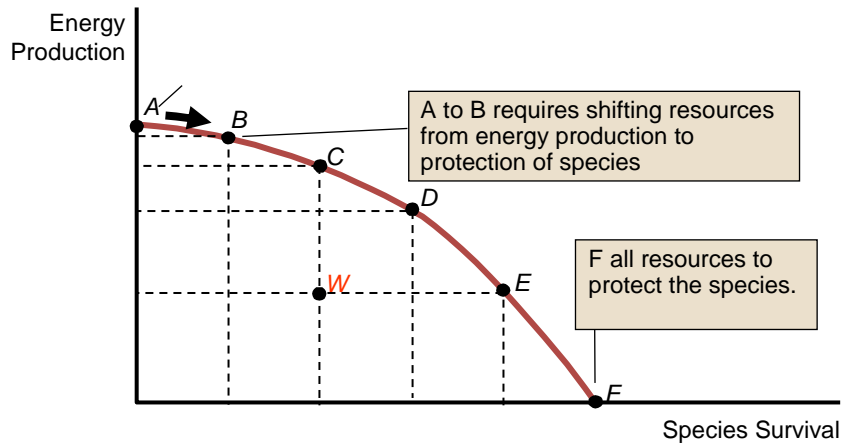# Environmental Policy and economic valuation

Questions to answer

1. Why manage environmental goods and services?

2. Why do we need an environmental policy?

3. What is economic valuation?

4. What are their theoretical foundations?

Management of a hydroelectric plant

- **Objectives:** To establish the volume of water control in a reservoir

- Quantity of water discharged can affect:

    -Hydro-power production
    -Recreation
    -"Feasibility of habitats
    -"Species Survival
    -Agricultural activities, etc.

Management of a hydroelectric plant

Energy Production

A to B requires shifting resources from energy production to protection of species

F all resources to protect the species.

W

Species Survival

Problem of environmental management

Decision making →

Dilemma

Trade-off

Opportunity cost

Points to consider in environmental management: Overview

The public decision-making on environmental management requires consideration of the following aspects:

(1) The value for all users from an increase or decrease of the activity concerned (social value)
(2) The total cost of providing increases or decreases in the activity and other management strategies.

We must also take into account the spatial and temporal dimensions of the results of the activity.

Problem of environmental management

Appropriate use of natural resources
↓
"Compare what is gained with an activity with what is sacrificed for carrying it out"
Problem management
↓
"Choosing the combination of natural and environmental services compatible with the highest level of social welfare"
↓
Need information
↓
Environmental Impact Study
Economic valuation of impacts
Cost Benefit Analysis (CBA)

ENVIRONMENTAL IMPACT STUDY
Effects

(A)   (B)
Environment   Human environment

Social perception (A and B)
↓
ECONOMIC ASSESSMENT

DEFINITIONS

ECONOMIC VALUATION:

"Instrument for environmental management by which to impute economic values to environmental goods and services "

ECONOMIC VALUE:

An environmental good and service has an economic value if it is perceived by people as something that helps to meet or increase their welfare

Details

- Two identical environmental impacts can cause different (time, people) perceptions (economic values)

- An environmental impact may not cause any perception (zero economic value)

Purpose of economic valuation

- To generate information (policy and decision making)

- It is not a price tag to the environment or its components

- But to express the effect of a marginal change in the provision of ecosystem goods and services

- How?

- In the form of an exchange rate compared to other things that people value

- This rate of exchange can be expressed by a common monetary measure

Cost Benefit Analysis (CBA)

- This method helps to inform us about the "trade-offs" involved in alternative strategies for managing environmental resources

- Provides a systematic enumeration of earnings (profits) and losses (costs) of a particular decision, measured in common units for comparison (units).

Allocation and distribution of environmental resources

Problems of economic analysis

1. Efficiency in resource allocation

2. Equity in the distribution

3. Sustainable growth

Problems of economic analysis

- Efficiency → cake largest possible (short term)

- Equity→ all eat it

- Growth → "cake" increasingly large as possible   (Long term)

Economic Efficiency

- Economic Efficiency:

  "A resource allocation by which social welfare is maximized"

- Criterion for assessing whether an allocation is efficient:

  "An allocation is efficient if it is not possible to improve the welfare of a person without worsening that of another"

  (Pareto efficiency)

Equity (dimensions)

- Interpersonal Equity

- Inter-regional Equity (spatial)

- Inter-generational Equity (temporary)

Allocating resources (Methods)

- Custom (Traditional Economy)
  - Resources are allocated according to past inherited conventions
- Authority (Centrally planned economy)
  - Resources are allocated according to explicit instructions from a central authority
- Market (Market economy)
  - Resources are allocated through individual decisions

MARKET AND ECONOMIC EFFICIENCY

THE MARKET AS A MANAGEMENT MECHANISM

Market (nature)

- A market is a group of buyers and sellers which can exchange goods with each other

  - Global Markets
    - Buyers and sellers scattered throughout the world (hunting turism)
  - Local Markets
   - Buyers and sellers within a limited area

Market (prices)

Market prices indicate:

- Where resources are most needed

- How resources should be combined

- How to distribute what is produced

Economic principles and common misunderstandings

- The economic value is not measured by what you actually pay for a good or service ("market value"), but for what you would be willing to pay

- The cost of a good or service is not a good indicator of its value (eg import of sand from the Sahara to the "Picos de Europa")

- The benefit or satisfaction from consuming successive units of a good tends to decrease ("diminishing marginal utility")

- The cost of achieving a given objective can be viewed as that to which it must give up to attain it ("opportunity cost")

- The cost of production tends to increase in the margin ("increasing marginal cost") because of the L.D.R.

Efficiency of market equilibrium
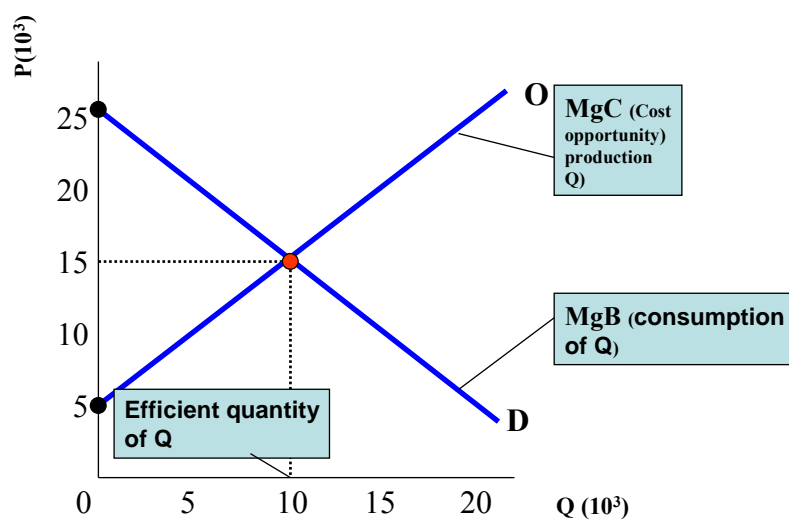
Efficiency of market equilibrium
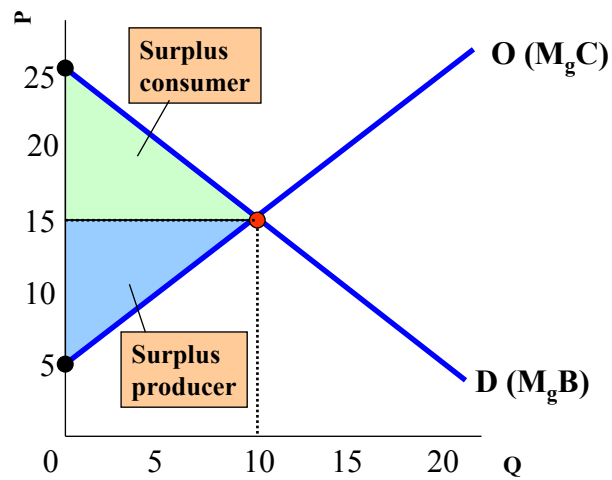
MARKET AND ALLOCATION OF RESOURCES TO ENVIRONMENTAL EFFECTS

- Under certain conditions, the market leads to economic efficiency

- But markets are not always efficient externalities (market failure)

- The "market failures" require public intervention (authority)

- Government intervention (Economic Policy)

DIFFICULTIES IN MANAGING THE ENVIRONMENTAL RESOURCES THROUGH THE MARKET

Concept of externality

An Externality occurs whenever the production of a company or the utility of a consumer are affected not only by value taken by the variable that the company or consumer control, but they are also unintentionally affected by the value take by other economic variables controlled by other agents

Externality "Production- Production " (Fish production-paper plant)

$y = f(x_1, x_2, \ldots x_n, w)$

y = amount of output (fish production)

x_i = level of utilization of factors production

w = factor of production controlled by another operator (water quality)

If, $\partial y / \partial w < 0 \rightarrow$ negative externality

$\partial y / \partial w > 0 \rightarrow$ positive externality

Externality "Production-Consumption" (Biodiversity-"environment tourism")

- $u = f(x_1, x_2, \ldots x_n, y)$

u = consumer's utility (environmental tourism)

x_i = level of consumption of possessions and services

y = production company (biodiversity)

If, $\partial u / \partial y < 0 \rightarrow$ negative externality

$\partial u / \partial y > 0 \rightarrow$ positive externality

Why externalities occur?

- Two properties of good and services

    1- Exclusion:

    A good is excludable if, when provided, it is possible to prevent a person from using it

    2 – Rivalry:

    A good is rival if its use by one person prevents or reduces the ability of others to use it
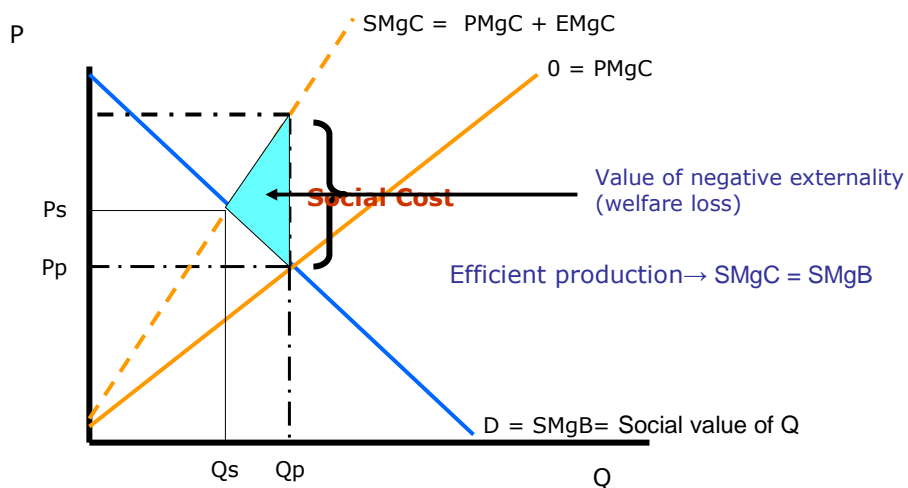
Four types of goods

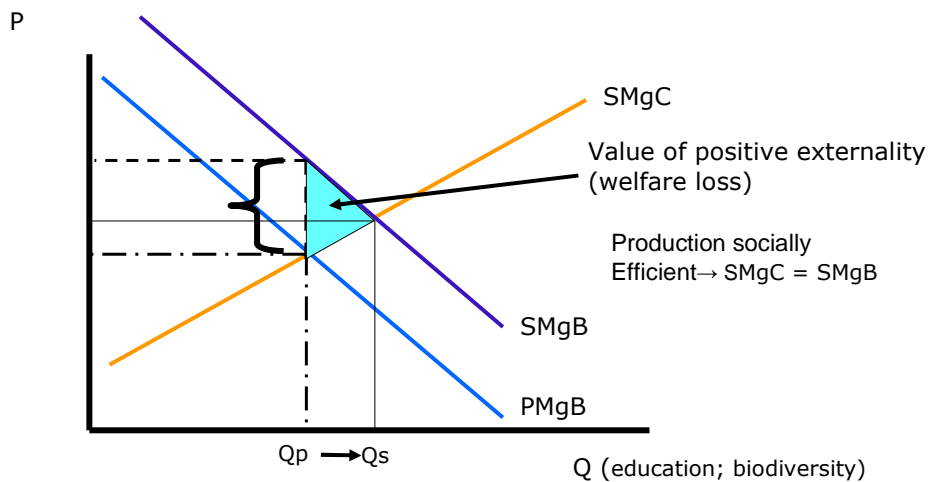|	¿Rival?	
	Yes	**No**
Yes	**"Private goods"** • Hamburguer •"Congested" natural park	**"Natural Monopolies"** •Coded TV • Natural Park "no congested "
No	**"Common Resources"** •Fisheries •Free-hunting area access "congested"	**"Public possessions"** •Biodiversity • Free-hunting area access "not congested"

¿Excludable?

Effects of externalities

- The existence of an externality (positive or negative) creates a difference between:

    a) The, private and social, cost of production

    b) The, private and social benefit consumption.

- Thus, even a competitive market will not reach the social optimum (efficiency).

Negative externality

Positive externality

P

SMgC

Value of positive externality
(welfare loss)

Production socially
Efficient→ SMgC = SMgB

SMgB

PMgB

Qp → Qs

Q (education; biodiversity)

Problems in environmental management

Environmental management problems can be caused by <u>three types of failures</u>:

(1)   Institutional failures
(2)   Market failures
(3)   Policy failures

These forms of failure are interdependent:

- *Property rights* over resources may be weak (institutional failure) because the Administration does not provide legal support (policy failure) or by the public good nature of the resource (market failure).
- In addition, imperfect property rights can result in externalities (market failure).

Problem of asymmetric information

- Development activities generate easily observable benefits
- Conservation activities generate benefits hardly observable
    - → Asymmetric information problem
- Consequences:
    - - Preferred development activities on conservation activities (undervaluing natural capital)
    - - Risk of unsustainable growth (imperfect substitution between types of capital, "nonlinear dynamics of ecosystems)

Economic valuation and environmental policy

Economic valuation and environmental policy

- The market is insufficient for environmental management

- It must be supplemented and corrected by government intervention measures (Environmental Policy)

- Economic valuation of external costs and benefits an essential tool of environmental policy

ENVIRONMENTAL POLICY

Basic Problems:

1. Determining the right balance between use and environmental protection

2. Induce operators to use environmentally desirable

But,

What is the appropriate level of protection environment?

SOME QUESTIONS

What level of particles should to deliver an industry?

How much land dedicated to the protection of endangered species?

Should we deteriorated a landscape to build a reservoir?

Problems of a regulatory nature (judgments of value)

- There are no unanimous answers in society

- Any decision made will please some and displease others

- Social decisions $\longrightarrow$ Social and political problem

$\downarrow$

Need for criteria for public decision making

Criteria for public decision making

- **Normative nature of environmental problems**→ Need for criteria for public decision making

  These criteria must answer three questions:

  1. How do you justify what is preferred by society?

  2. How do you measure it?

  3. How to add our measures among people?

WHAT IS PREFERRED BY THE SOCIETY?

SOCIAL CHOICE MECHANISMS

↓

Social Ordering

Social order: Types

- <u>Direct social ordering:</u>
  -
    It is built directly from an external principle (Biodiversity, equity, PIB, etc.).

    For example: "a is socially preferred to b if and only if the value an indicator of biodiversity e is higher in a that in b"

<u>Indirect social ordering</u> :

  - It is built exclusively in relation to the preferences of individuals → Social preferences is a mere reflection of the latter

Economic concept of value

- <u>Economic value:</u>
  Theoretical construct that reflects people well-being (welfare)

- <u>Social welfare:</u>
  What people consider contributes to their quality of life

- <u>Source of welfare:</u>
  Meeting social preferences

Can we measure preferences?

¿How?

PROPERTIES OF PREFERENCES

1. Stability: "Tastes and preferences are relatively stable"

2. No satiety: "More the better"

3. Substitution: "If the quantity of a good is reduce it is possible to increase the quantity of other good so that the person remains indifferent between the two situations"

Consequences of the substitution property

- Allows to set terms of trade ("trade-offs") between pairs of goods and services

- These terms of trade reveals the value that people attach to these goods and services

Measuring preferences

- The wish to give something in return

- The wish to receive something in return (compensation)

In monetary units

- "Willingness to pay" (WP) for a desired state
- "Willingness to be compensated" (WC) for an unwanted situation

Details and limitations on the economic approach to value

- Human preferences can be measured by means other than the WP and WC (voting procedures, content analysis)

- In the process of economic valuation, money is but a means by which to express some measure of economic value: the WP and WC

- The anthropocentric way of conceptualizing the value in economics (human preferences as the basis of value) is not the only possible way(intrinsic value)

- There are a number of problems implicit in the concept of economic value in regard to environmental valuation

"Intrinsic value" and "economic value" (I)

"Intrinsic value":

-Value system in which ecosystems or species have intrinsic rights to enjoy a healthy sustainable conditions

-These rights are on par with human rights and satisfaction.

-The value of an action or object would be measured by its contribution to maintaining the health and integrity of an ecosystem or a species per se (regardless of human fulfillment that entails)

"Intrinsic value" and "economic value" (II)

"Economic value":

-Reflects the difference that something makes to satisfy human preferences.

-It has an anthropocentric nature.

But:

-The boundaries between intrinsic and economic values are not clearly defined

-Human preferences may exist in the sense that nature should be preserved "in its own right"

Using economic values in public decision making

How to add individual preferences?

Kaldor-Hicks Compensation Principle

Def.:

If the gain enjoyed by those who prefer a' exceeds
the losses suffered by of those who prefer a'' , then the
change from a'' to a' is desirable,
i.e., a' has a higher position
in the social ordering

Consequence:

""For a policy / project to be " desirable ", the welfare gains
should outweigh the welfare losses

Basic rule for the acceptance of a policy / project (1)

$$\left\{ \sum WP^{G}_{i,t}(1+r)^{-t} - \sum WP^{P}_{i,t}(1+r)^{-t} \right\} > 0 \qquad (1)$$

where,
i= ith person
t= time

In (1):

Benefits are measured by the WP to ensure the benefit
(G refers to winners)
Losses are measured by the WP to avoid loss (P
refers to the losers)

Basic rule acceptance of a policy / project (2)

If the "losers" of a project / policy have legitimate property rights over what they lose, in (1) we should replace the WP by the WC:

$$\{\sum WP^G_{i,t}(1+r)^{-t} - \sum WC^P_{i,t}(1+r)^{-t} \} > 0 \qquad (2)$$

Basic rule acceptance of a policy / project (3)

- In (1) and (2) WP and WC are discounted

- When adding in time, the resulting magnitude is the "present value"

- Then the rule (2) would read:

$$PV(WP) - PV(WC) > 0 \qquad (3)$$

Aggregation rules

1. In (1) and (2) WP and WC are added by people according to the aggregation rule that defines "society" , for example, as the sum of the people.

   But:

   - There are no fixed rules for determining the boundaries that limit the amount of people.
   - "Society" may be the amount of people in a region, country or around the world.

2. Variations in the marginal utility (Um_g) of personal income could be also considered..

   That is:
   1€ profit / loss on a low income person would have more utility than 1€ profit / loss in a person of high income

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COST-BENEFIT ANALYSIS

- Instrument for public policy analysis

- Framework in which Economic valuation of environmental goods and services is performed.

- Provides a systematic enumeration of earnings (profits) and losses (costs) of a particular decision, measured in common units for comparison (units).

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