



Environment and Development

Introduction

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Environment and Development
Prof. Ngamjiahao Kipgen
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

What is ecology?

- ▶ Understand the relationship of living organisms to one another and to their physical environment.
- ▶ Refers to the **interrelations** of human beings, flora, and fauna with elements of the natural and the physical environment- biotic and non-biotic components.

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Prof. Neamjaha Kipgen
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

What is environment?

- ▶ Refers to the surroundings, or the context within which humans, animals, plants and other exist.
- ▶ We live in close interaction with the natural environment that has shaped our cultural identity, values system, and our economic well-being.

What is development?

- ▶ Development is a process that creates growth, progress, positive change or the addition of physical, economic, environmental, social and demographic components.

What are the major environmental problems?

- ▶ *Biodiversity* (Biodiversity is the most complex and vital feature of our planet)
- ▶ *Water* (Water pollution is a huge concern for us and our environment)
- ▶ *Deforestation* (We need plants and trees to survive)
- ▶ *Pollution* (water, air...)
- ▶ *Climate Change*

What is importance of environment?

- ▶ Environment plays an important role in the healthy living of human beings. it matters because it is the only home that humans have, and it provides air, food and other needs. Humanity's entire life support system depends on the well -being of all the environment factors.
- ▶ Can we live without this environment?
- ▶ Debate the possibilities of life outside EARTH in films and science [E.g. Avatar; 2012]

Context of Environment

- ▶ Environment in association with learning and experience refers to the sum of outside influences on the organism that is distinguished from the inherited potential that together influence human behavior and development.
- ▶ In relation to the natural world which is currently seen as fragile and threatened by human technology and development after the Industrial revolution and with the increase of human population.

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Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

Animate and Non-animate World

- ▶ Animate – plants and animals including humans
- VS
- ▶ Inanimate – objects, machines, and the physical world around us

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Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

Context of Development

- ▶ Concerned with the 'perception', 'representation' and 'connection' between human society and environment in stages of human & societal development.
- ▶ The stages of evolution, material development and the appropriation of nature-in space and time (society is dynamic and our knowledge of the world has evolved over time).

Growth and Development

- Economic Growth – GDP and Wealth
- Economic & Human Development (HDI) – not merely reducing poverty – GDP but includes other indicators such as literacy and education, life-expectancy and health, social welfare, human rights, state of the environment, the development of human capacities.

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Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

Sustainable Development

- ▶ Development should not lead to any environmental degradation and destruction.
- ▶ In 1987, the famous Brundtland Report entitled *Our Common Future* argued that the development process should be aimed at meeting the needs of the present generation without compromising the ability of the future generations to meet their own needs
- ▶ Sustainable development is the process by which we move towards sustainability

Cont.

- ▶ “...development that meets the needs of the present without compromising the ability of future generations to meet their own needs”
(World Commission on Environment and Development, 1987)
- ▶ This was endorsed in 1992 at the Earth Summit in Rio

Prof. Ngamjatso Kipgen
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati
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Cont.

- ▶ In May 1999 the UK's Sustainable Development Strategy was published and defined sustainable development in terms of four objectives:
 - ▶ Social progress which recognises the needs of everyone
 - ▶ Effective protection of the environment
 - ▶ Prudent use of natural resources
 - ▶ Maintenance of high & stable levels of economic growth & employment
- ▶ At the moment the richest 1/5th of the population receives 82.7% of total world income - whereas the poorest 1/5th receives only 1.4%

Ecosystem Fragility

- ▶ Large-scale destruction of the forest, during the historical process of colonization of the land and conversion of the original forest vegetation type, has depleted the germplasm of forest trees.
- ▶ Global change (involving climate change, biological invasion, land use/ cover changes and biodiversity depletion)

Environmentalism(s)

- ▶ Many of these areas of thought are part of a set of loosely integrated ideas some consider an alternative social paradigm rooted in ecological concerns and principles: Social ecology, Deep Ecology etc.
- ▶ North and South – American and Indian

S&T for Sustainable Well-being

- ▶ Development means improving the human condition in all aspects not only economic but also socio-political and the environment.
- ▶ ‘Sustainable development’ means doing so by means and to end points that are consistent with maintaining the improved conditions indefinitely.
- ▶ Sustainable well-being entails pursuing sustainable development to achieve well being where it is absent and to make those others experience a continued state of well being where the means are not sustainable.



How can S&T positively improve well-being?

- Advances in science help us in understanding shortfalls, dangers, and aid development of technology.
- Advances in technology help meet basic needs, reduce production costs, reduce consumption of resources and environmental impact, and help in development of new or improved product services

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Prof. Agnimitra Bhattacharyya
Department of Humanities and Social Sciences
The Department of Environment and Development
The Department of Technology Guwahati
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Going ‘Back’ for a ‘Future’

- We have the science and technology but the only way to build a secure world is to change both the world and our way of relating and thinking about the natural environment in order to develop a sustainable world for our children and grandchildren.
- Need to think globally not locally
- Many grassroots activities are promoting sustainable development – these fundamentally emphasize and reemphasize what was traditional and indigenous.



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Basic Ecosystem Ecology

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Prof. Ngamjaho Kipgen
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

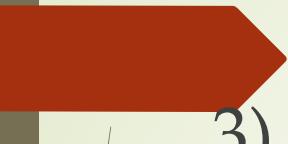


System: regulatory interacting or independent group of items forming a unified whole qualitatively different from the simple sum of its parts.

For ecology as a discipline the main system of focus is the: ecosystem.

Levels of Organisation

- 1) Individual: a single organism.
- 2) Population: group of individuals or members of the same species in a definable area.
- 3) Community: different populations of living organisms in a definable area.



3) Ecosystems: communities interacting with their physical world.

4) Biomes: large ecosystems with specific characteristics (deserts, grasslands, rain forests).

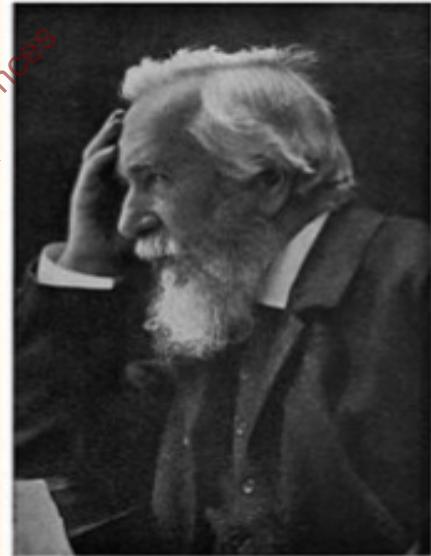
5) Biosphere: all the communities and biomes of the world.

6) Ecosphere: the biosphere interacting with other components of the earth. The global ecosystem.

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Prof. Ngamjiaho Kipgen
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

Principles of Ecology

- Ecology – study of relationships between living and nonliving parts of the world
- Ernst Haeckel (1866) first to use the word to name the study of how organisms fit into their environment



Ernst Haeckel

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Prof. Neampanoao Jogen
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

SOME BASIC PRINCIPLES OF ECOLOGY

- 1) All levels of organization overlap and interact.
- 2) Within ecological systems virtually everything is related to everything else.
- 3) The abundance and distribution of living organisms on earth are affected by aspects of the physical, biotic and social environment.

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- 4) Biotic communities differ in the numbers and kinds of species, the diversity of species, and the roles or ecological niches in the community.
 - 5) The species in biotic communities form networks of relationships or symbioses, which may be either favourable or unfavourable for each species.
 - 6) Different ecological communities have analogous components and may be similar in basic organization even though their constituent species are very different.

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- 7) Biological interactions are usually multiple and cumulative. Rarely, if ever, do interactions occur singly or in isolation.
 - 8) Interactive synergisms are often. Several factors working in combination often have a result that is more than the sum of their individual effects.
 - 9) Ecological reactions and interactions are often delayed.
 - 10) Threshold effects are common in ecological systems.
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Environmental Development
Prof. Nganmahaogogen
Department of Humanities and Social Sciences
Indian Institute of Technology Jharkhand*



11) Human populations are subject to ecological principles, although we artificially dissociate ourselves from other living systems. All of our activities and even our advanced technologies are ultimately dependent on nature.

12) Planet earth is a finite and closed ecological system that depends on solar energy. Within a closed ecological system, all life-support material must eventually be recycled, and no component of the system can expand indefinitely.

*NPTEL Online Certification
Prof. Agamjehao Kipgen
Department of Humanities and Social Sciences
Indira Institute of Technology Jhansi
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Relationships

- All living things form relationships with other living things
- Symbiotic Relationship – a relationship between organisms of two different species that live together in direct contact



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of. Namjiahao Kipgen
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

Ecosystems provide the central theoretical framework for ecology

They can be analysed in terms of four basic components:

- 1) abiotic substances (**water, oxygen, nitrogen, etc...** when outside living organisms).
- 2) producers (green plants and bacteria) *autotrophic*.
- 3) consumers (organisms that utilize organic materials manufactured by producers) *heterotrophic*.
- 4) decomposers (bacteria and fungi) *saprophytic*.

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- ▶ The fact that ecosystems are self-regulating does not mean that they are simple or stable. The increase in producers is said to create positive feedback on consumers, whereas the increase of consumers creates negative feedback on producers.
 - ▶ Biogeochemical cycles provide both a theoretical and practical basis for studying ecosystem function: hydrologic, carbon, nitrogen, phosphorus and sulphur.

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Prof. Nirmalabati Guwahati
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

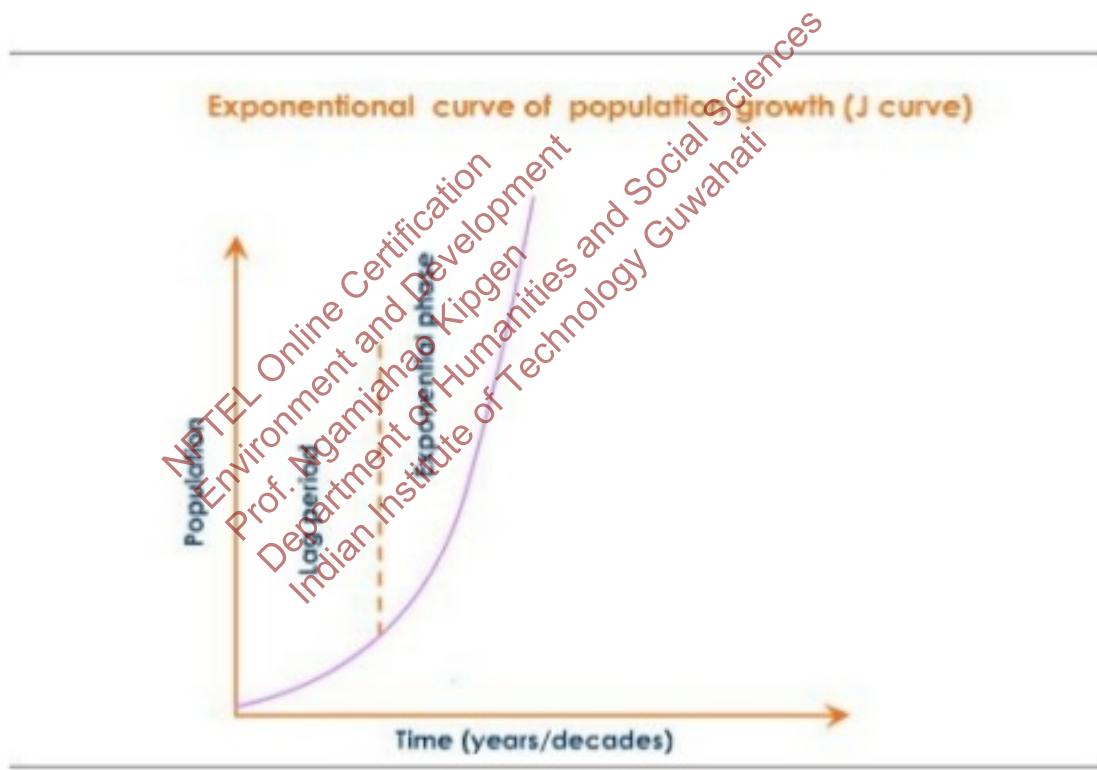
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- ▶ Ecosystem homeostasis refers to a relative balance of nutrient cycles, energy flows, and species and composition in ecosystems.

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Prof. Ngamjahao Kipgen
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

J-curve growth curve

- ▶ Exponential population growth: When resources are unlimited, populations exhibit exponential growth, resulting in a J-shaped curve
- ▶ A population graph with J-shape growth curve represents exponential growth (growth without limits), in which growth rate becomes faster and faster as the population grows in number or size.
- ▶ In exponential growth, growth rate is directly proportional to the population size or number.

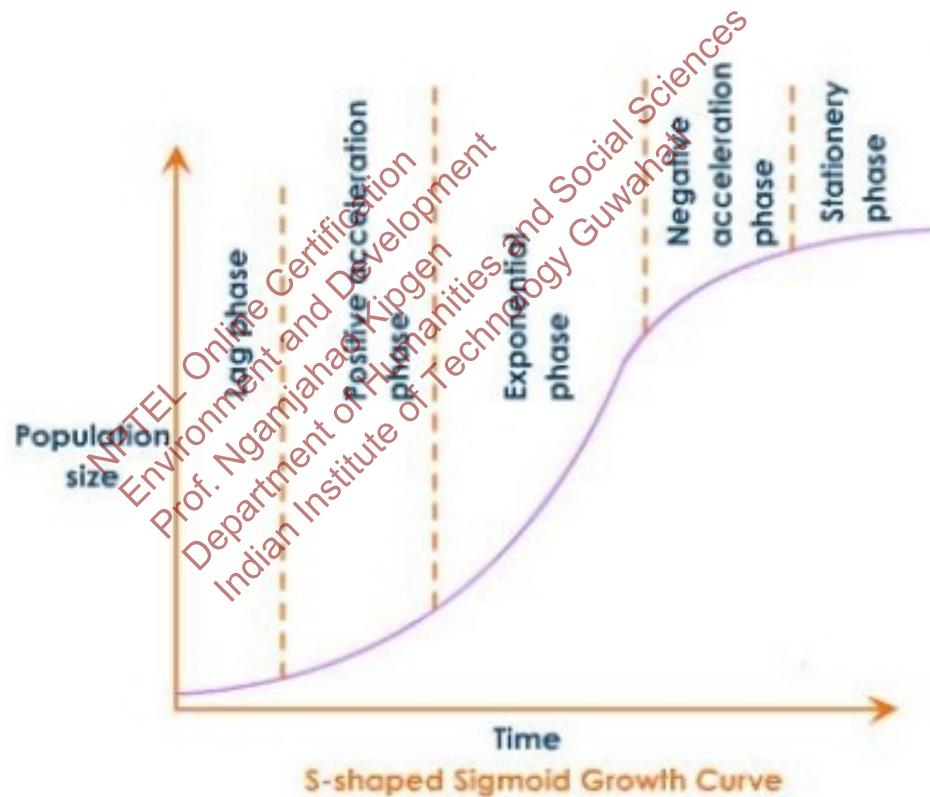
J-Curve Population Graph



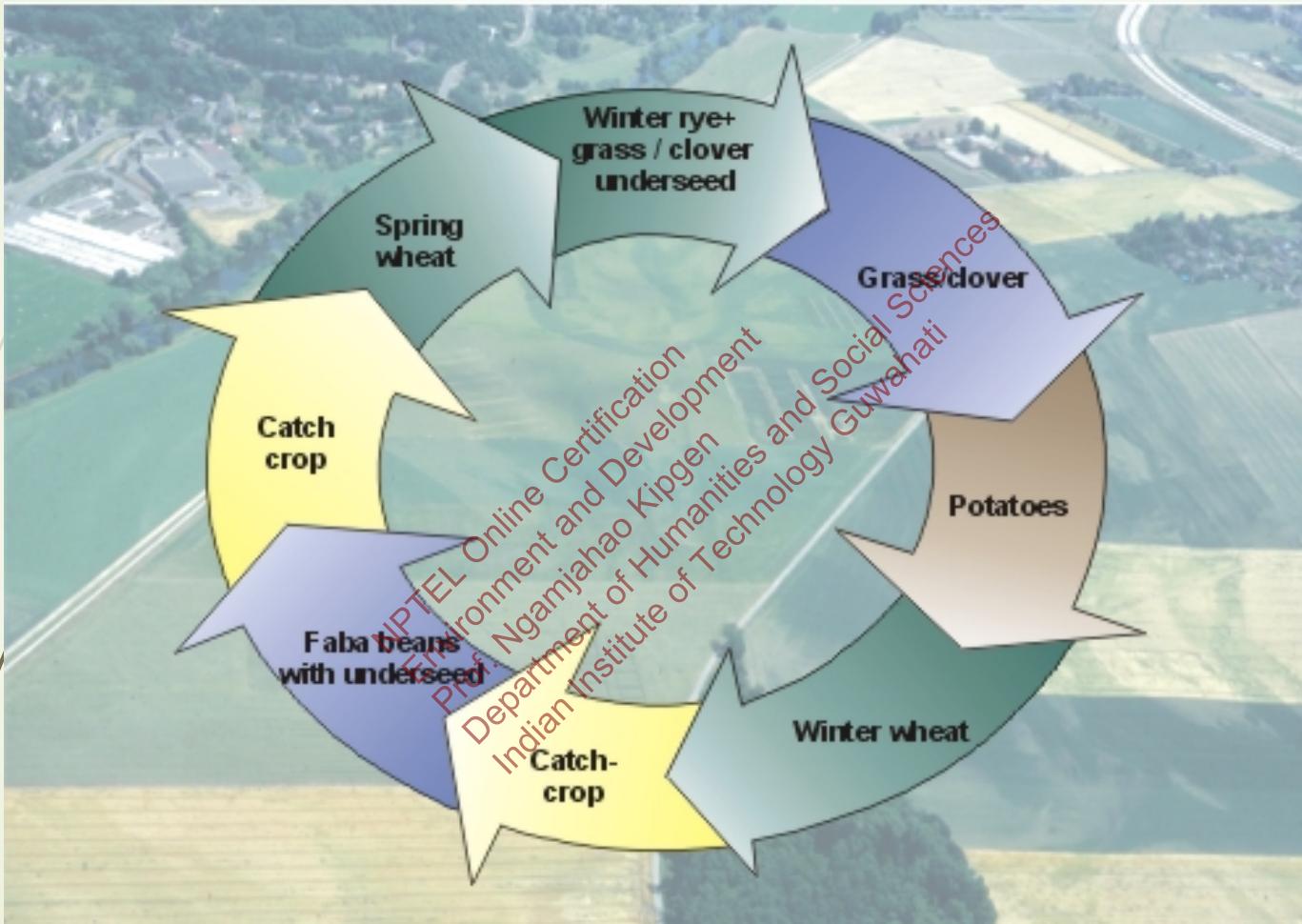
S-shaped growth curve (sigmoid growth curve)

- ▶ A pattern of growth in which, in a new environment, the population density of an organism increases slowly initially, in a positive acceleration phase; then increases rapidly, approaching an exponential growth rate as in the J-shaped curve.
- ▶ When resources are limited, populations exhibit logistic growth. In logistic growth, population expansion decreases as resources become scarce. It levels off when the carrying capacity of the environment is reached, resulting in an S-shaped curve.

S-Curve Population Graph



Crop rotation



High Farming



Two important innovations: animal fodder (turnips, chards) and nitrogen-enriching fodder (alfalfa and timothy-grass)

EARTH SYSTEMS

