HS 232

Lecture 5 10th Jan 2025

Externalities and Climate Change

Recap

- **Fundamental Knowledge about Climate Change**
- Understanding the causes, impacts, and solutions related to climate change.
- **From Climate Denial to Climate Skepticism to Climate Acceptance**
- Transition from outright denial of climate change to skepticism about its causes and impacts, and eventual widespread acceptance of scientific evidence.
- **Greenhouse Gas Effect and Global Warming**
- Role of greenhouse gases (e.g., CO_2, CH_4) in trapping heat in the Earth's atmosphere, leading to a rise in global temperatures.
- **The IPCC (Intergovernmental Panel on Climate Change): 1990–2022**
- Evolution of IPCC reports documenting the science, impacts, and mitigation strategies for climate change over the years.
- **The Present Situation and the 1.5-Degree Target**
- Current global climate scenario, with a focus on limiting temperature rise to 1.5°C above pre-industrial levels to mitigate severe impacts.

What is externality ?

- Consumption, production, and investment decisions of individuals, households, and firms often affect people not directly involved in the transactions.
- Sometimes these indirect effects are tiny.
- But when they are large, they can become problematic—what economists call externalities.
- Externalities can be both positive and negative

Externality

- Externalities are defined as the spillover effects of the consumption or production of a good that is not reflected in the price of the good.
- Eg: Production of steel results in pollution being released into the air, but the cost of the pollution to the environment is not reflected in the price of steel.
- As a result, there are differences between private returns or costs and the returns or costs to society as a whole.

What are the costs and benefits?

Private Cost (marginal private cost)

- The private cost is the price of an activity to an individual consumer or firm.

Social Cost (marginal social cost)

- The social cost is the total cost of an activity not just to the firm but the rest of society as well.

Private Benefit (marginal private benefit)

- The private benefit is the benefit received by an individual or a firm by consuming and producing a good respectively.

Social Benefit (marginal social benefit)

- The social benefit is the total benefit to society from an economic activity.

Marginal cost?

- **Marginal Cost** refers to the additional cost incurred by producing one more unit of a good or service. It helps businesses decide how much to produce by comparing the cost of production with potential revenue. Marginal cost is a critical concept in economics and is represented mathematically as:

$$\text{Marginal Cost (MC)} = \frac{\Delta \text{Total Cost}}{\Delta \text{Quantity}}$$

- ΔTotal Cost: Change in total production cost.
- ΔQuantity: Change in quantity produced.

- For example, if producing 100 units costs $1,000 and producing 101 units costs $1,010, the marginal cost of the 101st unit is:

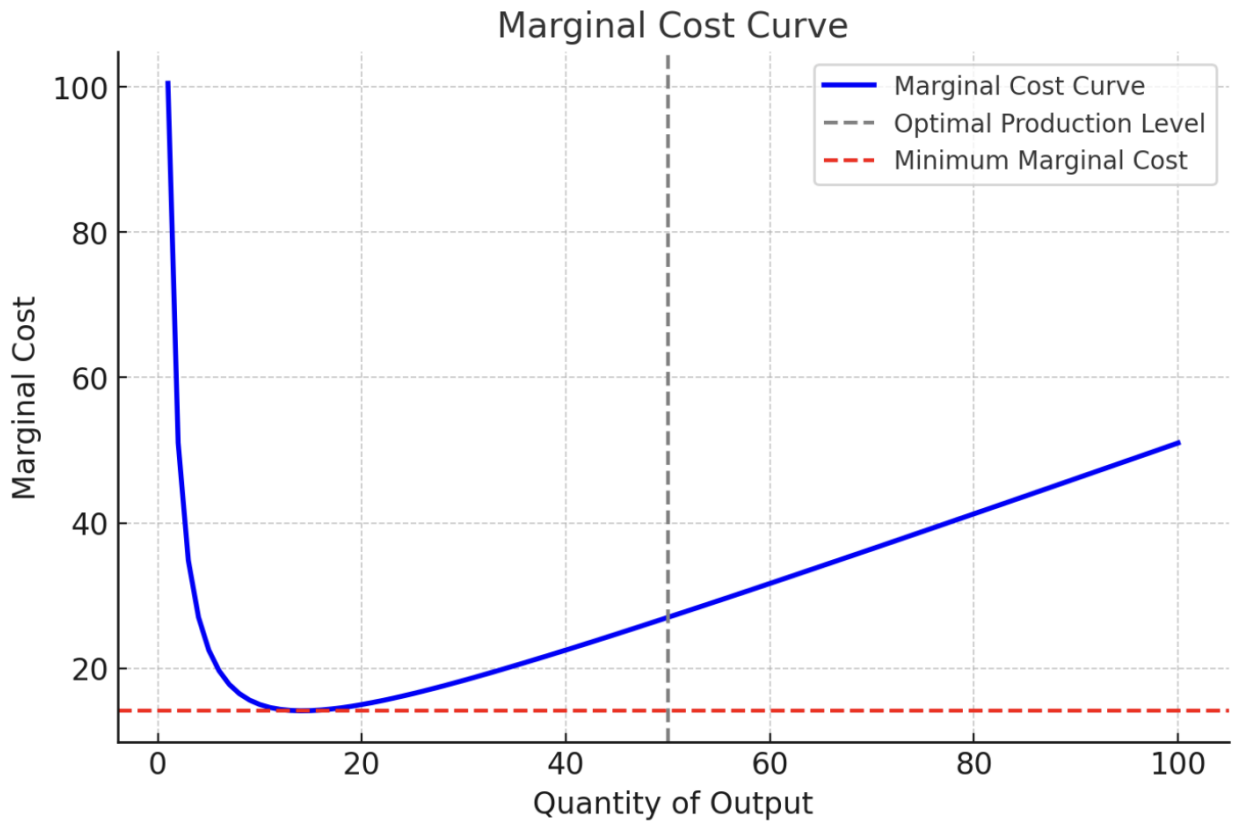
$$MC = \frac{1010 - 1000}{101 - 100} = \$10$$

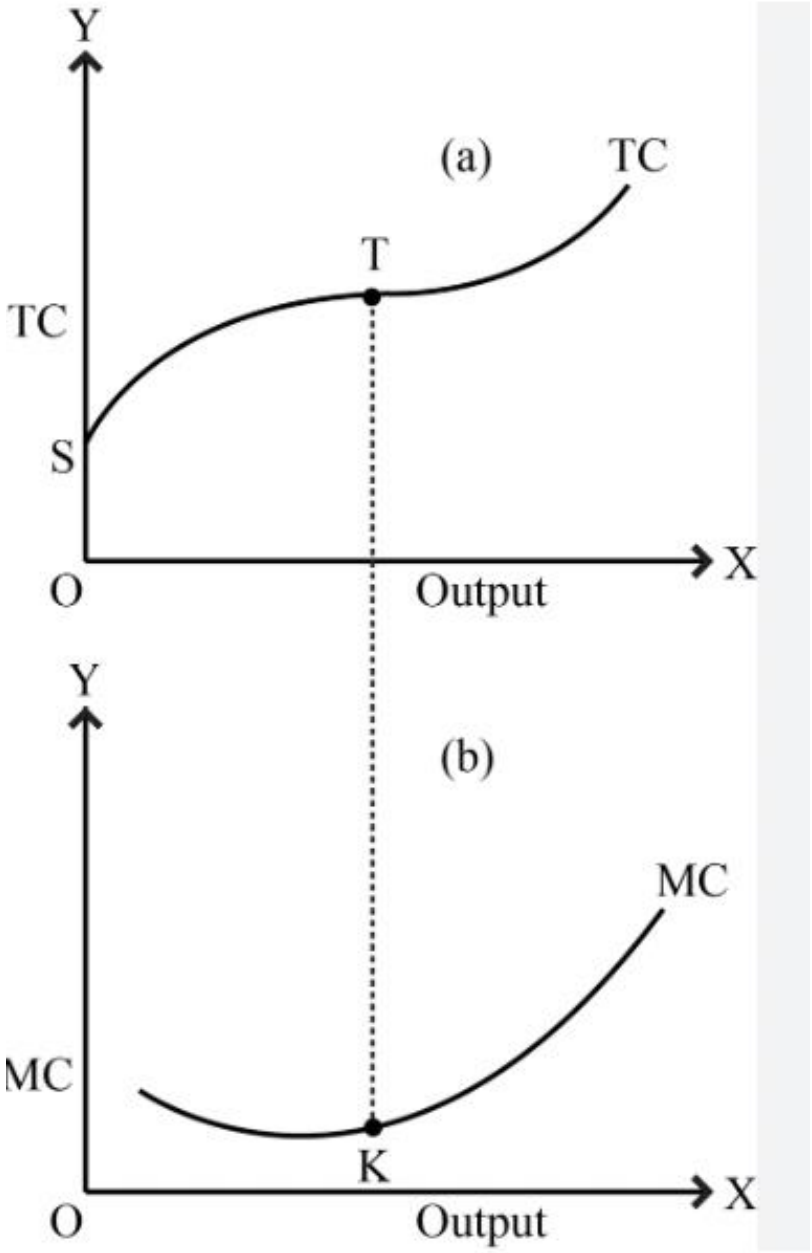
Key Points

- **Variable Costs**: Marginal cost usually depends on variable costs (e.g., labor, raw materials), as fixed costs (e.g., rent, equipment) remain constant regardless of output.
- **U-Shaped Curve**: Typically, the marginal cost curve is U-shaped. It decreases initially due to *economies of scale* and then increases as production faces constraints like capacity limits or inefficiencies.

Marginal Cost Curve

Here is the marginal cost curve, which typically shows a U-shaped pattern. Initially, marginal costs decrease due to efficiencies in production, but as production scales up, they increase due to diminishing returns. The optimal production level often lies near the bottom of the curve, where costs are minimized





Total cost and Marginal cost

MC and TC increase: When MC is rising, TC increases at an increasing rate.

MC and TC decrease: When MC is falling, TC increases at a diminishing rate.

MC and TC are constant: When MC is constant, TC increases at a constant rate.

MC and TC at minimum: When the rate of increase of TC stops diminishing, MC is at its minimum point.

Marginal Revenue

- Marginal Revenue (MR) refers to the additional revenue generated from the sale of one more unit of a good or service.

Formula for Marginal Revenue:

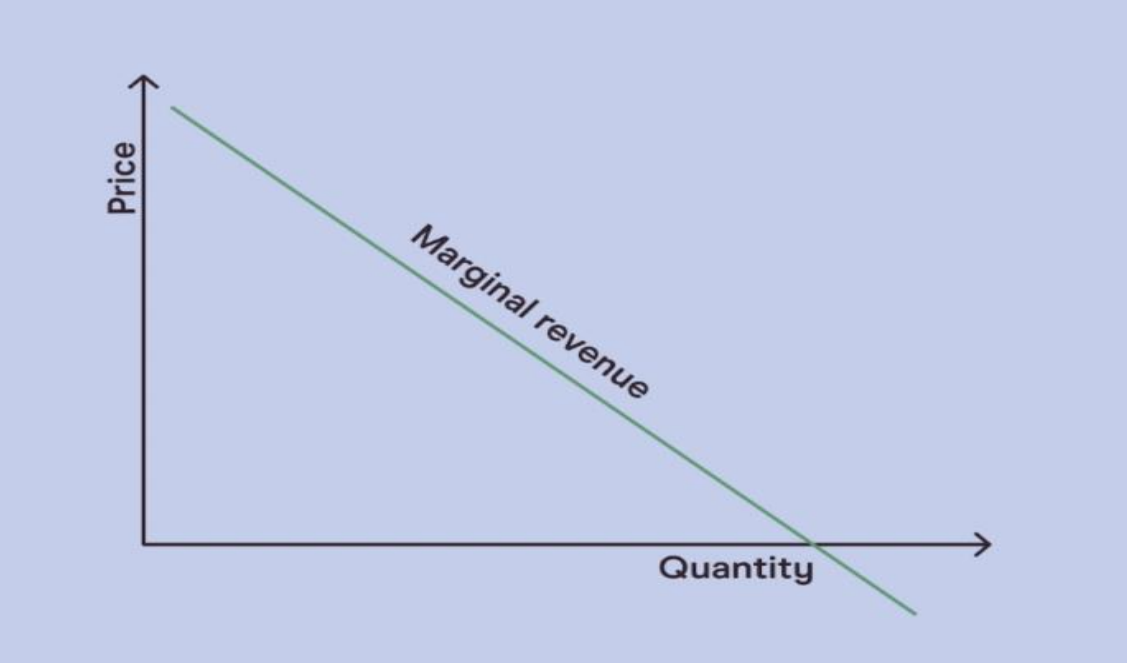
$$MR = \frac{\Delta TR}{\Delta Q}$$

Where:

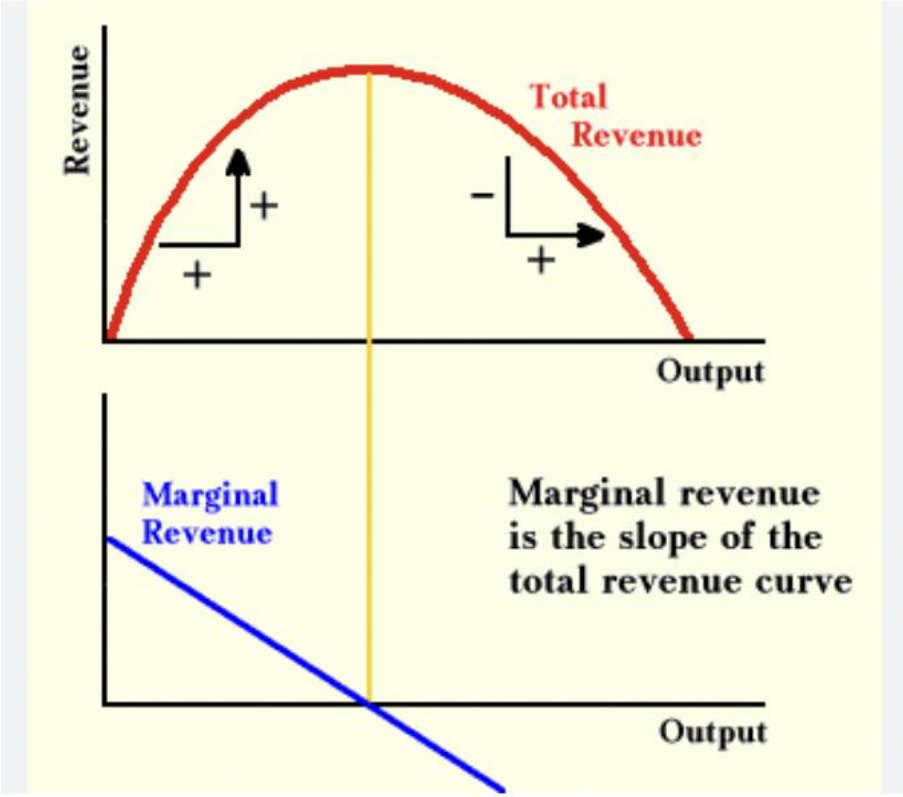
- MR is the marginal revenue,
- ΔTR is the change in total revenue,
- ΔQ is the change in quantity.

MR curve

- The marginal revenue curve is downward sloping and below the demand curve and the additional gain from increasing the quantity sold is lower than the chosen market price (there is often an economically inverse relationship between price and quantity)

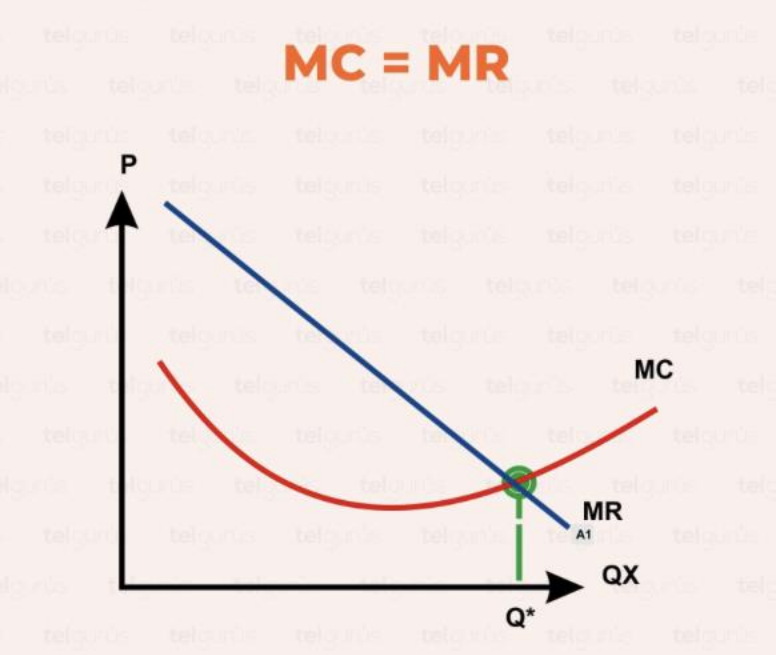


Total Revenue and Marginal Revenue



When MR is 0 firms should stop producing – break even point
Total Revenue = Total Cost

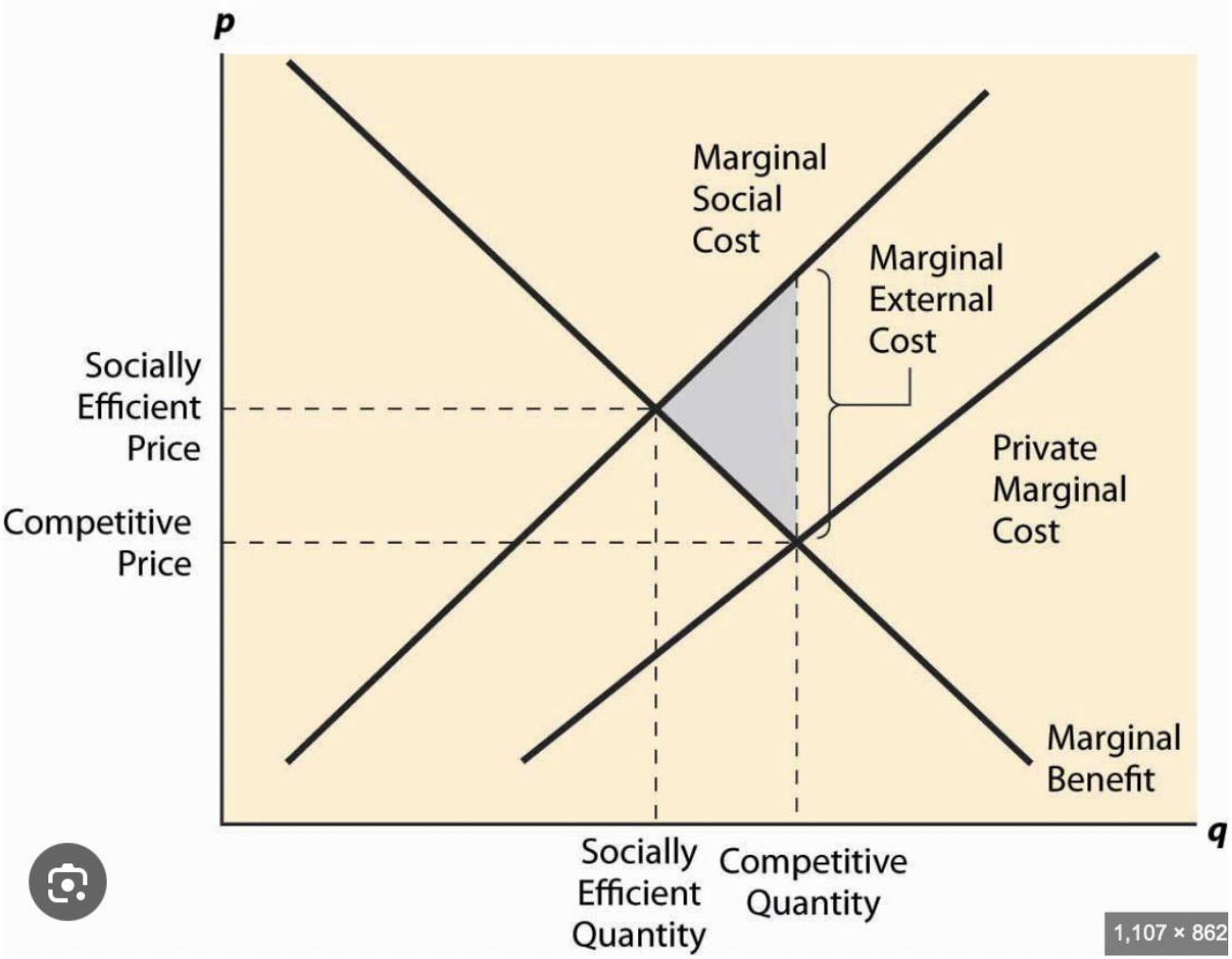
The point of equilibrium



The conditions for a firm to be in equilibrium are:

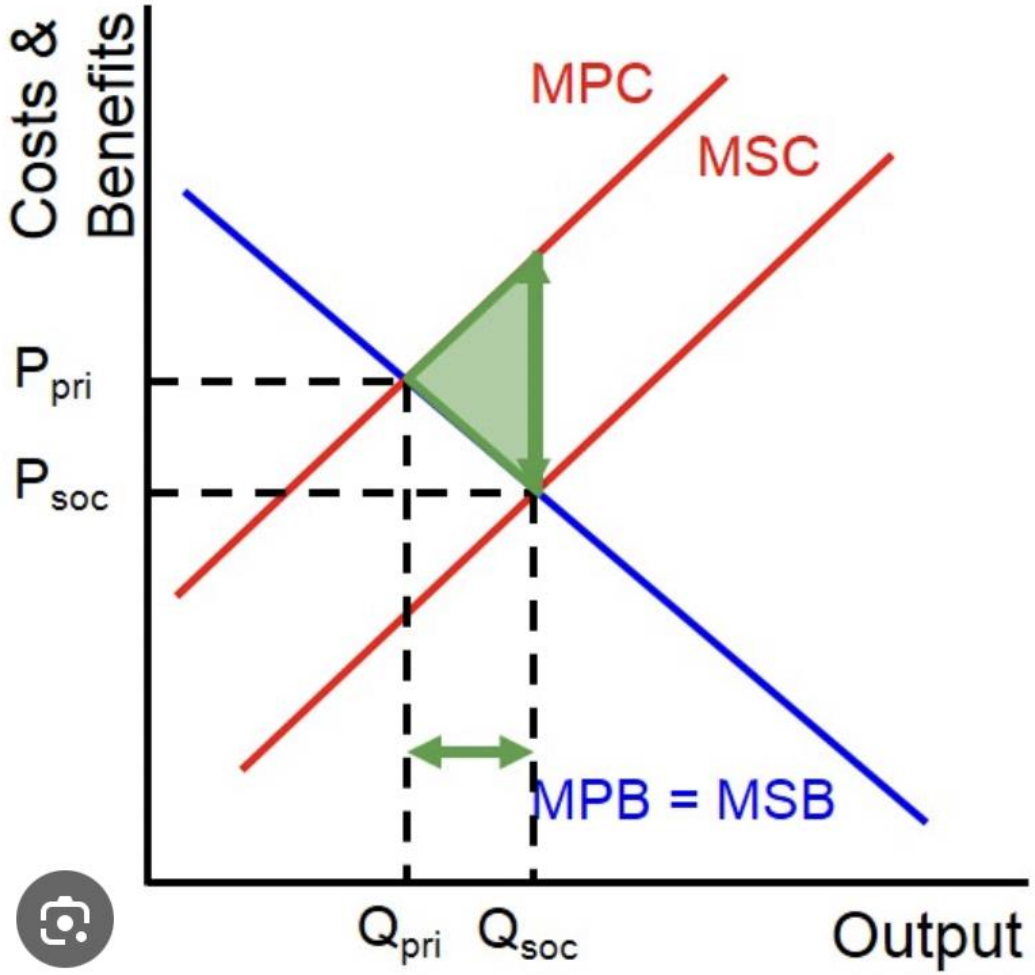
- **Marginal cost (MC) equals marginal revenue (MR)**
- **MC curve cuts the MR curve from below**
- **MC is rising at the point of equilibrium**

Externality (Negative)



PMC < SMC
PMB> SMB

Externality (Positive)



PMC > SMC
PMB < SMB

Climate change – an environmental externality

- Global pollution creates global bad – borne by all – a negative externality
- No mechanism to internalize CO2 emission
- Further CC is a public good issue too
  - a **public good** is a good that is both non – excludable and non - rivalrous in that individuals cannot be effectively excluded from use and where use by one individual does not reduce availability to others.