

IMAGE

SOUND

LOGO

NARRATOR:

A series of programs about this planet  
and what people are doing to it.

SLOW MOTION SHOTS

Energy! It makes living creatures  
go. And

DISSOLVE TO SUN

it comes from the sun.

GREEN FIELD

Some of the sun's energy---

a small fraction of the total striking  
the earth --- is captured by green  
plants. The radiant energy is trans-  
formed into chemical energy which is  
radiated through

EATING SEQUENCE

trillions of mouths in the web of life.

Yet everything we take from nature  
must be paid for --- there is no such  
thing as a free lunch. That old rule  
of economics, is the new lesson of  
ecology.

SUPER MAIN TITLE:

THE SEAMLESS WEB

FADE OUT

FADE IN TO:

ATMOSPHERE SHOT

The biosphere --- the thin zone of  
life --- reaches at most about four  
miles above sea level and a few miles  
into the ocean's depths. Most life  
flourishes at the interfaces between  
water, air, and land.

The biosphere is made up of countless subsystems -- forests, lakes, rivers, swamps, farmland, cities, mountains --- that interact in varying ways. Destroy a forest, risk a flood hundreds of miles away; fill an estuary, deplete an ocean fishery. These life systems have gained great stability and resilience from nature's incredible diversity --- just as many strands make a strong fabric.

#### WATER CYCLE --- SLOW MOTION FALLS

Materials are moving constantly through the biosphere in great circulation patterns-- cycles of recirculation, really, for the materials are confined in a closed system. Water rushes downhill toward the oceans only to rise in evaporation. It travels in clouds... falls as rain or snow to return by various streams to the oceans.

Or to be taken into plants and other living things. Oxygen, carbon, nitrogen, sulphur, and other elements continually move through their own cycles... spending some of the time in us and other living things. One cycle is open-ended, however, always moving in one direction. Energy.

#### TILT UP SMOKE STACKS TO SUN

When we talk of energy sources these days, we are likely to think in terms

of nuclear, coal, oil. We overlook that all of this power we consume amounts to only one-twentieth of the solar energy captured by green plants and used by life on earth.

PHOTOSYNTHESIS

This unique achievement is accomplished through photosynthesis. The sun's energy enables green plants to take in water and carbon dioxide. The energy is bound up with the carbon, hydrogen and some of the oxygen as carbohydrate while oxygen is given off as a waste product. The plant "waste" is vital, of course, to all animals, supplying the material we all breathe --- completing an important cycle in the seamless web. Green plants capture more energy than they use themselves and this excesses --- stored as organic matter --- is the food for all other living things.

FARMER WITH COWS

As this energy is transferred up the food chain from mouth to mouth about 90 percent of the amount taken in is used up at each consumer stage. This means that it takes about 10 times as much grain to feed people who get their energy from meat instead of from grain directly --- and why steak is a pre-eminent symbol of a wealthy society.

WOMAN IN SUPERMARKET

STEAK

FOREST

Not all of this organic energy is accessible to human beings as food.

FOOD

But every bit of it -- fallen leaves, rotting trees, dung -- is consumed by some species. Fortunately for some of us, our biological energy -- none of which we can make for ourselves -- comes in pleasing variety. For the very few, nature even supplies luxuries. Not all organic matter is eaten, of course. Some yields its energy as heat and light.

WINE

FIRE

LUMBER

Some provides material for our homes.

PAPER MILL

Paper for our information and knowledge.

GIRL AT STREAM

Fiber for our clothes.

STREAM

In addition to providing the oxygen we breathe and food we eat, living systems perform such life-support activities as cleaning our water.

SKY

Scrubbing our air

SNOW SCAPE

Nourishing our spirits.

FADE OUT

FADE IN

TRAFFIC, TILT UP OFFICE BUILDING

The tide of human population has run toward cities. And no wonder! Cities have been good for people. Helped them move up the socio-economic ladder with new and better jobs.

FLORENCE, PARIS

JAPANESE MOTHER AND CHILDREN

For the most part, cities have enriched people's lives --- for cities are spawning grounds of human culture.

URBAN SPRAWL

But with the unabated influx of people, the city sprawls into metropolis --- megalopolis.

SUBWAY, PEOPLE

Still the people keep coming to the lure. From where? Not only from the countryside. In 1830, there were one billion human beings. In 1930, two billion. Now we're approaching four billion --- growing by 75 million a year.

FACADES

DISSOLVE TO PAVEMENT TRUCKING SHOT

Modern urban areas bring drastic changes to the environment. Sealed off from the land, they interfere with nature's cycles. Rainfall no longer replenishes water supply. Huge amounts of water must be pumped in from remote areas, magnifying the city's thirst for power.

DAM

RIVER AND BOATS

Often, the dam that stores the water supplies hydroelectricity, and also tames the city's river into a channel for industrial transportation. Tankers bring in consumables and cart away wastes. The city must expand its sanitation systems.

POWER PLANTS

HOT SUNSET

Still more electrical power is needed. Ravenous for energy and insulated from the land, the city generates tremendous heat, altering the climate. Dog days become more numerous and more unbearable. The thermal load poses one environmental limit.

AIR POLLUTION

Another appears in the form of air pollution, which jeopardizes public health.

AGRICULTURE

Dense urban populations exact still an additional environmental price. More than one acre of agricultural land is required to feed each urban resident. The growth of urban centers ordains the growth of agriculture, and both are reducing the world's natural ecosystems. Industrialized agriculture checks the spread of farm lands somewhat by increasing yield per acre. Greater productivity is achieved by growing a single crop over vast areas and relying heavily on machines, chemical fertilizers, and pesticides.

PRIMITIVE AGRICULTURE

While more primitive forms of agriculture do not produce such abundance per acre, they make far less demand on energy and provide gainful employment for a great many people.

MODERN AGRICULTURE

Mechanized agriculture, on the other hand, cuts manual labor drastically. This, combined with the increased productivity, makes farming attractive to businessmen. It is worth noting that the economic system, which energizes other human systems, also has its origins in the sun. Divining that the sun was the source of life, our primitive ancestors worshipped it as the bestower of immortality. Gold was believed to be the sun's radiance materialized and, consequently, the metal assumed great material value. Today, gold --- money --- is a key factor in the human system.

SUN, REFLECTION ON WATER

PROMETHEUS STATUE

GOLD COIN

MECHANIZED AGRICULTURE

GRAIN STORAGE SHOTS

Industrial agriculture is dependent upon energy, which was cheap at first. This situation changed when the United States --- the world's most important agricultural exporter --- began to run short of oil and oil-producing nations raised their prices. This forced up the price of grains. But by this time, other events had a significant impact upon the world food situation.

OIL PORT

DISSOLVE TO ANCHOVETTA FISHING

Thanks to favorable conditions, Peru became the world's number one fishing nation --- catching 10 million tons of anchovetta a year. This species, generally not used directly to feed people, became the main source of the world's fish meal. The protein-rich powder in these bags went to fatten

#### BAGS OF FISHMEAL

cattle and poultry in Europe and North America.

#### ANCHOVETTA FISHING

In 1972, conditions suddenly changed. Most of the anchovetta off the coasts of Peru and Chile disappeared. Repercussions were world-wide. A shortage of fish meal in Peru affected farmers in the United States where protein-rich soybeans were available to fill the gap. However, the sudden demand for soybeans sent the price skyrocketing. An even more crucial event forced food prices even higher.

#### SOYBEAN HARVEST

#### WHEAT SHIPPING

Plagued by a drought that parched several areas in the world, the Soviet Union's grain crop failed. The USSR had sufficient money to make huge purchases on the American market. This transaction and food demands from other drought-affected areas virtually cleaned out the world's food reserves. The price of wheat trebled in a year. Grains became scarce for aid programmes.

#### SAHEL FAMINE

In drought-ravaged West Africa, 100-thousand people starved to death. Millions of others were forced to the edge of disaster. Throughout the world, 500-million people are starving today. Many more are malnourished. With the higher prices for fuel, fertilizer, food --- with reserves in the industrialized nations used up, the fate of

#### GRAIN SHIP

CU'S FACES

mankind now is tied to a bountiful  
harvest each year.

CROWDS

So each development becomes the cause  
for subsequent effects. We started  
with urban growth, which has been good  
for people, and we find ourselves  
running out of food, overtaking our  
environment, eroding our biological  
heritage, and jeopardizing our future.  
That is the meaning of the seamless web.

FADE OUT

FADE IN

PLEXIGLASS STATUE

"What a piece of work is man!" marvelled  
William Shakespeare. The human body  
is the miracle of evolution. Yet it  
is vulnerable. Too much smoke or  
asbestos -- cancer of the lungs. Too  
much polyvinyl chloride -- cancer of  
the liver. Too much mercury--  
disintegration of the nervous system.  
Too much radioactive strontium --  
death to bone marrow. And the thing  
is -- we can't escape pollution put  
into the world system because we are  
parts of that system. And so we  
carry DDT in our fatty tissue, lead  
in our blood, and other alien subs-  
tances in a growing burden.

DISSOLVE TO IRRADIATED FOREST  
AND WOODWELL

Finally, we are no healthier than our  
environment. And how does pollution  
affect our environment?

Ecologist George Woodwell at Brookhaven National Laboratory on Long Island is conducting one of the longest ecosystem studies in the world. Since 1961, radioactive cesium placed at the top of a 20-foot pole has been turned on for 20 hours a day. We can see what the radiation has done to the surrounding oak-pine forest. Life virtually is eliminated from the devastated zone at the center --- only some lichens and mosses survive. In the next concentric zone farther out, when the radiation is slightly weaker, grasses and sedges still exist. In the circle beyond them --- shrubs. In the fourth zone, only the pines have been killed. Finally, the original forest.

The experiment simulates in microcosm the graduated effects of pollution upon natural systems. It is a model for the way nature dies from pollution. Dr. Woodwell sees a parallel pattern around smog-ridden cities or industrial factories that vomit sulphur oxides. Scientists now suspect that rain tainted by pollution may be suppressing natural fertility in areas as large as the northeastern United States.

WOODWELL ON CAMERA

WOODWELL:

The earth's biota, the living systems of the earth, are being reduced very rapidly now, very

much more rapidly than they have ever been reduced previously in the history of man. That the reductions are widespread, they are certainly world-wide now, and that in the net, the habitability of the earth as far as man is concerned is being reduced.

#### ECOSYSTEMS

Ecologist Woodwell says we must realize quickly that these living systems are our most precious resource. In order to preserve them, he believes, we must keep chemical and other poisons from the great circulation patterns of the earth, and must exercise prudence with those natural resources we need to exploit.

#### FISHING SCENES

##### WOODWELL VO:

We are reducing fisheries, in many cases to the point where they will never recover. To the extent that we eliminate species of fish, this is an irreversible change...

#### WOODWELL ON CAMERA

... and we have to think of that sort of change, which is now very widespread around the world as "mining the earth's biota". Mining it irreversibly, turning resources that should be renewable resources into non-renewable resources.

#### SEWAGE-MARSH RECYCLING EXPERIMENT

Dr. Woodwell and colleagues are studying one way to turn the tide --- by converting waste sewage into a reusable resource.

In this experiment, sewage from a nearby town flows through a strip of marshland to filter into a pond. The water is cleaned and the nutrients are taken up by the plant species in the marsh and pond --- and finally are eaten by fish in the pond. The fish are harvested to provide food, completing the cycle. A return to a closed system.

The fertilizing sewage also speeds plant growth in a meadow and, most importantly, in an agricultural system. This imitation of nature --- to recycle, re-use, make the fullest use of available resources --- is the alternative to the wasteland.

#### GARBAGE DUMP

#### STOP-MOTION WHEAT GROWING

As for the disappearance of species, it is an irony that modern agriculture's drive for the perfect strain of wheat and other crops --- fast-growing, pest resistant, and so forth --- leads to the neglect of plant species that may be vital to future generations. The United Nations Conference on the Human Environment proposed a genetic seed bank in the interests of the future food supply.

#### ANIMALS

The same urgent attention must be given to the growing number of endangered animal species and extinctions. An

AERIAL OF CITY

extinction is forever! Most extinctions result from loss of habitat --- either to the spread of agriculture to feed humans or dwellings to shelter them. So there is a trade-off, and we may ask: What difference does it make if we lose a few species in such a good cause?

PENICILLIN  
SICK PEOPLE

Would anyone have cared if we had lost a lowly bread mold? That is until scientists discovered the miraculous power of one of them to kill harmful germs. Out of this discovery grew today's powerful antibiotic strategy in guarding human health. Would anyone dare to suggest today that it wouldn't have mattered if we lost penicillin?

WAR FOOTAGE  
ARMORED COLUMN

Finally, we must make better use of available energy. According to United Nations figures, governments today spend 200-billion dollars a year on armaments. Not only is this a non-productive, wasteful use of energy, but its intended purpose is destruction.

A BOMBS

In spite of long-term United Nations efforts to use atoms only for peace, it is well to remember that most of the tremendous nuclear potential still is locked in bombs and warheads.

These practice bombs of the 1950's and early 1960's taught an invaluable ecological lesson. In addition to their military utility, their radio-activity contaminated living systems, all living systems.

We have come a long way. We have begun to monitor the world's environmental health through operation Earthwatch under the United Nations Environment Program. But is the gathering of information enough?

DISSOLVE TO MAURICE STRONG

STRONG ON CAMERA

STRONG:

Of course, this is the real question. One of the things we can all agree on is the need for better information, better knowledge of the consequences of our actions, but we cannot guarantee what people will do when they have this information.

FACES

Now essentially this is the question that will determine whether man will make it or not, because if we destroy ourselves individually and collectively, inadvertently as we have been doing through pollution of our environment, then of course that's one thing. But if we destroy ourselves willfully, knowing the consequences of our action, that's really a form of collective suicide. I

feel optimistic enough to believe that when man understands fully the consequences of his own actions, he will be prepared to subject himself to the individual and collective discipline of his materialistic drives which will permit him not only to survive but to enjoy the better, fuller life for all mankind that is clearly within our reach today. This is really in my view where the whole of man's history and his future culminate. This generation of man is going to be taking the basic decisions which determine whether or not the human species will survive on this planet.

SUPER END CREDITS

