

# Sustainable Development:

What is it?

Why does it matter?

## What is Sustainable Development?

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- Context
  - Sustainable Development as a concept dominates much of the literature concerning the *broader* implications of technology and modernity
- Goal: To make students aware of
  - Prevailing thinking about sustainability
  - Challenges regarding synthesizing the impact of a technology within a broader context

# What is Sustainable Development?

Firstly, what is “Development”?

## Development Economics

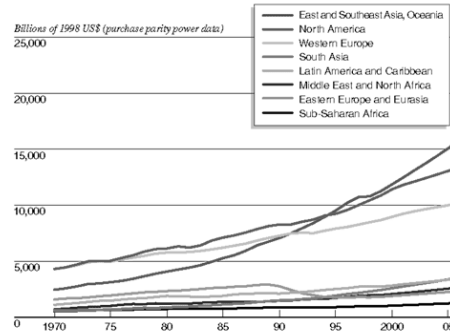
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- Emerged in the 1940's
- Goal:  
To raise the standard of living throughout the world
- After World War II, often tied up with Cold War goals.
  - Seminal Text:  
*The Stages of Economic Growth: A Noncommunist Manifesto* (Rostow)
- Led to the creation of World Bank, IMF, and GATT

## Development Economics: Measures of Success

- Concept widely accepted
- Global improvement
  - Possible exception Sub-saharan Africa

Regional GDP: 1970-2015



Source: CIA's Long-Term Growth Model.

Source: Figure 1.4, Human Development Report 2005, UNDP  
Courtesy of United Nations Development Programme.

## What is Sustainable Development?

## Classic Definition

- *“Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs”*  
(The World Commission on Environment and Development, United Nations, 1987)

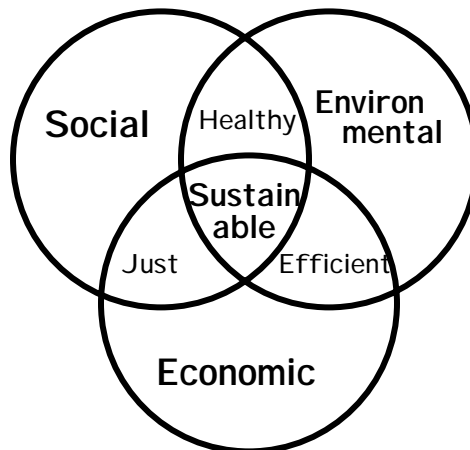
## Other Definitions of Sustainable Development

- *Improvement in the quality of human life within the carrying capacity of supporting ecosystems*  
(World Wildlife Fund)
- *A condition in which the ecosystem maintains its diversity and quality— and thus its capacity to support people and the rest of life—and its potential to adapt to change and provide a wide range of choices and opportunities for the future*  
*A condition in which all members of society are able to determine and meet their needs and have a large range of choices to meet their potential*
- *Economic growth that provides fairness and opportunity for all the world's people, not just the privileged few, without further destroying the world's finite natural resources and carrying capacity*  
(Prong and ul Haq 1992).

Key Questions:  
**What?**  
**... to Sustain?**  
**... to Develop?**

**What is to be Sustained?:**  
Broadly Accepted Elements of Sustainability

- Economic
  - Human Capital
  - Human-made Capital
- Environment
  - Natural Capital
- Social
  - Social Capital



Adapted from <http://www.state.nj.us/dep/dsr/sustainable-state/what-is.htm>

## What is Economic Sustainability?

- **Human-made Capital**
  - Traditional economic capital
  - Produced means of production
- **Human Capital**
  - Often simply refers to labor
  - More subtly, the ability of an individual to produce or increase income
    - Knowledge
    - Skills
    - Health
    - Values
  - **Activities that increase human capital**
    - Education
    - Training
    - Medical care

## Environmental Sustainability

- **Maintenance of Natural Capital**
  - Ecosystem services that enable life
- **Sources**
  - Stocks of raw materials
  - Flows of renewable resources
- **Sinks**
  - Capacity to assimilate wastes

## Environmental Sustainability: Goodland 95

- **Output Rule:**
  - Waste emission can't exceed assimilative capacity of local environment
- **Input Rule**
  - **Renewables:**  
Harvest rates should be within regenerative rates
  - **Non-renewables:**  
Harvest rates should be below that rate at which renewable substitutes are developed

## Social Sustainability

- **Social Capital**
  - No Consensus definition
  - Knowledge and rules of interaction in culture and institutions
    - Legal system
    - Government
- **Social Sustainability general includes addressing basic needs of population**
  - Recognitions of social issues in traditional development economics predate environmental concerns
  - Income distribution
  - Quality of life
    - Illiteracy
    - Hunger
  - Institutional participation
  - Increasing choice

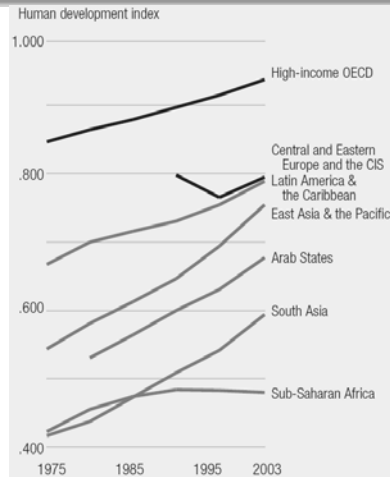
## Development Economics: Measures of Success

- UN Development Program - Human Development Indicator

- GDP
- Education
- Life-expectancy

- Troubled Areas

- Sub-saharan Africa



Source: Figure 1.4, Human Development Report 2005, UNDP  
Courtesy of United Nations Development Programme.  
ESD.123/3.560: Industrial Ecology - Systems Perspectives  
Randolph Kirchain

## How much is to be sustained?

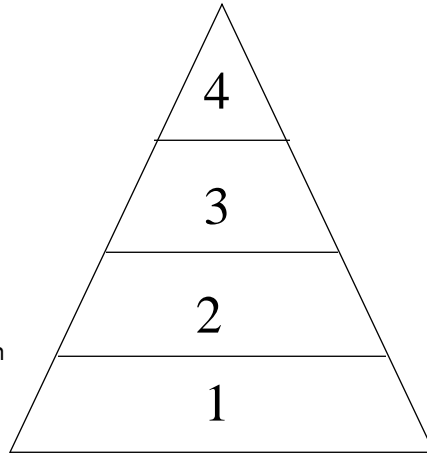
Quantity  
or  
Quality

Timeframe



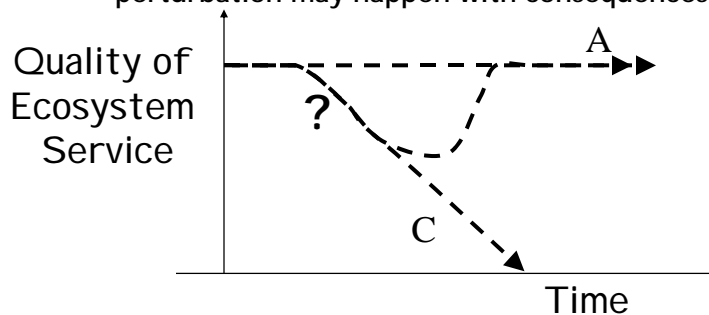
## What is to be Sustained? Sustainability Hierarchy (Marshall and Toffel)

- Actions are unsustainable that
  - Level 4
    - Reduce quality of life
    - Violate other values
  - Level 3
    - Cause species extinction
    - Violate human rights
  - Level 2
    - Significantly reduce life-expectancy or basic health
  - Level 1
    - Endanger human survival



## Over what time frame should we care about sustainability?

- Are these sustainable?
  - Some would disagree with labeling B as acceptable
  - During perturbation B, it is possible that another perturbation may happen with consequences like C



Is it sustainable if we allow some forms of capital to deteriorate while others are maintained?

Examples?

## Capital Substitutability: Trading off over resources or time

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- **Strong Sustainability**
  - Cannot make tradeoffs among sustainability of various resources
  - What is an example of a potential tradeoff?
- **Weak Sustainability**
  - Some resources / ecosystem capabilities may deteriorate if the value extracted is reinvested in substitutable capabilities