

Environmental Economics

INTRODUCTION

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Why “Economics for the Environment”

- Economics studies **how** individuals, firms, and governments make decisions under constraints (budgets, technology, rules) and multiple objectives.
- Applied to the environment, it helps explain **why** pollution and ecosystem degradation occur even when we know they are harmful.
- It is not just “finance”: it is about **incentives, choices, and trade-offs** (compromises among competing goals).
- For engineers: technology is necessary, but if it is **not economically adoptable** (or not properly incentivised), diffusion will be limited.

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Why ignoring economics leads to failure

- Environmental policy can fail if it ignores **how** consumers and firms respond (adaptation, avoidance, relocation of activities).
- Many problems persist because markets **do not properly account** for environmental costs and benefits.
- *"Getting the prices right"* means ensuring private decisions reflect **social costs** (e.g., pollution) and **social benefits** (e.g., ecosystem services).
- The aim is to meet environmental targets with **less waste** and with ongoing incentives to improve.

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Two examples: paying for pollution vs paying for protection

1) Pay for pollution (pollution pricing)

"Getting firms to pay for the pollution their activities produce can help achieve environmental quality targets more efficiently than simply regulating firms."

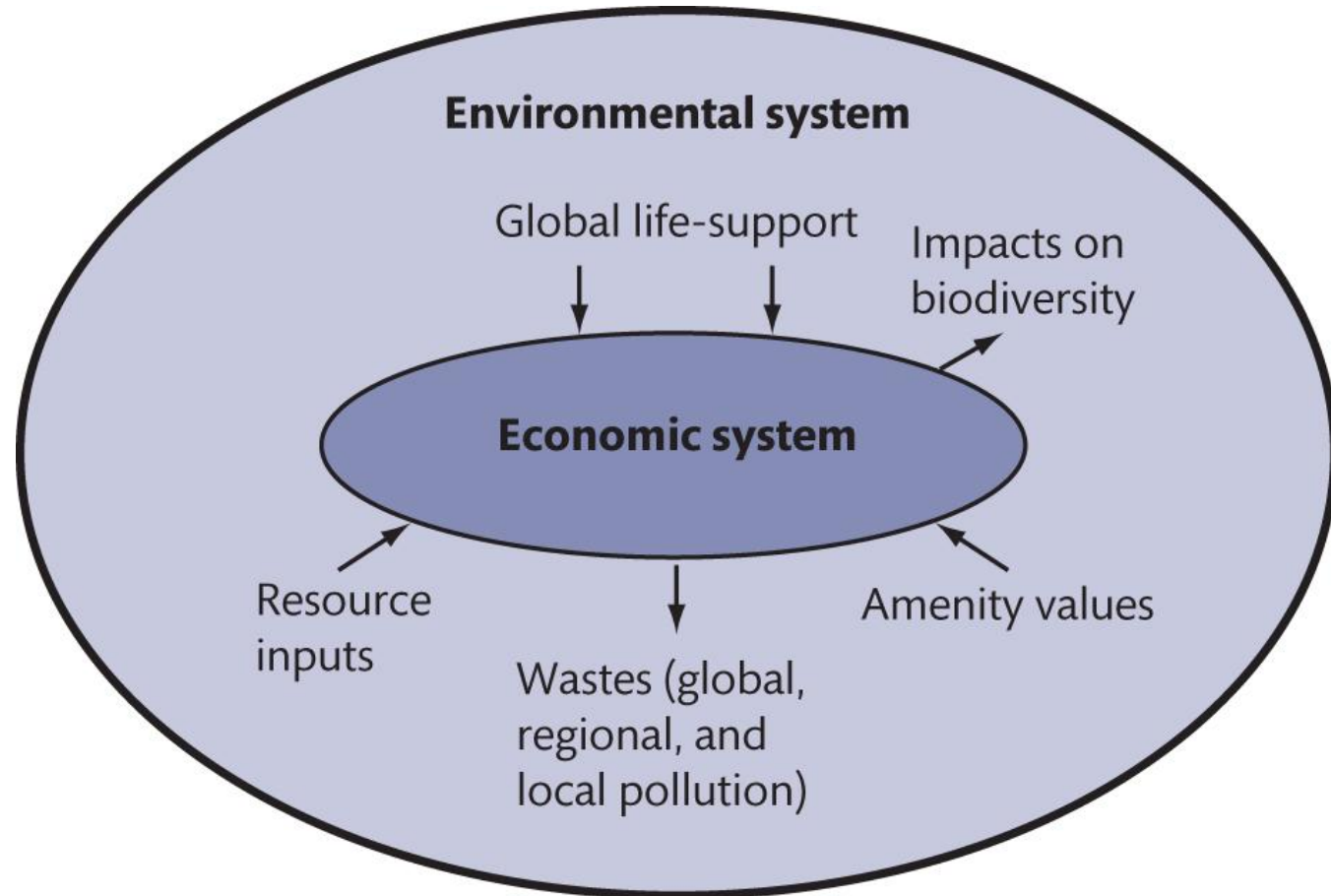
2) Pay for environmental benefits (ecosystem services)

"Rewarding farmers and foresters for the beneficial ecosystem services such as flood control or carbon storage which their land can 'supply' gives these managers an incentive to increase the provision of such ecosystem services."

Key idea: economic signals (paying and rewarding) change decisions and environmental results.

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Economy and environment: key interactions



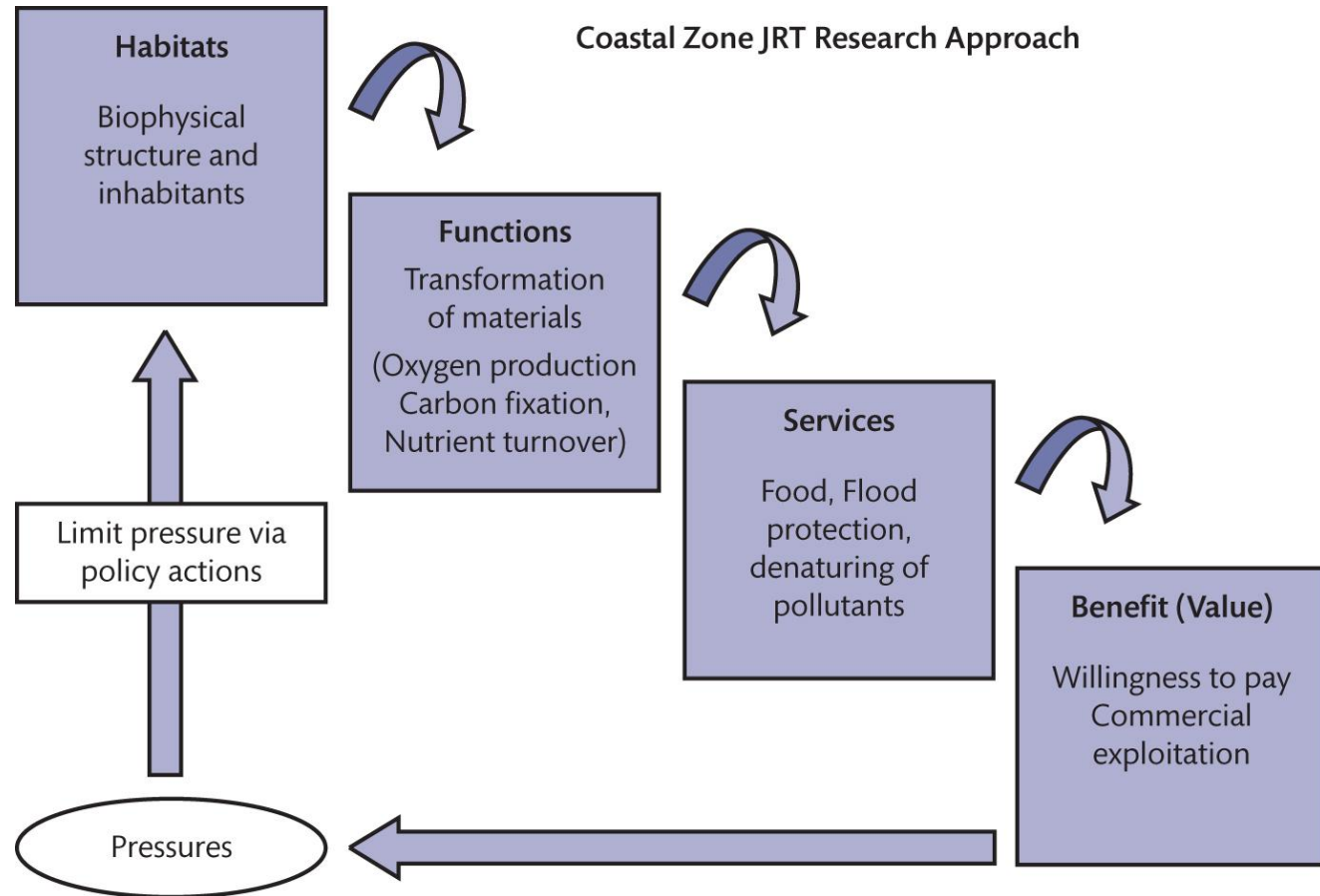
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From “non-market” services to ecosystem services

- Economics is not only about market prices: many environmental benefits are **not priced** (non-market) but still important.
- Protecting ecosystems (e.g., wetlands) can bring economic benefits through **biodiversity, flood defence, and pollution treatment**.
- For policy and the transition, we must understand how economy and environment are **connected** and influence each other.

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Economy and environment: key interactions



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Four ecosystem service groups

- Since the Millennium Ecosystem Assessment (MEA, 2005), ecosystem services are grouped into:
 - 1. Provisioning** services
 - 2. Regulating** services
 - 3. Cultural** services
 - 4. Supporting / intermediate** services
- Some benefits have market prices (e.g., timber), others do not (e.g., wildlife watching, carbon storage) but they are still economically important.

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Ecosystem services from deep sea canyons

(source: Jobstvogt et al. 2014)

Ecosystem services	Explanations on values
Provisioning services:	
Carbon sequestration and storage	The value of natural uptake, storage and burial of organic material within the canyon.
Food provision	The canyon's value of providing marine organisms for human consumption.
Genetic resources and chemical compounds	The option value of using canyon organisms in biotechnological, pharmaceutical, or industrial applications.
Regulating services:	
Biological control	The value of controlling diseases and invasive species.
Waste absorption and detoxification	The value of burial, decomposition and transformation of waste within the canyon ecosystem.
Cultural services:	
Aesthetic and spiritual	The value of the canyon ecosystem for inspiring religion, arts, movies, documentaries, books and folklore.
Bequest and existence	The value of maintaining the canyon ecosystem for future generations and the intrinsic value of its marine species.
Scientific and educational	The cognitive value of the canyon ecosystem for science and education.
Intermediate services:	
Biologically mediated habitat	The value of canyon habitats formed by marine organisms.
Nutrient cycling	The value of storage and recycling of nutrients by canyon organisms.
Resilience and resistance	The value of the amount of disturbance that the canyon ecosystem can cope with and its ability to regenerate after disturbance.
Water circulation and exchange	The value of currents, such as up-and down-welling, dense shelf water cascading and mixing of water masses.

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Ecosystem services and benefit from a coastal wetland

Ecosystem service classification	Ecosystem service	Economic benefit
Regulating	Carbon storage and sequestration (e.g. by salt marsh plants)	Avoided climate change damages; less spending needed on other greenhouse gas control
Regulating	Storm and flood mitigation	Avoided flooding damages to nearby houses, farmland and commercial property
Cultural	Habitat for birds	Value of bird watching trips
Cultural	Educational resource	Value to school children of learning about how wetlands function
Provisioning	Supporting fish populations	Value of commercial fish catch due to wetland function

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Co-evolution of economic and environmental system

- Economy and environment change over time and **co-evolve**: each one affects the other.
- Higher economic demand can reduce the environment's ability to provide services:
 - more use as a **waste sink** can reduce life-support services or amenity;
 - higher demand for **resource inputs** can reduce amenity flows.
- Economic activity can affect **biodiversity**, that also matters for resistance to shocks (resilience).

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Ten Key Insights from Economics

1. **Economy and environment are determined together:** they affect each other.
2. **Behaviour matters:** people and firms respond to incentives (often prices) and decide “at the margin”.
3. **Environmental resources are scarce:** every use has an opportunity cost (giving up the best alternative).

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Ten Key Insights from Economics

4. The free market can create the “wrong” level of environmental quality:

- too many **environmental bads** (e.g., pollution)
- too few **environmental goods** (e.g., beautiful landscapes)

Reason: often there is **no price/right** to discourage pollution or reward environmental benefits (**market failure**).

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Ten Key Insights from Economics

5. **Markets often allocate resources well:** they coordinate actions and share information (Adam Smith's "invisible hand"). They can also work for the environment (e.g., tradable pollution permits).
6. **Government intervention** does not always improve outcomes: it can create coordination/information problems and lead to **government failure**.

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Ten Key Insights from Economics

7. **Environmental protection costs money:** there are direct and indirect costs, and marginal costs often rise (each extra reduction is more expensive).
8. **For renewable resources** (fish, forests), Maximum Sustainable Yield (MSY) is rarely the optimal harvest level because it ignores economic costs and benefits.

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Ten Key Insights from Economics

- 9. Economic growth may contribute to environmental problems,** but few people would swap today's life for life 200 years ago: income and life expectancy increased.
- 10. Many environmental problems are global:** cooperation is hard because game theory shows incentives to free-ride. Economists can help design institutions to reduce this.