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Urban and Territorial Ecology

Alexandru-Ionuț PETRIȘOR, PhD (Ecology), PhD (Geography), Habil. (Urban Planning)

COURSE INFORMATION

Program of studies	Faculty of Urban Planning, Doctoral School of Urban Planning
Type of course	Required course and studio
Level of course module/unit	PhD
Number of ECTS credits	3 + 3
Competences to be developed	1. Understanding main concepts of ecology 2. Understanding systemic organization of live matter and holistic approach to environmental issues 3. Correct use of the technical jargon and specific concepts
Objectives	The course aims to familiarize students with the systemic interpretation of the human habitat in its relationship with the natural components of the environment, premise for understanding the dynamic of their relationship and sustainability.
Teaching methods	Lectures, PowerPoint presentations, discussions.
Evaluation	Attendance of at least 75% results in the accumulation of 3 credits.
Bibliography	1. Petrişor A.-I. (2011), *Systemic theory applied to ecology, geography and spatial planning*, Lambert Academic Publishing, Saarbrücken, Germany, 172 pp. 2. Petrişor AI (2013), *Are human settlements ecological systems?*, Oltenia. Studii şi comunicări. Ştiinţele Naturii 29(1):227-232 3. Petrişor AI, Petrişor LE (2014), *25 years of sustainability. A critical analysis*, Present Environment and Sustainable Development 8(1):175-190

Introduction to Ecology

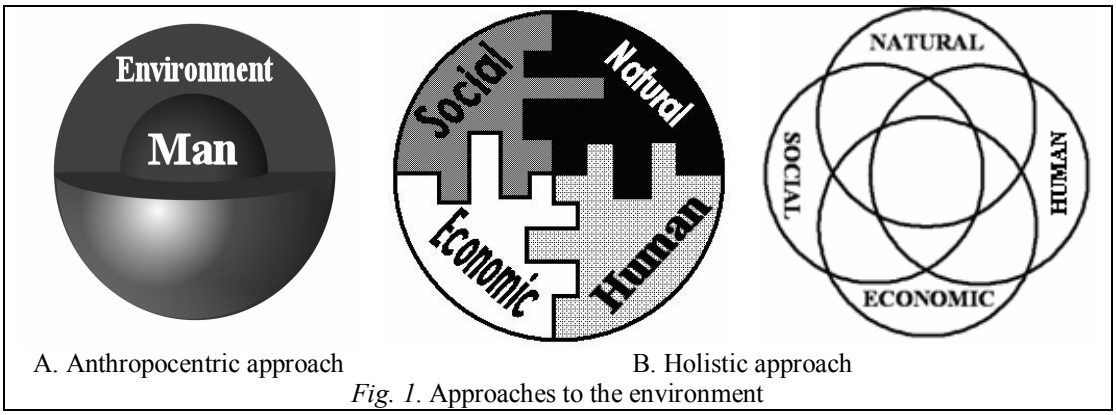
The Environment

Views on the environment could be classified as either anthropocentric (man-focused) or holistic (no focus) - *Fig. 1*. Anthropocentric views (*Fig. 1A*) are sectoral (the so-called natural environment is divided into *environmental factors*: water, air, soil, flora and fauna) or un-sectoral. The holistic approach does not make any distinction between the natural and man-made (man-dominated) systems. All the following concepts rely on the holistic approach (*Fig. 1B*).

Holistic definition of the environment: the environment is the hierarchy of organized ecological systems.

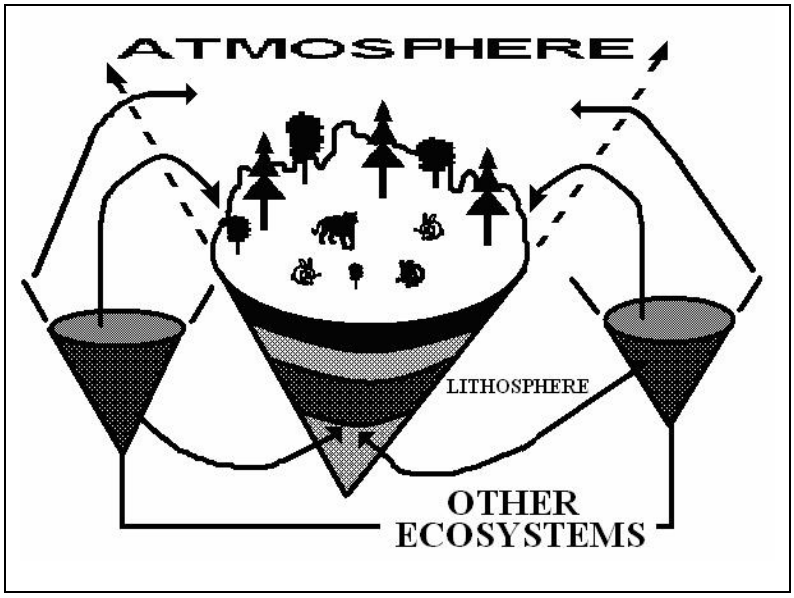
An ecological system (*Fig. 2*) consists of a lifeless (***abiotic***) component, *i.e.*, all geological, geographical, climatic etc. factors, and a live (***biotic***), component, *i.e.*, all vegetal and animal species. The two are tightly connected and form a whole. Ecological systems depend on exchanges with other similar systems. The transition area between two ecosystems is called *ecotone*.

The main functions of ecological systems are ***biogeochemical circuits*** and ***self-regulation***; the later provides for the continuity of structure in time and space in a dynamic equilibrium, as ecological systems evolve continuously through ***ecological succession*** / ***adaptive cycles***.



A. Anthropocentric approach B. Holistic approach

Fig. 1. Approaches to the environment



The first function is carried via food chains and webs (*Fig. 3*). Matter circulates via metabolism (organisms eat each other, substances are decomposed and used to build own constituents), while energy is embedded in chemical links and spent in metabolic processes. Since the numbers and biomass decrease across food chains, a better representation is the food pyramid (*Fig. 4*).

Ecological systems suffer transformations in time, maintaining their stability through self-regulation under dynamic equilibrium conditions. These transformations are called generically *succession*. Primary succession occurs after catastrophic events that destroy the biocoenose completely. Secondary succession represents the gradual transformation of a biocoenose into a new one (*Fig. 5*).

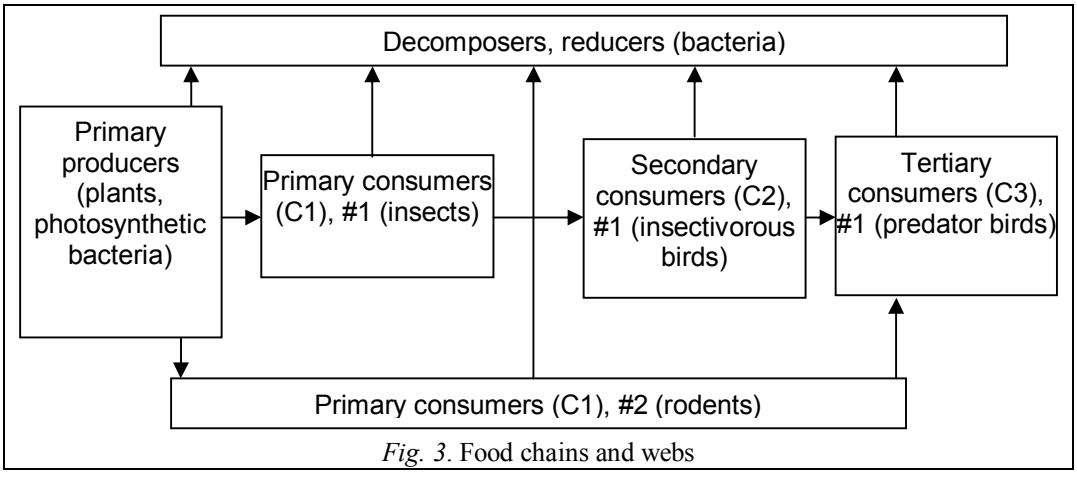


Fig. 3. Food chains and webs

Interpreting the stability of ecological systems (Vădineanu, 1998);

- ***Resilience*** – speed of the return of variables to equilibrium after impact – large for stable systems
- ***Persistence*** – conservationism to impacts – measured by duration of stability under impact – large for stable systems
- ***Resistance*** – amplitude of changes under impact – small for stable systems
- ***Variability*** – frequency of changes under impact – small for stable systems.

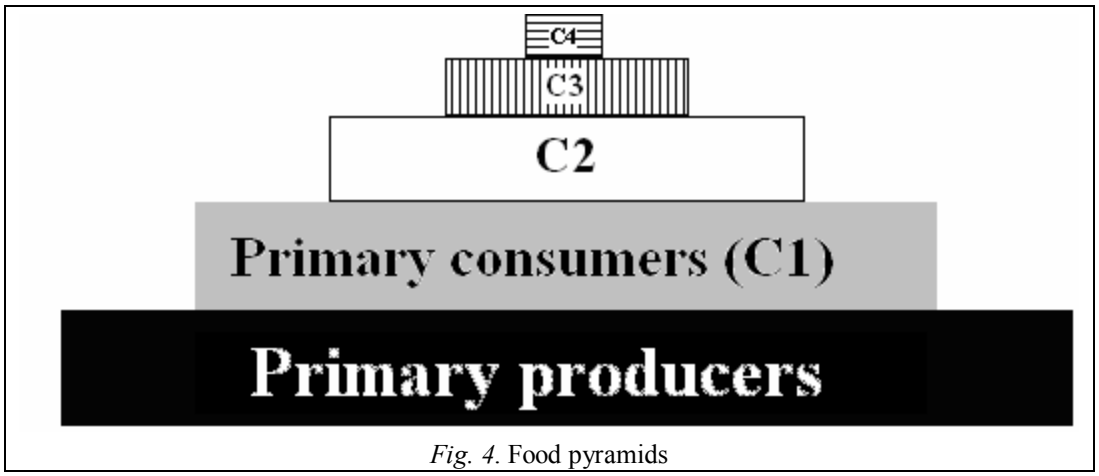


Fig. 4. Food pyramids

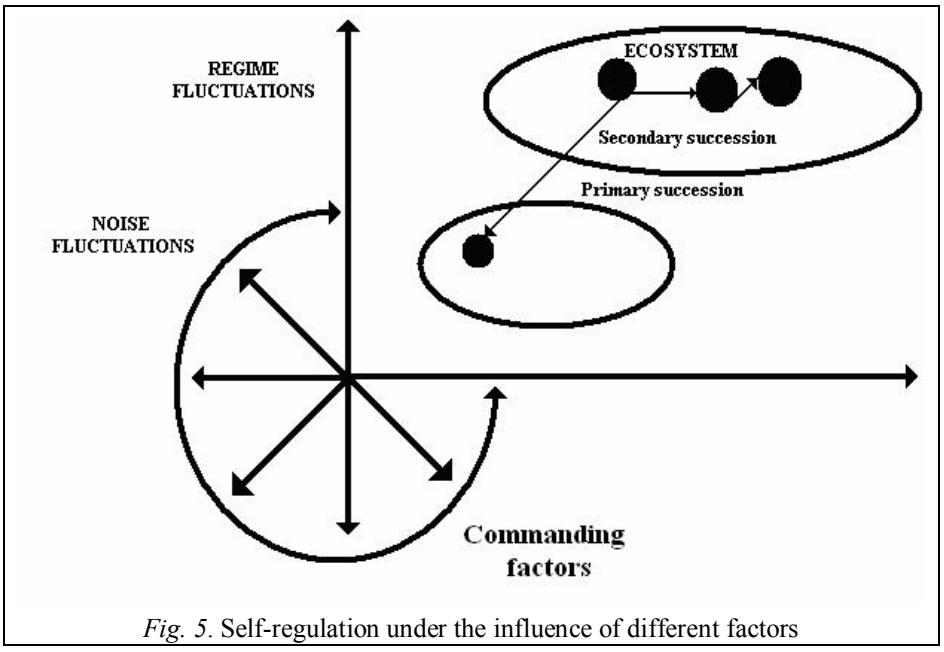


Fig. 5. Self-regulation under the influence of different factors

Ecological systems form a hierarchy (*Fig. 6*).

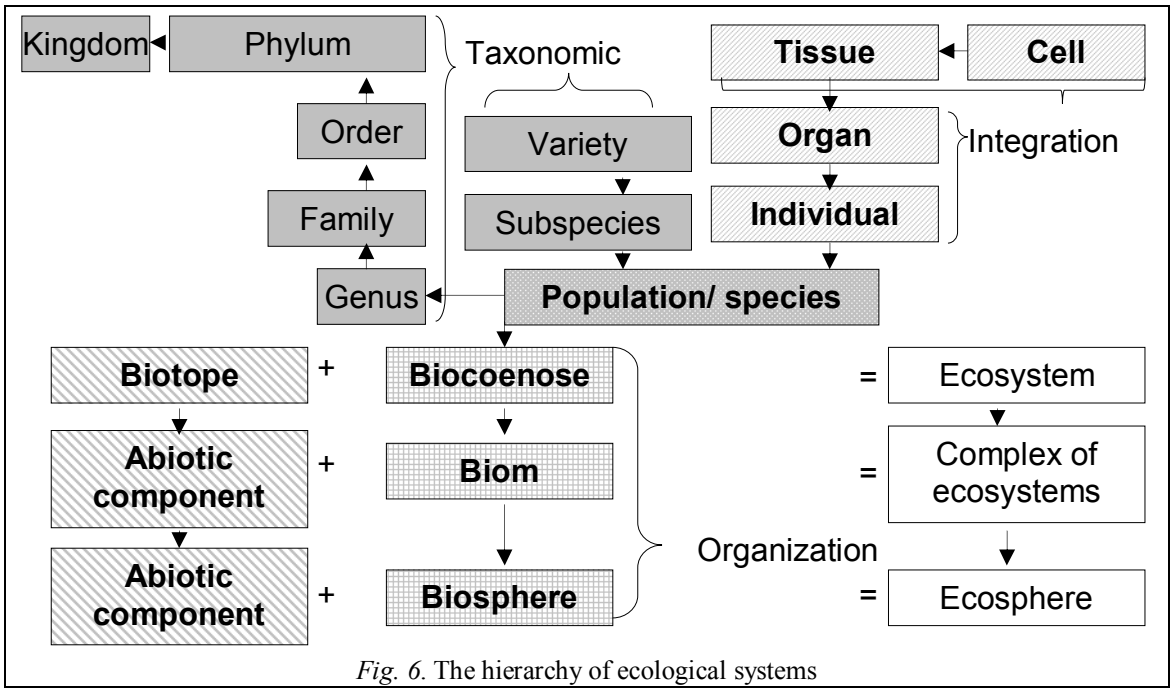


Fig. 6. The hierarchy of ecological systems

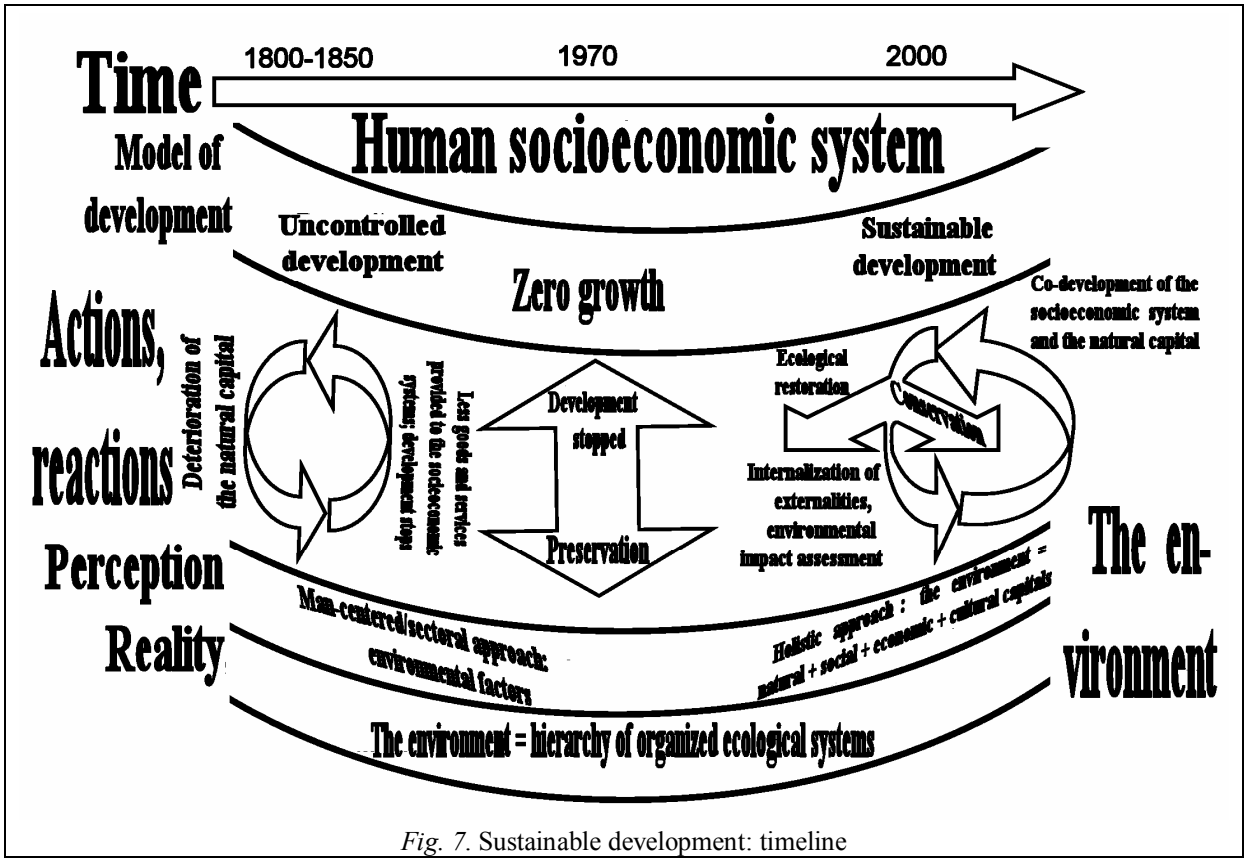


Fig. 7. Sustainable development: timeline

Deterioration of the Environment

The concept is an "umbrella" covering negative environmental effects of human activities: pollution – linearization of food and energy circuits, loss of biodiversity, fragmentation of habitats, introduction of alien species, genetic manipulation, construction of dams and other water works etc.

The leading causes are the growth of human population and its needs. Abraham Maslow has proposed a pyramid of needs: (1) physiological, (2) safety, (3) social acceptance, (4) self-esteem, prestige and success, and (5) self-realization.

Responses to the Deterioration of the Environment

1. "Zero-growth" solution – Club of Rome, 1972
2. Sustainable development: equally meet present and future needs (1987 – Brundtland Report, 1992 – Rio de Janeiro). Sustainable development equally implies a sustainable (wise) use of natural resources within the limits of the carrying capacity, conservation of biodiversity (via natural and cultural protected areas), ecological restoration of deteriorated systems and preventive actions embedded in sectoral development strategies, including the internalization of environmental costs and environmental impact assessment. The main components of sustainable development are displayed in *Fig. 7*. The carrying capacity represents the ability of a system to maintain its structure and function, producing a certain amount goods and services for a given human population.

Conservation: the "zero-growth" model promotes strict conservation called *preservation*; in sustainable development, conservation means to bring a system to a condition where it can self-regulate (within the limits of its carrying capacity).

Biodiversity

Rio de Janeiro convention on biological diversity: variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

What means: diversity of biocoenoses, biotopes; of complexes of ecosystems (including ecosystems), of human population and artificial ecological systems.

Components:

- Ecological diversity, at several levels: complexes of ecosystems, species and ecological niches
- Diversity of organisms – taxonomical hierarchy
- Genetic diversity – genotypes, frequency in populations
- Cultural diversity – interaction of man at all levels, traditional lifestyles

Modeling man-dominated systems