

Economics of Environment

Positive Economics	What is / was / will be	(description)
Normative Economics	What ought to be	(optimization)

Environment treated as an asset:

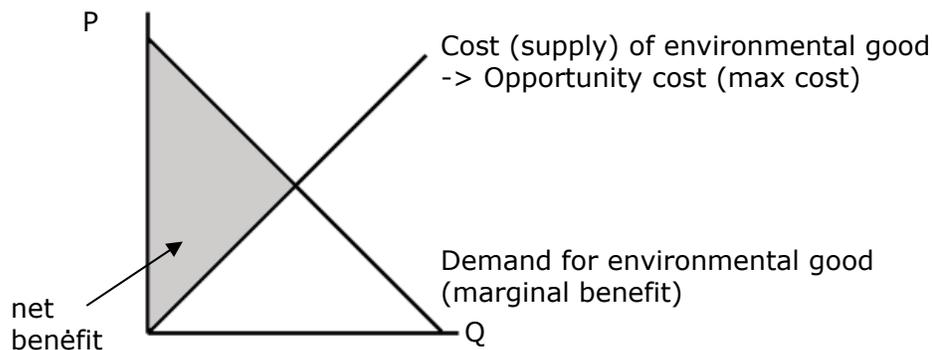
- inputs of raw materials & energy
- source of benefits & amenities
- sink for wastes

1. Efficient Use of Environmental Resources

How much of an environmental asset should be used? (normative)

Criterion 1: static efficiency: MAX net social benefit from utilization

- like efficient production decision



Net benefit = willingness to pay (utility) – social cost

Maximum net benefit = Pareto optimal decision

$$\begin{array}{ccc} \downarrow & & \downarrow \\ \text{Marginal Benefit} & = & \text{Marginal Cost} \end{array}$$

Criterion 2: dynamic efficiency

- takes account of changes over time (timing of B + C)
- present value

$$PV(B_n) = \frac{B_n}{(1+r)^n} \quad r = \text{discount rate}$$

Dynamic efficiency: max PV of net benefits over time

→ implies PV(marginal net benefit from last unit in each period) equal

Positive discount rate → 1 unit of benefit is more valuable today than tomorrow

Scarcity

Constraints on "depletable" supply -> present consumption affects future consumption (not necessarily "non-renewable")

"marginal user cost" = PV(forgone opportunities at the margin)

Fossil fuel example: market must consider extraction & MU costs

Sustainability

"What level of fossil fuel consumption is sustainable?"

Sustainability criterion (Rawls): future generations should be left no worse off than present

How can this be if dynamic efficiency allocation → more consumption now?

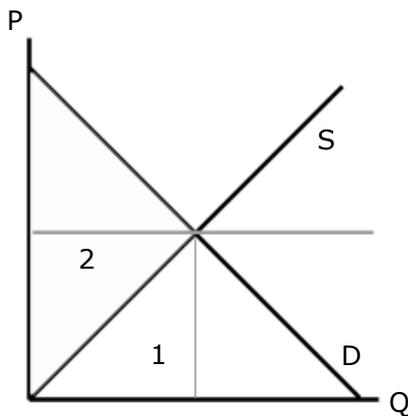
→ Need to transfer (save) some present benefit for future. How? Invest.

Property Rights

For market mech. to achieve efficient outcome (allocation), need property rights structure that conveys:

1. universality (all resources privately owned)
2. exclusivity (all B + C accrue to owner only)
3. transferability
4. enforceability (secure from seizure/encroachment)

Self interest → max surplus → efficient allocation



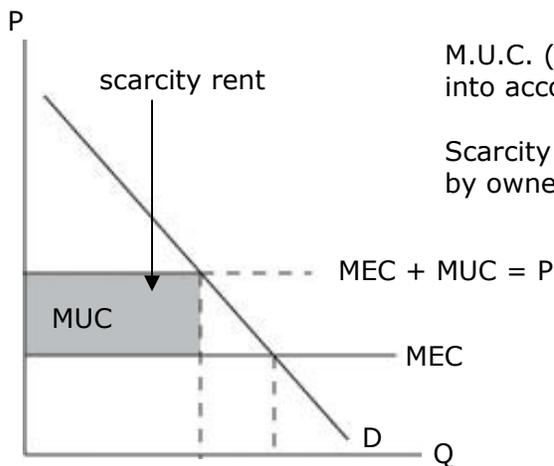
1 = variable cost
2 = producer surplus
Revenue = $P \times Q = R$
Profit = $R - TC = R - 1 - \text{fixed cost} = 2 - \text{f.c.}$

Short run: prod. surplus = 2 = profit + f.c.
Long run: no f.c. (all costs variable), so prod. surplus = profit

Perfectly competitive, no scarcity: L.R. profit = L.R. producer surplus = 0
With scarcity, ownership: L.R. prod. surplus = profit + scarcity rent $\neq 0$

Scarcity rent arises from:

1. Nature of resource (land)
2. Marginal user cost in depletable resources



M.U.C. (due to reduced resource in future) taken into account by owner → P above MEC

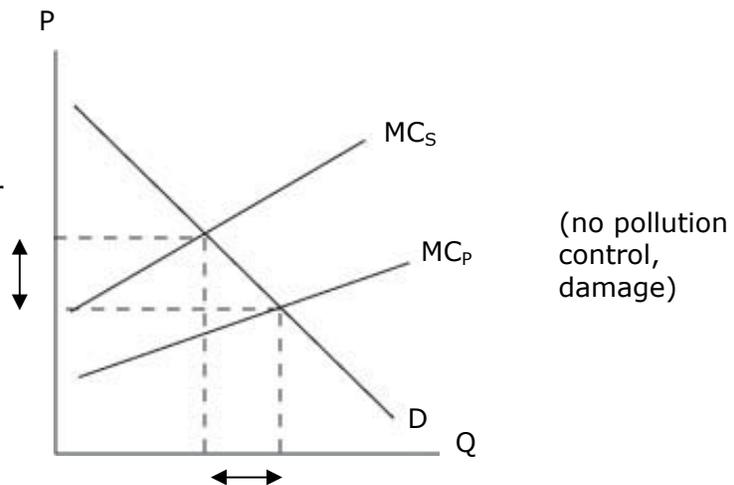
Scarcity rent is an opportunity cost, appropriated by owner of resource.

MUC = marginal user cost
MEC = marginal extraction cost

2. Failures

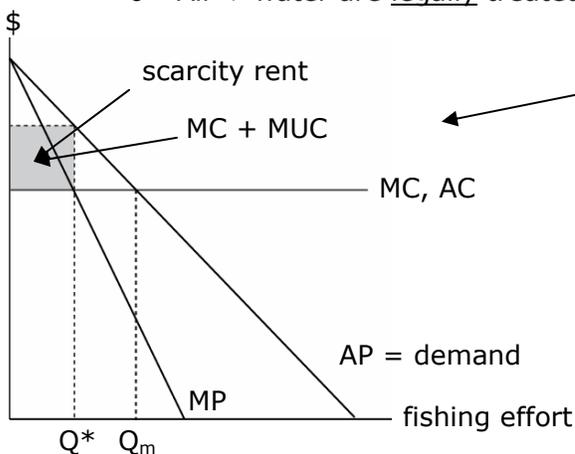
Externalities

Harbor: port + resort hotel
Port uses harbor for waste
Resort hotel wants clean water



What leads to this?

- Improperly designed property rights
 - o Recall: universality + exclusivity: everything owned, all B + C accrue to owners only
 - o Common property resources: not exclusively controlled by single agent
 - o Air + water are legally treated as common property resources



Fishery:

Efficient level: $MC = MP : Q^*$
w/o property rights:
indiv. Fishers: $AC = AP$
scarcity rent dissipated
stocks drawn down

Unlimited access destroys incentive to conserve

Public goods

- Consumption indivisibility
- Fully accessible to all

National defense example:

- "free rider" problem
- Private supply not necessarily zero, but less than efficient

What price? Varies among consumers – no way of knowing
→ "complexity"

Imperfect market structure

Monopoly/cartel – inefficient allocation, production, pricing

Discount Rates

Private discount rate may be > social discount rate. Why?

Discount rate = cost of capital = risk free + risk premium

- risk free is the same
- risk premium > for private
 - o Why? Risk caused by government

Private decisions -> faster exploitation than socially optimal

Government Failure

Interest groups – protective legislation "rent seeking"

- increasing net benefits to group at expense of society
- Regulation/liability