Introduction to Natural Resource Economics

Natural Resource Economics

Aditya KS

May 25, 2025

ICAR–Indian Agricultural Research Institute

Contact: adityaag68@gmail.com

Website: https://adityaraoks.github.io/

Outline

Introduction

Introduction

- Natural Resource Economics (NRE) studies the supply, demand, and allocation of Earth's natural resources.
- Emphasizes efficiency and sustainability in using renewable and non-renewable resources.
- Integrates economic analysis with ecological constraints and intergenerational equity.

Definitions

Key Definitions

- **Natural Resources:** Inputs from nature—renewable (forests, fisheries) or non-renewable (minerals, fossil fuels).
- **Environmental Economics:** Branch addressing market failures (externalities, public goods) in environmental goods.
- **Ecological Economics:** Interdisciplinary field embedding the economy within ecological limits, stressing sustainability.
- **Externality:** Uncompensated cost or benefit affecting third-parties.

Why a Separate Field?

Why Natural Resource Economics?

- **Irreplaceability:** Many resources (e.g. fossil fuels) cannot be regenerated within human timescales.
- **Lack of Substitutes:** Critical ecosystem services (clean air, biodiversity) have no perfect market substitutes.
- **Intertemporal Effects:** Resource decisions affect welfare across generations.
- **Market Failures:** Externalities, unclear property rights, and public-good characteristics lead to inefficiencies.

Important Milestones

Important Milestones in NRE (I)

Table 1: Selected Theoretical and Policy Milestones

Year	Concept	Contribution
1849	Faustmann Formula	Present value of forest land; optimal rotation in forestry.
1914	Gray Model	Early exhaustible resource analysis; scarcity and extraction path.
1920	Pigovian Tax	Internalizing negative externalities via taxation.
1931	Hotelling's Rule	Optimal extraction path for non-renewables; user cost grows at interest rate.
1947	Travel Cost Method	Valuation of recreational benefits using revealed preferences.
1954	Gordon–Schaefer Model	Economics of renewable fisheries; MSY vs. MEY.

Important Milestones in NRE (II)

Year	Concept	Contribution
1960	Coase Theorem	Private bargaining can achieve efficient outcomes under low transaction costs.
1962	*Silent Spring*	Sparked modern environmental movement and pesticide regulation.
1972	Stockholm Conference	First major international environmental summit; global action plan.
1974	Hartwick Rule	Investing resource rents to sustain constant consumption over time.
1980s	Contingent Valuation	Stated-preference surveys for non-market valuation.
2009	Elinor Ostrom	Governance frameworks showing commons need not lead to tragedy.

Summary

Summary

- NRE provides tools to manage scarce resources efficiently and sustainably.
- Addresses market failures through policy instruments: taxes, permits, property rights.
- Key theoretical developments span from Hotelling's Rule to modern governance of commons.