

Course Code: CE 447

Course Title: Climate change and sustainable development

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LECTURE: 02

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Lecture plan

- Rules of sustainable development
- Indicators of sustainability
- Tools of achieve sustainability
- Zero-emission process

Rules of sustainable development

- The implication of the concept of sustainable development is that:
 - The next generation should inherit such a stock of wealth, comprising man made assets and environmental assets --- which stresses on all capital assets
 - The next generation should inherit a stock of environmental assets no less than inherited by the previous generation ---- which stresses on natural capital only
 - The components of the inherited stock should be man made assets and human assets ---- which includes human capital besides man made and natural capital

Rules of sustainable development

- Aggregate capital stock (man made + natural + human)
 - man made capital (K_M) consisting of machines, buildings, roads etc.
 - Natural capital (K_N) includes all renewable and non-renewable resources or any natural assets yielding a flow of ecological services with economic values over time
 - Human capital (K_H) comprises the stock of knowledge and skills

Indicators of Sustainability

- Pearce and Atkinson has developed a sustainability index or indicator of the form:

$$Z = S/Y - d_M K_M/Y - d_N K_N/Y$$

Where,

S \longrightarrow gross saving

Y \longrightarrow income

d_M \longrightarrow depreciation of man made capital

d_N \longrightarrow depreciation of natural capital

To ensure sustainability, $Z \geq 0$.

Indicators of Sustainability

- **GNH:** The four pillars of GNH are the promotion of equitable and sustainable socio-economic development, preservation and promotion of cultural values, conservation of the natural environment, and establishment of good governance.
- **HDI:** The Human Development Index (HDI) (1990) is the measure of life expectancy, literacy, education, and standard of living for countries worldwide. It is a standard means of measuring well-being, especially child welfare. It is used to determine and indicate whether a country is a developed, developing, or underdeveloped country and also to measure the impact of economic policies on quality of life.
- **EF:** Ecological Footprint (EF) compares human consumption of natural resources with Earth's ecological capacity to regenerate them.
- **HPI:** Happy Planet Index is an innovative measure (2006) that shows the ecological efficiency with which human well-being is delivered. It is the first ever index to combine environmental impact with human well-being. Each country's HPI value is a function of its average life satisfaction, life expectancy at birth, and ecological footprint per capita.

Tools to achieve sustainability

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What are the Tools to Achieve Sustainability?

- By-product synergy and industrial ecology
- Cleaner production
- Design for environment
- Eco-efficiency
- Energy efficiency
- Environmentally conscious manufacturing
- The four Rs
- Green procurement
- Performance contracting
- Pollution prevention
- Zero-emission processes

Tools to Achieve Sustainability

Describe the Tools to Achieve Sustainability?

- By-product synergy
A holistic view of industry in which organisations exchange energy and material between one another, rather than operating as isolated units
- Cleaner Production
Continuous application of an integrated preventive environmental strategy applied to processes, products and services to increase eco-efficiency and reduce risks to humans and the environment

Tools to Achieve Sustainability

- **Design for environment**
Techniques used to incorporate an environmental component into products and services before they enter the production phase
- **Eco-efficiency**
A vision for producing economically valuable goods and services while reducing the ecological impact of their production

Tools to Achieve Sustainability

- Pollution prevention

Reduces the amount of hazardous substance, pollutant or contaminant entering any waste stream or otherwise released into the environment. It can be achieved by good housekeeping, material substitution, manufacturing modification, resource recovery, technology etc.

- Zero-emission process

Improving technologies and processes to the point of maximum resource productivity and virtually no waste