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PENR/ESPM 198
Fall Semester, 1995
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Sustainable Development

Perspectives on Sustainability

• Economic Growth Approach

$$\max_{\delta C_t} \int_0^{\infty} e^{-rt} U(C_t)\, dt$$

Maximize consumption per capita over time.

• Constrained Growth

$$\max \int_0^{\infty} e^{-rt} U(C_t)\, dt$$

$$\text{subject to} \quad E_t \leq \overline{E}$$

Maximize growth subject to environmental quality constraints.

• Safety Rule Approach

$$\max_{\{N_t, t=0,\ldots,\infty\}} P(N_t \geq N)$$

N_t = population size

Maximize probability population is above critical level.

• What Should Be Sustained?

-Humans
-Species
-Cultures
-Environments

• How Should Sustainability Be Attained?

Command and controls vs. incentives.

Problems:

-Incomplete information (depends on technological knowledge).
-Transaction costs.

Principles of Modeling

• Estimated Macro Relationships

• Aggregation from Micro to Macro

• Physical/Economic Relationships

Example: Conservation technologies.

IPM
Drip
Precision agriculture
Crop rotation

• Improve Yield

• Reduce Input Cost

• Reduce Damage

Policies: Pollution tax
Input/technology tax
Input tax
Technology tax
Direct control

Transition Toward Biological System (Renewability)

Economics of stages of settlement:

hunters/gatherers
slash and burn
homestead
queuing
scarcity
transition to markets

Examples: crop production
fine chemicals
medicine