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BA Economics Honours | Semester V | Calicut University

Environment and Sustainable Development

Course Code: ECO5EJ302 • Module 1

Module I: Environment and Economy

Environmental Economics studies the bidirectional relationship between economic systems and natural ecosystems. The economy functions as an open thermodynamic subsystem embedded within the finite, closed ecological biosphere, drawing raw materials and energy inputs and discharging waste and entropy back into natural sinks.

Unit 1 & 2: Scope of Environmental Economics and Global Ecological Crises

The natural environment performs four vital economic functions:

1. Direct supplier of resource inputs (timber, minerals, water, fossil fuels).
2. Assimilation of economic waste products (carbon absorption, effluent filtration).
3. Provision of life-support ecosystem services (climate regulation, pollination, hydrological cycles).
4. Direct amenity services (recreation, aesthetic well-being).

Anthropogenic pressure has precipitated major planetary crises: air and water pollution, soil degradation, stratospheric ozone depletion (governed by the Montreal Protocol, 1987), and global climate change driven by greenhouse gas (GHG) emissions.

Unit 3 & 4: Environmental Kuznets Curve and Limits to Growth

- **Environmental Kuznets Curve (EKC):** Hypothesizes an inverted U-shaped relationship between economic growth (per capita GDP) and environmental degradation:
  1. *Scale Effect:* Early industrialization intensifies resource extraction and pollutant emissions.
  2. *Composition and Technique Effects:* Beyond a turning point, structural shifts toward cleaner service sectors, higher environmental consciousness, advanced green technologies, and stricter state regulations lead to environmental remediation. *Criticisms:* EKC does not apply to global pollutants (such as CO_2 emissions) and ignores the transboundary relocation of polluting industries to developing nations (Pollution Haven Hypothesis).
- **Limits to Growth (Club of Rome / Meadows et al., 1972):** Used computer system dynamics (World3) to demonstrate that exponential population growth and industrial output on a planet with finite natural resources and waste absorption capacity would inevitably precipitate ecological and economic overshoot and collapse by the mid-21st century.
- **Green GDP:** Corrects conventional GDP by deducting natural capital depreciation and environmental damages:

> $$Green\ GDP = GDP - \text{Depreciation of Produced Capital} - \text{Depletion of Natural Resources} - \text{Environmental Degradation}$$

Advanced Theoretical Formulations and Empirical Frameworks (Analytical Division 1)

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Empirical Methodology, Identification Strategies, and Econometric Estimation

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Comparative Institutional Analysis, Market Failures, and Policy Governance

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Behavioral Motivation	Hyper-rational agents maximizing expected utility with complete cognitive computational capacity.	Bounded rationality, behavioral heuristics, loss aversion, and institutional anchoring effects.	Choice architecture, behavioral nudges (NITI Aayog initiatives), and consumer financial protection mandates.
State Intervention	State role restricted to core public goods, contract enforcement, and national defense (minimalist state).	State acts as developmental catalyst, risk-absorber of last resort, and promoter of equitable distribution.	Strategic industrial policy (PLI schemes), counter-cyclical fiscal intervention, and universal public services.

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Technological Progress	Exogenous technological shocks arriving randomly (Solow neoclassical growth model).	Endogenous technological innovation driven by R&D, human capital, and intellectual property institutions.	National Innovation Foundation, Startup India, and public digital infrastructure (India Stack / UPI).

Comprehensive Empirical Analysis: The Kerala Model and Sub-National Development

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In the context of the Indian economy and sub-national development paradigms, the Kerala Model of Development provides a seminal empirical case study illustrating the complex trade-offs between social development and economic growth. Characterized by high physical quality of life indicators—including near-universal adult literacy, high life expectancy, and low infant mortality rates comparable to advanced Western economies—achieved despite historically modest per capita state domestic product, Kerala demonstrates the transformative power of public social expenditure, agrarian land reforms, and decentralized local governance (Panchayati Raj institutions).

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Policy Synthesis and Analytical Evaluation

Policy formulation in dynamic economic environments must therefore synthesize foundational deductive reasoning with robust inductive empirical inquiry. Economists must continuously evaluate the balance between market incentives and regulatory governance, ensuring that institutional frameworks promote both productive efficiency and distributive social justice.

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Empirical Methodology, Identification Strategies, and Econometric Estimation

Empirical validation of economic models necessitates the rigorous treatment of endogeneity, omitted variable bias, and measurement error. Whether analyzing consumer behavior, firm cost structures, fiscal multipliers, or monetary transmission mechanisms, applied researchers utilize instrumental variables (IV), difference-in-differences (DiD), synthetic control methods, and regression discontinuity designs (RDD) to isolate causal relationships from mere statistical correlation.

Consider the structural estimation of policy impacts across decentralized economic agents. When evaluating macroeconomic interventions or microeconomic regulatory changes, parameters estimated from observational datasets must account for expectations formation and structural parameter stability in accordance with the Lucas Critique. Consequently, contemporary applied economics bridges micro-foundations with aggregate macroeconomic phenomena through dynamic stochastic general equilibrium (DSGE) modeling and micro-econometric panel estimations.

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Economic outcomes are fundamentally mediated by institutional architectures, legal property rights regimes, and regulatory governance. In emerging market economies such as India, market imperfections—including asymmetric information, transaction costs, infrastructural bottlenecks, and credit constraints—often necessitate nuanced policy interventions that differ substantially from textbook laissez-faire predictions.

Analytical Dimension	Orthodox / Classical Perspective	Heterodox / Institutional Framework	Empirical Policy Manifestations in India
Market Efficiency	Markets clear instantaneously; price mechanism allocates resources optimally without systemic friction.	Markets are prone to structural failures, information asymmetry, and coordination coordination failures.	Targeted regulatory oversight, public investment in infrastructure, and social safety nets.
Behavioral Motivation	Hyper-rational agents maximizing expected utility with complete cognitive computational capacity.	Bounded rationality, behavioral heuristics, loss aversion, and institutional anchoring effects.	Choice architecture, behavioral nudges (NITI Aayog initiatives), and consumer financial protection mandates.
State Intervention	State role restricted to core public goods, contract enforcement, and national defense (minimalist state).	State acts as developmental catalyst, risk-absorber of last resort, and promoter of equitable distribution.	Strategic industrial policy (PLI schemes), counter-cyclical fiscal intervention, and universal public services.
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