and Canada. In 1992, Canada banned cod fishing off the coasts of Newfoundland and Labrador to replenish the stock. However, no government controls the open oceans, making it difficult to establish a global policy.

In summary, the government uses several methods to provide public goods or to prevent the tragedy of the commons, such as granting property rights, so that people have an incentive to protect the value of the property; it can organize a system that uses market forces, such as the creation and trading of pollution permits or fishing quotas. The government can also actually pay for the public good, such as the military, which consumes the largest part of the United States budget.

**The Importance of clearly-defined Property Rights and Coase’s Theorem**

Implicit or explicit property rights can be created by regulating the environment, either through prescriptive command and control approaches (e.g. issuing legal controls over what and what cannot be produced by the Government) or by market-based instruments (e.g. tradable permits).

**The Distributional Problems with Taxation and making the Polluter Pay**

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| Essentially the point here is that it is not as simple to tax a polluter as it is hard to know to what extent the ‘Polluter’ is causing the most damage. To see this, imagine a scenario where there is a river. On this river lies a Chemical factory which releases harmful chemicals into the river. Downstream is a town (10000 people) where there are residents who use the river to wash, drink, fish, play etc. A classic negative externality scenario! If the Government intervened to tax, the problem would be that although the chemical factory was now paying for the ‘external cost’ to society, these residents would still need to pay to clean up the water. Only if the chemical company pays the residents downstream directly will the market be efficient. This could happen where the chemical factory directly compensates say a water company in the town?  | http://www.google.co.uk/url?sa=i&source=images&cd=&ved=0CAUQjBw&url=http%3A%2F%2Ffigures.boundless.com%2F20062%2Ffull%2Fower-plant-datteln-2-crop1.png&ei=wECQVOvvAsq9UaXpgdAO&psig=AFQjCNFcokGa-xxKKgpKfHXSIDMPY7CZBA&ust=1418826304124030 |
| In this example it might seem clear that the chemical company should compensate the firm and the local residents downstream. However it is not that simple! Imagine now that this chemical company that is polluting the river actually makes an anti-malarial drug for countries in Sub-Saharan Africa (Zambia etc.). Before the tax was imposed, the drugs were cheap and people in Zambia etc. could afford to buy them. Now, with the increased prices due to having to pay compensation to those downstream, the Chemical firm has been forced to raise its prices. Suddenly Sub-Saharan Africa can no longer afford the drugs and 500,000 people contract malaria (most of them are expected to have died within a few months). Should it be the customer of the polluting company paying through higher prices for its product (i.e. the Zambian) or should it be the individual residents downstream which pay the company to stop polluting. Which activity has the greatest reward for society? Clean water or malaria drugs? Therefore there is not necessarily a simple solution to the question of ‘whom should compensate whom’. The chemical company might turn around and refuse to pay the tax on ethical grounds and argue for their “right” to pollute the river.**Whom should compensate whom? Why the absence of property rights can lead to a market failure.**Who should pay whom is a question about who owns the property rights. As we have seen, property rights can be legal laws issued by the Government which everyone has to abide by. Externalities and therefore market failure often arise because of this lack of property rights- nobody owns the atmosphere or the oceans for example currently which is why we may have climate change problems? Does a chemical company own the right to pollute? If it does, then those who suffer will need to pay the company to reduce the production if they want the pollution reduced. If the rights to pollute are owned by those who suffer the pollution, then the chemical company will have to buy the right to pollute the rivers. If they both have rights, then whoever values the pollution more will need to pay.In the example above, without Government intervention, the Chemical firm pollutes the river (because no one is stopping them). Yet the local residents do not necessarily (in free market land) currently have the right to healthy water unless the Government intervenes.**Extending Property Rights: Government Intervention and Coases’ Theorem**In 1960, a famous economist, Ronald Coase invented the so-called ‘Coases’ Theorem’ which clearly defined and assigned property rights to public and quasi public goods which would resolve environmental problems by internalizing externalities and therefore relying on incentives of private owners to conserve their own ‘properties’ and resources for the future. The law may also allow adjacent property holders to seek compensation when individual actions diminish the air and water quality for adjacent landowners if they all have clearly defined property rights. In otherwords, an alternative to direct control from the Government such as regulation is for the Government to extend property rights for individuals on public goods and eliminate the market failure by bringing it into the framework of the market. General examples might include being given the rights to workers to sue for compensation if they have suffered injury at work or for local residents to claim compensation if pollution levels exceed a set level. In the example above, the Government would give the local residents the right to have clean water. By extending the property rights for the residents, both parties could now legitamitely claim that their rights should be taken into account and they would enter into negotiations to determine who should pay compensation to whom. As long as these transaction costs (i.e. the costs of negotiating a settlement) were low (a big assumption!), two conflicting parties would work it out between themselves to reach an optimal position dependent on who valued the economic resource more without the need to visit a court of law. Either the residents would pay the chemical company to stop pollution or the chemical company would pay compensation to the local residents. It may seem strange that a someone ‘suffering’ from pollution would have to pay to stop that pollution but this may be perfectly rational if the value or benefit to society (in this case global society) of continued pollution is greater (because of the good it is doing in Zambia) than the effect on just one group of people (in this case the local residents). Then it would fall on the local residents to pay the chemical company to not pollute the river. Critics of this view argue in reality, the likelihood of ‘transaction costs’ being low is perhaps unrealistic. For example the exact cost and value to each party of the resource might be hard to value. Also if there are lots of possible claimants on one side (say the local residents), it might be expensive to get all of their specific values of the ‘good’ recorded. Residents might also overstate the externalities they are suffering from to get more compensation. If an agreement was therefore not met, the water company and local residents would have to goto a court of law to determine who should compensate who and so Coase’s Theorem would not work. |