

THE ANTHROPOSYSTEM AS AN INTERACTING FUNCTIONAL UNIT

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ABSTRACT

The objective of this paper is to construct an analytic framework for the interaction of man with the environment. The term anthroposystem is proposed as the name for the interacting functional unit produced by man for the purpose of maintaining his own civilization. Recognition of the concept of the anthroposystem would be helpful in understanding and analyzing the issues presented by environmental problems.

DEFINITION AND COMPONENTS OF THE ANTHROPOSYSTEM

The study of man and his environment covers a very broad range of subjects. The human environment, for example, includes the combination of physical and biological conditions that affect and influence man, and the complex of social and cultural conditions affecting the nature of an individual or community. Thus, in order to study man and his environment one would need to know biology, chemistry, physics, sociology, psychology, medicine, geology, geography, economics, engineering, law, or just about all of the disciplines in a university curriculum.

It is suggested that, for academic convenience we disregard the distinction between man and his environment and consider, instead, man and his environment as an interacting unit called the *anthroposystem*. The system is a functional and structural unit of interwoven and overlapping hierarchies of organization which maintain human civilization. We can then divide the anthroposystem into components on the basis of what they do to influence

man's chance of survival in a stable environment. When this approach is followed, the unit may be broken down into four major components which can be separately defined and logically analyzed. Figure 1 illustrates the four components of an anthroposystem: matrix, producers, consumers, and decomposers.

The matrix in anthroposystems is composed of all non-living and non-productive parts of the system such as buildings, streets, air, and water. The matrix provides the edifice or fabric in which the other components operate. The producers include two categories: agricultural and industrial. The agricultural producers are plants, such as wheat, barley, rice, and corn, while the industrial producers are the machines and tools operated by man to produce shelter, clothing, transportation, and so forth. The consumers are man and his domesticated animals. The decomposers in the anthroposystem are the waste-water treatment plants, recycling plants, electrostatic precipitator, spray collector, or scrubber, etc. A fully functional decomposer component would serve to maximize the recycling of materials. Therefore, the anthroposystem can be considered to be a functional unit or self-contained system, as long as it has an energy source. Today, however, the materials no longer needed are usually not recycled but are dumped into surrounding environments. This dumping causes the pollution of the environment and the depletion of natural resources.

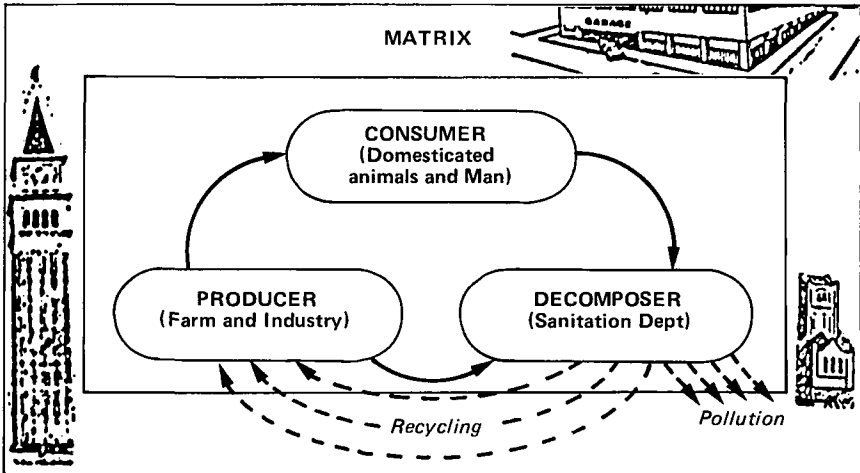


Figure 1. The anthroposystem is one of the simplest constituents of the biosphere which operates to form a functional stable unit. The diagram demonstrates the relationship of the four components of the anthroposystem with the arrows pointing to some of the major pathways of materials.

ECOSYSTEMS AND ANTHROPOSYSTEMS

Ecology is defined as the study of the interaction of organisms with each other and with their environment. The term ecosystem refers to the interacting system of organisms and their non-living habitat [1]. Recently, Odum [2] gave a more comprehensive definition of an ecosystem as "Any unit including all organisms (i.e., the community) in a given area interacting with the physical environment so that a flow of energy leads to a clearly defined trophic structure (i.e., nourishment), biotic diversity, and material cycles (i.e., exchange of materials between living and non-living parts) within the system is an ecological system or ecosystem." The biosphere is the whole zone at the surface of the earth occupied by living things [3]. Thus, we can argue that there are two fundamentally different units in the biosphere: human systems and ecological systems [4].

It is generally agreed that ecosystems have four functional components [5-7]. The matrix, in natural ecosystems is composed of all the physical or non-living factors, such as water, soil, air, temperature, and light. The matrix provides the building or edifice in which the community operates. The producers are photosynthetic or chemosynthetic organisms such as plants and some bacteria which are capable of making their own food. The consumers are the herbivores, carnivores, scavengers, and parasites. They cannot make their own food. The decomposers are primarily fungi and some bacteria. They serve a very important function in the ecosystem through recycling of the elements. If there were no decomposers, all the elements used by the producers and consumers would remain imprisoned in their bodies when they died. The decomposers, however, break down the dead bodies, and turn producers and consumers into inorganic compounds. These inorganic compounds are then available for producers to make more organic compounds. It is a closed repeating cycle.

The ecosystem is the structural and functional unit of ecology because, in theory, it can survive forever as long as it has an external energy source. Ecosystems are so complex, that up to now, no scientist has been able to isolate and maintain an entire ecosystem. Similar to an anthroposystem, an ecosystem is one of the simplest segments of the biosphere that can, theoretically, exist independently.

The anthroposystem differs from ecosystems in several basic ways. For one thing ecosystems depend primarily upon sunlight as a direct source of energy, while the anthroposystem uses other sources of energy, in addition to sunlight, such as hydropower and nuclear energy.

Another example of the difference between the two systems lies in the fact that the decomposers in the anthroposystem are not as developed as in ecosystems. Ecosystems rely on their decomposers to break down dead plants and animals, and to recycle waste materials. The anthroposystem lacks these efficient, natural decomposers. Because the anthroposystem recycles very few

of its waste materials which are no longer usable, they are dumped into the environment where they accumulate and cause pollution. Parasitic and destructive nature of the anthroposystem results in the depletion of natural resources and the contamination of the environment. A detailed discussion of natural resources and/or pollution is beyond the scope of this paper.

GENERAL CONSIDERATIONS

The anthroposystem model aids in understanding the ways in which the real world diverges from the ideal. This in turn, helps to identify possible targets for action. For example, the agricultural producer component (e.g. croplands, range farms) provides the consumer's everyday need for food. Natural ecosystems also play an economic role. These ecosystems have carrying capacities of their own. What rights should they have? Should ecosystems be given the right to maintain their structure and function or "ecological integrity" [8], or will economic consideration be used to veto the rights of their species (e.g. Tellico project)?

The model is also a working plan that has a wide range of applications and can be used to formulate other principles and laws. This is especially true if we consider that the interaction of man and his environment would be difficult to comprehend without clear-cut experimental theories. Today the study of man and his environment may be considered largely a descriptive science. However, out of necessity, it will become more of an experimental science in the future.

Certain well-formulated generalizations are indispensable to the unification and clarification of the relationship that exists between man and nature; they would help the student to form basic theories. These theories, as in other sciences, should be based empirically on observation and experimentation. Increasing scientific sophistication, of course, will make it necessary to revise earlier theories.

More progress has been made in dealing with discrete factors of our environment (e.g. with air and water pollution) than with the relationship between man and his environment. This, of course, is due primarily to the fact that everyone can see and feel the immediate effects of pollutants. But it tends to obscure the most important and fundamental issue facing the biosphere. There has been a failure in the identification, measurement, and inclusion of all the variables interacting to form the various ecosystems and anthroposystems. Whole system modeling, however, is gaining a toehold in some areas of environmental studies [9].

The "people must be helped to develop a world perspective focusing on the structures that sustain life and will determine the quality of life in the future. . . ." [10] I believe that the anthroposystem model should aid mankind in getting a firm grasp of the broad picture of its place in the biosphere.

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