Unesco-UNEP international Environmental Education Programme

Environmental Education Series 18

THE BALANCE OF LIFEKIND: AN INTRODUCTION TO THE NOTION OF HUMAN ENVIRONMENT

Division of Science, Technical and Environmental Education

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PREFACE

This module is an introduction to the notion of human environment. It is intended for teachers and pupils of lower secondary school level, and attempts to clarify and articulate in a holistic perspective principal concepts and notions related to natural, social and cultural dimensions of the human environment.

Proper understanding of the notion of human environment is essential for the attainment of the objectives of environmental education (EE), i.e. a better comprehension of environmental complexity and more efficient individual and collective action in coping with environmental problems.

The module was initially elaborated in the form of an information booklet by Dr David Archibald, consultant at the Madison Public School, Wisconsin, USA. Within the context of the UNESCO-UNEP International Environmental Education Programme, it was subsequently restructured and tested as an educational module by Dr Noel McInnis, specialist in EE curriculum development at Madison, USA.

Pupils and teachers involved in the testing of the module expressed keen interest during its application. They found it particularly useful as an overall framework for introducing interdisciplinary practice in EE.

The experimental nature of the module should be emphasized. The teacher should use the proposed content and activities in a critical spirit, systematically adapting them to local conditions and evaluating the results obtained.

TABLE OF CONTENTS

THE BALANCE OF LIFEKIND

Guide for the Teacher

GENERAL INTRODUCTION

This modular unit provides a global perspective to which the teacher may relate all other environmental studies. This perspective is comprehended within the relationships among 15 concepts : the balance of lifekind, human environment, global environmental system (biosphere), ecosystems, human systems, energy, food, agriculture, evolution (adaptation), culture, population, community, interactions (feedback) and values. These concepts are elaborated in the «Introduction" to the Student's Guide, and in the section below, entitled «Network and Sequence of Concepts".

Most of the concepts in this unit are already familiar to students. In most cases, only the interrelationship of these concepts will be experienced as new. The one certain exception is the newly coined term, «lifekind". «Lifekind" is the concept that makes this global perspective possible. In the experience of the author and of others who have worked with this concept, "lifekind" and "balance of lifekind" bring to the study of environment and ecology a greater sense of tangibility than the terms "nature" and "balance of nature". The lifekind concept is not, however, suggested as a substitute for the concept of nature. It is merely a supplementary concept that distinguishes what nature — at least Earth's nature — is ultimately about.

The chief value of this modular unit is that it provides a common terminology for the understanding of both biological systems and human cultural systems. The common-sense terminology of this unit can be translated into the average vocabulary of any language, and can be understood by the average reader of any language.

The teacher is urged at this point to read the "Introduction" to the Student's Guide before proceeding with the Teacher's Guide.

Preliminary Examination:

Interest in and attention to this unit can be enhanced if students are questioned on their present understanding of the unit's subject matter prior to their reading. This preliminary examination is offered, therefore, not as a test to be critically marked, but as an opportunity for students

to think, share and discuss among themselves and with the teacher their existing knowledge of the unit's subject matter. Rather than being told whether their thinking is "right" or "wrong", if students are asked to decide this for themselves as they read the "Introduction" to the Student's Guide, their motivation to learn from this unit will be greatly enhanced.

1. This modular unit is entitled "The Balance of Lifekind". If this is the first time you have seen the word "lifekind", what do you suppose it means? What do you suppose "balance of lifekind" means?

2. How many of the following terms can you define?

adaptation	food chains
balance	interactions
biosphere	photosynthesis
culture	technology
ecosystems	thermostat
evolution	values
feedback	

3. Describe at least two ways in which energy and food are related.

4. What are some differences between a population and a community?

5. How are technologically constructed environments, such as buildings and cities, similar to the environments that surround them? How are they different?

6. How are humans different from all other creatures?
   What differences does this make, when compared with other creatures, in how humans relate to their environments?

7. Which of the following is most dependent on the other?

   environment
   technology

8. Are there limits to which humans can change their environments?
   If not, why are there no limits?
   If so, what determines the limits?

9. Are there limits to which humans can adapt to their environments?
   If not, why?
   If so, what determines these limits?

Objectives:

General Objectives.

To learn a common terminology for the description of both biological systems (ecosystems) and human cultural systems.

To learn the similarities and differences between biological systems and human cultural systems.

To learn a new point of reference for environmental studies : the balance of lifekind.

Behavioral Qbjectives.

To compare and contrast the functions and effects of ecosystems and human systems on the balance of lifekind, utilising the terminology presented in this unit.

To evaluate one's own values in terms of the compatibility of these values with the balance of lifekind and with the maintenance of a preferred lifestyle.

Network and Sequence of Contents:

The material in the "Introduction" to the Student's Guide makes it possible for students to compare and contrast ecosystems and human systems, as a basis for considering which human behaviors and cultural values are more or less compatible with the balance of lifekind.

The more profoundly critical comparisons and contrasts between ecosystems and human systems, which require maturity of understanding, have been reserved for this section of the Teacher's Guide. Suggestions for the use of this additional material are presented in the section to follow, entitled "Network and Sequence of Activities".

Ecosystems and Human Systems : The Limits to Both

Human systems have become a source of growing instability in the biosphere. Some of the reasons for this become apparent when human systems are compared with ecosystems.

Ecosystems	Human systems
Energy	
Ecosystems are sustained by an unlimited energy source : solar radiation.	Human systems are presently sustained by a finite energy supply: fossil fuels.
The balance of lifekind was established prior to the existence of human systems. This balance developed over billions of years, and is governed by the daily and seasonal flow of solar radiation into Earth's biosphere and ecosystems.	Advanced technological societies burn fossil fuels so extensively that large amounts of additional heat energy are released into the biosphere.
The biosphere and its ecosystems were not evolved to accommodate energy in significant excess of the amount received via solar radiation. At some point, excess energy in the biosphere must produce feedback that establishes a different balance of lifekind.	The present scale of human fossil fuel consumption releases enough heat into the biosphere to alter the temperature—and thus the balance of lifekind— in many of earth's ecosystems. Nuclear energy and artificially concen trated solar energy will have similar effects.
Food/Agriculture	
Most of the energy stored in food is used up by the organism that consumes the food. In biological food chains, approximately 10 calories of one organism are needed to produce 1 calorie of another. For instance, it takes about 10 calories of grain to	The planting, cultivating, harvesting/slaughtering, processing, transporting, packaging, market ing, merchandising and preparation of food in the home requires approximately 10 calories of fossil fuel energy for each calorie of food energy delivered to our table.

produce 1 calorie of animal. (Calorie ration—10:1)	In energy terms, humans have added one more link to their food chain : 100 calories of fossil fuel are required to produce the 10 calories of grain (bread) that produce 1 calorie of human. (Calorie ratio—100:1)

Evolution/Culture

Biological evolution adapts all organisms and their supporting systems to the processes that sustain life.	Cultural evolution presently subordinates Earth's organisms and life-support systems to the processes that sustain techno-logy.

Population

Ecosystems maintain population levels of each species within the limits of natural checks and bat-ances, including such factors as locally available food and shelter, and the presence of natural enemies and disease.	systems allow a few popula tions (humans, cattle, dogs, cats, etc.) to grow as rapidly as we are able to increase their food and shelter and to eliminate natural enemies and disease via pesticides, herbicides and (in the case of micro-organisms) medicine.

Community

Ecosystem communities feature a large diversity of species who live within the limits of local resources.	Human communities tend to ex clude most species, and are sustained by resources from far beyond their local area.For example, almost every country in Earth's northern hemisphere draws its energy and material resources from every major ecosystem on the planet.
Populations and communities tend to be rather evenlydis-persed in ecosystems.	Human populations tend to con-centrate in locations determined by proximity to large bodies of water or by convenience for their transportation networks.In certain countries, over 95 per cent of the human population lives on less than 5 per cent of the land.

Interactions

Communities in ecosystems are organized around the interactions of biological functions and processes.	Humans increasingly organize their communities around the interactions of technological functions and processes,such as transportation and utilities networks.
In ecosystems, most organisms interact with a large variety of other organisms.	

Balance

Ecosystems are immediately governed by a common process of natural checks and balances, including the availability of light, food, water, oxygen, habitat and the presence or absence of natural enemies and disease	Human systems are immediately governed by competing sets of cultural checks and balances, including those of ideology, religion, custom, law politics and economics These arrange-ments take little or no account of the requirements of lifekind other than humans.

Throughout these comparisons a common theme prevails : the increasing preoccupation of human systems with technological concerns.This preoccupation distracts us from some basic realities of our participation in the balance of lifekind:

- Our technological capabilities are limited by Earth's material resources;

- Earth is limited in its ability to accomodate human technology without major alterations in the natural systems that sustain the balance of lifekind.

The limits to adaptation

The limits to what Earth has for us to take from it are paralleled by the limits to what Earth can take from us. Human disruption of the balance of lifekind is provoking changes in Earth's biosphere, changes in temperature, weather patterns and climate. Such changes affect the survival conditions for many populations, including our owns For instance, changes in climate can greatly affect the ability of human agricultural technology to produce food in the quantities needed to sustain our present level of population.

Perceiving the global environmental consequences of human activity is very difficult for most of us, because the effects of each local activity are diffused throughout the biosphere. Since it is the combined and accumulated effects of human systems that threatens the biospheric balance of lifekind, no particular imbalance seems to be cause for- alarm. Unquestionable evidence of a major threat to the present balance of lifekind will be available only when many of the alterations we have set in motion have become irreversible. But to wait for unquestionable evidence that we are destroying the present balance of lifekind is to wait until we ourselves are the victims of that destruction. This is why the questions raised in this modular unit must be given careful consideration by every thinking citizen of planet Earth.

Network and Sequence of Activities:

The purpose of this unit being to help students think of themselves within the larger context of lifekind, it is far more important that they become aware of and comfortable with this frame of reference than that they attain a sophisticated mastery of its description. For this reason, the activities in the Student's Guide were chosen to encourage a way of thinking rather than to inculcate the ability to recite the details presented in the reading material.

The teacher's responsibilities for the student activities is twofold: to assure that they understand what they are being asked to do, and to provide the opportunity for them to share and discuss among themselves—under the teacher's supervision—the results of their activity. It may not be feasible for each student to complete every activity. It is important, however, that each activity be performed by a few members of the class and that all class members benefit from the sharing and discussion of each activity's results.

The teacher will use his/her judgment as to the extent and type of use that is made of the additional material on environmental limits presented above. It could be reproduced for students to read, or it could be presented verbally. Perhaps the most effective way to present it is to wait until the students have completed their activities, and then ask them leading questions that enable them to think their own way to an understanding of environmental limitations. The teacher can present as much of the above material as seems appropriate in the context of the class discussion of the leading questions. The most important thing is to avoid the "doomsday" psychology that so often accompanies the discussion of environmental limitations. This is best accomplished by considering the opportunities for constructive change in human systems that are presented by environmental limitations.

Evaluation:

The following questions are designed to assess the student's understanding of the major points presented in the reading material.

1. Explain how each of the following relates to the balance of lifekind:

energy	population
food	communities
agriculture	feedback
food chains	interactions
evolution	culture

2. Describe at least two ways in which energy and food are related.

3. List five life-supporting factors and three life-taking factors that are important in maintaining the balance of lifekind.

4. Explain what is meant by the statement, "all existence is mutual".

*5. Briefly describe the evolution of human culture in terms of the energy resources that have become available to humans at various points in history.

6. What is the relationship between agriculture and the evolution of human culture?

7. Describe two major differences between humans and other lifekind.

*8. Describe at least four ways that human systems differ from ecosystems.

*9. How are technologically constructed environments, such as buildings and cities, similar to the environments that surround them? How are they different?

10. Explain the following statement : ecological values are primarily concerned with the preservation of lifekind, while technological values are primarily concerned with human convenience. Do you agree with the statement? Give your reasons for agreeing or disagreeing.

*The asterisked questions can be answered more extensively by students who have been acquainted with the comparative information in "Network and Sequence of Concepts" above. The following questions are for those who have also considered the issue of environmental limitations.

11. What is the ultimate limiting factor in both ecosystems and human systems? Describe how this limiting factor affects each of these systems.

12. How could the balance of lifekind be affected by continued increases in energy consumption by humans?

13. How would scarcity of material resources—fuels, minerals and metals—affect the balance of lifekind? Are these resources as essential for the support of lifekind they are for the support of human lifestyles? Why or why not?

Bibliography:

The bibliography in the Student's Guide is equally valuable to teachers, especially You Are An Environment which was written with both teaching and learning in mind. In addition to these books, the following are recommended for teachers:

. DuShane, Judy et. al. "Whole Earth Education : A Future Look at Environmental Education". Columbus, Ohio. State Department of Education, 1978.*

this document provides an excellent rationale for learning processes that require, as does this unit, a commitment to the pursuit of wholeness in the participants and a view of the Earth that is holistic.

. UNESCO/UNEP, "Guiding Principles of Environmental Education Programmes" . . .

* Requests for this document should be addressed to John Hug, State of Ohio Department of Education, Columbus, Ohio, U.S.A. 43215.

THE BALANCE OF LIFEKIND

Guide for the Student

INTRODUCTION:

Lifekind

Although this may be the first time you have seen the word "lifekind", you will find it to be a very useful word.

Just as the word "humankind" enables us to refer to all human beings at once , so does the word "lifekind" allow us to refer to all living things at once. There is good reason for having a single word that represents all living things. It enables us to refer more easily to those things which all organisms have in common. It also enables us to understand more clearly the effects of the so-called "balance of nature".

Every planet keeps its natural forces in balance, but Earth is the only planet we know of whose balancing of natural forces has produced life. In acknowledgement of this unique result, it is very appropriate to designate Earth’s balance as "the balance of lifekind".

On Earth, the balance in nature maintains the balance of lifekind. How Earth’s balance of lifekind is established and maintained is the subject of this unit.

The Human Environment

Because of the balance of lifekind, all living creatures have one thing in common : they must adapt to their environments, and when their environments change they must adapt to the change. The adaptation of living creatures to their environments is a universal requirement from which no organisms are exempt. Adaptation is so essential to the balance of lifekind that the failure of a species to adapt leads to its extinction.

There is one species, however, that appears to be exempt from having to adapt to its environments. The human species has learned how to adapt environments to itself. Humans create technological environments—buildings-that have different lighting, temperature and humidity than the larger environments surrounding them. Humans also create machines—boats, cars, trains, trucks, airplanes—which enables them to concentrate their population in a small area and sustain themselves with supplies from beyond this area.

Humans are the only creatures that adapt environments to themselves. Humans are also the only creatures who can supply nearly all of their physical needs with materials imported from beyond their local environments. For these reasons, humans appear to be exempt from the universal requirement that all creatures adapt to their environment. The human environment— the environment that is created and sustained by human technology— appears to function according to a different system than the rest of Earth's environments.

Are humans exempt from the need to adapt to their environments? If so, is the exemption complete? If not, what are the limits to this exemption? These questions can be answered intelligently only if we understand the larger global environment system and the more localized ecosystems within which and by which human environments are sustained.

The Global Environmental System

Each square mile of Earth's surface contains material from every other square mile of Earth's surface. This happens as the global network of air currents and waterways carries dust, seeds and other particles from everywhere that is to everywhere else that is. The global network of air currents and waterways, along with all of the life that it sustains, is called the "biosphere". The biosphere is the life-containing and life-sustaining portion of the Earth. The biosphere ranges from a few miles above the ground to several feet below Earth's surface (or river/lake/ocean bottom). The biosphere is so essential that no earthly life can exist apart from it. Even astronauts in outer space are sustained by materials and systems taken or adapted from Earth's biosphere.

The biosphere is a global environmental system that regulates, via the movement of air and water, the pattern of climate and weather all over the Earth. Climate and weather, in turn, regulate the amount and variety of lifekind that inhabits each local area of the Earth.

Ecosystems

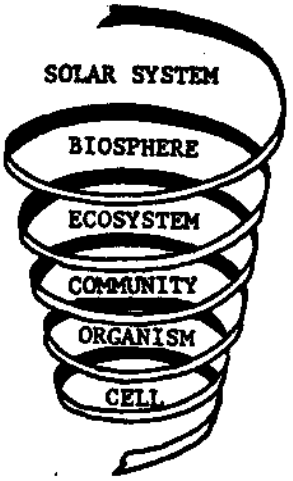
Earth's biosphere sustains millions of distinct—but never separate--smaller systems called ecosystems. The term "ecosystem" is used to designate the inclusive environment of a local area such as tide zone, a pond,a woodland, a valley, a field, a mountain, etc. There are seven basic types of ecosystems : tundra, desert, grassland, forest, jungle, fresh water and ocean.

Ecosystems are so completely integrate within the larger biosphere that it is impossible to define exactly where one ecosystem ends and another begins.

Ecosystems, like all other natural systems*, are maintained by the larger natural system that surround them. Thus, ecosystems are maintained by the constantly fluxuating activity of heat, light, air and water in the surrounding biosphere, just as the biosphere's activity is maintained by the steady forces of solar radiation and universal gravitation.

Within ecosystems, the balance of lifekind is maintained as follows: solar energy is converted by green plants into food for all living organisms. Through evolution, each population of organisms adapts to the ecosystem and community of other organisms that surrounds it. This adaptation is governed by interactions among life-supporting and life-taking factors which maintain all natural forces and activities in balance.

*A natural system is a set of interdependent forces and activities which check and balance one another in such a way that a selfregulating state of order prevails. The balance of lifekind is maintained by a hierarchy of natural systems:



Energy and Food

Solar radiation provides the energy that sustains all life on Earth. Via photosynthesis, green plants convert sunlight energy into a form of sugar called sucrose. This sugar energy, and its conversion into carbohydrates, is the basis for the growth, via cell-building activity, of the green plants that produce it. This energy, along with the vitamins, minerals and the other nutrients and cell-building materials that plants take up from the soil, is passed from creature to creature via networks of food chains. Food chains consist of producers (plants), consumers (animals) ans decomposers (micro-organisms in the soil that break down organic matter and recycle it for new growth).

Evolution

All creatures must adapt their behaviors and their physical structure to such environmental conditions as variations in temperature, moisture level, availability of shelter, the amount and types of available food, and the eating habits of other creatures. Because environmental conditions are constantly changing, the survival of any species depends upon the ability of its members to adapt to change. The process of adapting to changing environmental conditions is called evolution.

Population

Each species reproduces and forms populations of its own kind. Populations are limited in size and geographic area by such life-supporting factors as the availability of light, food, oxygen, shelter, water and space. They are also limited by life-taking factors, such as the presence of natural enemies, disease and adverse weather conditions.

Community

All existence is mutual. Each population depends upon neighboring populations even as the neighboring populations depend upon it. This interdependence of populations creates communities (local food chain networks) of plants, animals and micro-organisms. Communities range in size from less than an acre of pond, bog or forest bluff to thousands of square miles of lake, ocean, tundra, desert, jungle, grassland or forest.

Interactions

Everything that happens in the biosphere, in an ecosystem, in a population, or in a community, has some effect on everything else. Yet, despite trillions of mutual effects, order rather than chaos prevails in all natural systems. This order is maintained by a process called "feedback".

Perhaps the most familiar example of feedback is the interaction between a thermostat and a heating unit. Both the thermostat and the heating unit

respond to one another's feedback. The thermostat responds to the heater's feedback, a rise in temperature, by cutting off the heater's power; when the temperature lowers, the heating unit responds to the thermostat feedback, an electrical signal that reactivates the flow of power. (In refrigerators, a thermostat similarly regulates the cooling unit).

Feedback also governs interactions within the biosphere, ecosystems and communities. An ecosystem's initial response to a reduction in rainfall from the biosphere is a corresponding reduction in the growth of vegetation. If the reduction of rainfall is permanent, a new balance of lifekind is established in the area as 1) some species of plants die out and the animal population(s) dependent on those plants move elsewhere; and 2) other species of plants and animals that are adapted to the more arid climate occupy the area. If the climatic change affects a large geographic area, some plant and animal species unique to the area may become extinct.

Communities are governed by the feedback interactions among populations. If, for example, a local rabbit population becomes significantly reduced by disease, human intervention or other life-taking factor, the populations of related species adjust accordingly. The population most dependent on rabbits, such as foxes, also decline or move elsewhere. The populations most depended upon by rabbits, such as plants, increase in size. If the rabbit population grows again, appropriate readjustments will occur in related populations.

Balance

Via the feedback interactions among the life-supporting and life-taking factors mentioned above (see "Population"), mutual adjustments and adaptations are constantly taking place throughout the biosphere, ecosystems and communities. It is these feedback interactions plus the continued recycling, through food chains, of nutrients, oxygen, water and other life-sustaining substances, that maintains the balance of lifekind.

Human Systems

Human beings are uniquely self-conscious. We are aware of many effects that our environments have upon us and also of many effects that we have on our environments. Each of us is aware of his or her own past, present and future. We have accumulated a collective knowledge of the past and present, and both individually and collectively we plan for our continued existence in the future. We also have knowledge of the past and present of our environments—the biosphere and its ecosystems—and our plans for the future also assume their continued hospitable existence.

Knowing that our present is different from our past, we imagine futures that differ from our present. Accordingly, we actually invent our future.

We do this whenever we perceive no relationships among the elements of our environments. When we perceive new ways of relating different materials,

a machine is invented or a building is constructed. When we perceive new ways of relating among ourselves, a new community takes shape. When we perceive new ways of relating with non-human organisms, a park is developed or a zoo is built. When we perceive new ways of relating to the universe, a religion, philosophy or science is born.

Humans are the only biological systems that evolve wheels, buildings, cities, parks, zoos, religions, philosophies and sciences. Collectively, the ideas and new forms of relationship that emerge from human self-conscious thought are called "culture". Cultural forms, and the processes that bring them into being, have at least two things in common with biological forms and processes:

> Cultural forms and processes become organized in systems—ideological, legal, social, political, economic, technological, etc. Once cultural systems are established, they make it necessary for all new cultural forms and processes to adapt to the existing order.
>
> Cultural forms and processes, and the systems in which they become established, are ultimately limited by the checks and balances—interactions—of natural systems,

Human systems are governed by both biological evolution and cultural evolution, which may be contrasted as follows:

Biological evolution governs variation/adaptation within and among living organisms.	Cultural evolution governs variation/adaptation in the invention and use of ideas as well as variation/adaptation within and among the forms that ideas are given.
Biological evolution regulates changes within and among the units of life—species (populations, communities), organisms and cells.	Cultural evolution regulates changes within and among the units of meaning—symbols, words, beliefs, customs, techniques, values and the other ideas that humans invent and use to understand, interpret and express their lives.

To some extent, each type of evolution, biological or cultural, also affects the other. For instance, different cultures place different meanings on natural events. While one culture may explain a drought in scientific terms, another may attribute it to the anger of a god. Such differences in interpretation make a further difference in how each culture attempts to deal with drought. One culture may invent an irrigation system while the other holds ceremonies to appease the angry deity. Neither attempt to deal with drought is "right" or "wrong", but each has very different consequences for the way the culture survives, including the size of the surviving population.

Environments evolved by culture differ from biologically evolved environments in two significant ways:

Biologically evolved environments—ecosystems—are the result of organic adaptations that accumulate over millions of years.	Culturally evolved environments, such as transportation systems and cities, can be created or modified in a few years or decades.
Biological evolution is immediately regulated by the checks and balances of natural systems that maintain the balance of lifekind.	Cultural evolution is immediately regulated by the ideological, social, political. economic and technological checks and balances of human systems. Cultural evolution takes little or no conscious account of lifekind in general, and is often at odds with the natural systems that maintain the balance of lifekind.

Despite the difference between biological and cultural evolution, and the differences between the environments each evolves, the activity of human systems can be described in essentially the same terms that are used to describe ecosystems:

Energy

Human systems, like ecosystems, are powered by energy that can ultimately be traced to solar radiation (exception : nuclear energy).

Early humans were limited to the energy sources of all other animals: food and self-locomotion. Thus, until about 10,000 years ago, humans were nomads who foraged for their foods. Human settlements in permanent locations became possible—and necessary—only after new ways of using energy were discovered and developed : controlled fire, the domestication of cereal plants, and the domestication of animals to perform work.

Today, our cultural life-support systems—manufacturing, transportation, communications, etc.—are powered mostly by solar energy that was trapped in green plants some 200,000 years ago. These plants were buried before fully decomposing, and their energy is now available to us in the
different forms of carbon called fossil fuels : coal, oil and natural gas.

The use of coal enabled the extensive smelting, molding and alloying of metals that was essential to the Industrial Revolution. The discovery of petroleum, a more portable fuel, enabled the development of engines on such a vast scale that the global diffusion of industrial and transportation systems became feasible.

Agriculture (Food)

The domestication of plants and animals allowed humans to regulate and increase their food supplies. The first human settlements were established to implement the technology of agriculture and to protect resulting food supplies from the scavenging assaults of those who continued to forage.

As humans began raising greater quantities of food with the same or less effort, large numbers of them were released from the need to work the soil. As these people turned their attention to non-agricultural pursuits, other ways of relating to their environments were developed.

Culture (Evolution)

The freedom to pursue non-agricultural activity was expressed in the development of ideas, social customs and relationships, law, cities (and later, nations), politics and ecomonics, and in the development of techniques, tools and marines for implementing these activities.

In essence, some humans used their freedom from the pressure of immediate survival concerns to think about the meaning and purpose of their existence. According to the meaning and purpose they perceived, they modified natural environments and evolved cultural environments to serve their own needs and wants.

Population

The ability of humans to adapt environments to their own requirements and desires enabled them to settle almost everywhere on the planet. The

application of increasingly effective agricultural technologies continued to multiply food supplies, which in turn sustained large increases in human population. The application of technology to disease prevention, especially during and since World War II, has drastically reduced early mortality in humans and has been the major reason for the recent "explosion" of human population.

Community

LIke all lifekind communities, the communities established by humans are organized on the basis of mutual interdependence. But unlike other lifekind communities, human communities are organized more according to cultural than to biological relationships. From the very first human communities to those of the present day, they have been based primarily upon the development and maintenance of technology, accessibility to technological goods and services, and the enjoyment of technology’s benefits. This is especially apparent in modern cities, where technological environments largely displace the pre-existing ecosystems and even parallel some ecosystem functions, as in the case of commercial food chains : processors, distributors, wholesalers, retailers.

Interactions

Human interactions are most immediately governed by technological systems, including transportation networks for the movement of people and materials, communication networks for the exchange of ideas and information, political networks for the exchange and regulation of authority, monetary networks for the exchange of goods and services, and utilities networks for the distribution of energy and water.

Until the last century, the pace of human interactions was governed by the rhythms of natural systems : the force of wind, the flow of water, the gait of animals. In the Nineteenth Century, the pace of human interactions increased in direct proportion to the increase in the availability and speed of engines. In the Twentieth Century, as human interactions are paced by the speed of electricity and electronic communications, the rhythms of natural systems tend to be ignored or forgotten.

Balance

Humans are constantly creating new social, economic and political regulations for the purpose of maintaining balance in their cultural/technological systems. The nature of these intellectually contrived checks and balances varies greatly from society to society. These variations are the result of unique geographical and historical circumstances in the experience and growth of each society, including differences in their physical environments, in their religious, social and political beliefs and customs, and in their economic and technological circumstances.

Current technology further complicates the balancing act required to maintain order in human systems. Compared to ideas and information travelling electronically at approximately the speed of light, all other systems are very slow. Ideas are disseminated rapidly and widely, but the ability of administrative bureaucracies and other culturally evolved systems to implement ideas and assimilate information is relatively quite limited.

The Human Environment Revisted

Humankind has become, like wind and water, a global force. There is no place on the planet that is unaffected by human activity. Our technology is altering the chemical, biological and physical conditions of air, water and land throughout the biosphere. The biosphere, in feedback to these alterations, is responding with changes in temperature, weather patterns and climate. Ecosystems, in feedback to both human systems and the biosphere, are respond-

ing with changes in the quality of air, water and land and with changes in the population of other species. In some ecosystems, suchas the sub-Sahara, these changes are evidenced in a decreased ability of the land to support human life.

Again, we are brought to the questions asked earlier : Are humans exempt from the need to adapt to their environments? If so, is the exemption complete? If not, what are the limits to this exemption?

Unfortunately, no amount of knowledge about the biosphere, ecosystems and other natural systems will produce an unarguable answer to these questions. This is because of the great differences in point of view, not only from culture to culture but also from group to group within each culture. These differences in viewpoint cannot be simply categorized with reference to human systems alone. However, referred to the balance of lifekind, every answer to the above questions tends to reflect either ecological values or technological values.

Values

Values are those aspects of human culture and personal behavior which govern our choices. Choices which result in behavior that adapts human systems to the balance of lifekind are choices that reflect ecological values, i.e. lifekind-supporting values. Choices which result in behavior that adapts ecosystems to human systems are choices that reflect technological values, i.e. lifestyle-supporting values.

There are some who say that technological values are un-natural or anti-natural. Others maintain that since humans emerged from the same systems that govern all other lifekind, our unique technological values are merely different from other natural phenomena. Such debates tend to ignore the reasonable certainty that both ecological and technological values are with us to stay. Rather than argue the merits of ecological values vs. technological values, it will be much more fruitful for humankind to determine which lifestyles (technological values) are compatible with the balance of lifekind (ecological values), and then to enjoy the best of both systems : ecosystems and human systems.

Activities:

1. In the environment of your community, find five different examples of human adaptation to environment and five different examples of human adaptation of environment. (The same example may sometimes serve both purposes. For instance, a house is one kind of adaptation of environment; but the way it is built—either its location, its shape or its materials—may Represent an adaptation to its environment).

2. List some ways that you have adapted to your environment, and some ways that you have adapted your environment to yourself. Again, the same example may Sometimes serve both purposes.

3. Consulting the results of activities 1 and 2 above, evaluate each adaptation according to the following question : Does this adaptation tend to include or exclude non-human lifekind? After evaluating all of the adaptations, what conclusions can you draw about their significance for the balance of lifekind?

4. Count how many different species of both plants and animals you can observe in the area immediately surrounding your school. Then count the number of plant and animal species you can observe in an area of similar size that is not near uman habitations. What differences do you notice? Does the information in the "Introduction" help to explain the differences? How? Can you think of further explanations?

5. For one day, keep a record of how much time you spend interacting with lifekind other than human. This includes plant life, such as grass, as well as animals and insects. On another day, observe an animal's interactions with other life-kind. Are they any differences?

6. Which of the life-supporting factors (see "Population" above) have humans been able to increase? Which of the life-taking factors (again see "Population") have humans been able to decrease? How has other lifekind been affected by these increases and decreases?

7. If you could have three wishes come true, what would you wish for? Of your three wishes, which of them are as compatible with supporting lifekind in general as they are with the support of yourself? IS it possible to want things that are compatible with both? What are some differences between things that support lifekind generally and those that mostly support only you and other humans?

Additional Information:

Select one of the following topics : energy, food, evolution, population, community, interactions (feedback). Consulting newspapers, magazines, books, knowledgeable persons and other sources of information on the topic, write a description of how the information you discover relates to the balance of lifekind.

Annotated Bibliography:

With the exception of one of the books listed below, there are no further sources which explicitly discuss the balance of lifekind. The other books are suggested for their implicit discussion of this theme.

. Edberg, Rolf. On the Shred of a Cloud: Notes in a Travel Book.

Tuscaloosa, Alabama. University of Alabama Press, 1969.

This is one of the world's most sensitively written books concerning the simultaneous fragility and tenacity of the biosphere and ecosystems in the face of human environmental destruction.

. McInnis, Noel. You Are An Environment : Teaching/Learning Environmental Values.

2nd ed. Los Angeles, California. Serenity Press, 1979

This is the only other publication at present which discusses the balance of lifekind, although additional materials are in preparation by the same author/publisher. Correspondence should be addressed to Serenity Press, Box 36752, Los Angeles, California 90036 USA.

. Storer, John. The Web of Life.

New York, New York. New American Library, 1953.

This brief book is one of the most fascinating and readable books about the ecology of the biosphere and ecosystems.