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**ON**

**ENVIRONMENT AND DEVELOPMENT: A COMMON GROUND**



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**Editors**

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Geraldine Wu

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Sarasa Kimata

Shantanu Rana

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Emilie Smith

Cecilia DeFerrari  
Sisi Maw

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Andrea Lee

Martin Blinder  
Paul Haacke  
Tara Matthews  
Elizabeth Santos

**Writers**

Ashraf Abu-Nuwar  
Deborah Cholmondeley  
Asma Fareed  
Andrea Lee  
Carmen O'Shea  
Shantanu Rana  
Michael Stoynov

Martin Blinder  
Ardlee Delimon  
Sarasa Kimata  
Harsha Marti  
Alexander Pozdnyakob  
Elizabeth Santos  
Christine Torrey  
Andrea Woodhouse

Alec Borisoff  
Yadana Desmond  
Mehmet Kirdar  
Claudia Montes  
Indhira Prego  
Emilie Smith  
Marc Uy

**Cartoons**

Ikko Asada

**Faculty Advisors**

Tony Doyle

Margot Steinberg

**Technical Consultant**

Lynda Crawford

With special thanks to Jane Carter, Uner Kirdar, Paul Matthews, and Sylvia Gordon

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## Introduction

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*"Treat our earth well, for it was not given to us by our parents; it was lent to us by our children."*

*-African proverb*

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In the past half century people worried that their children would not have our Earth to live on, that all life would be obliterated by a nuclear holocaust. Today, with the end of the Cold War, the fear of nuclear war has diminished significantly but the possibility that the earth will not be able to sustain life has not. The environment is no longer an issue which can be overlooked as it was in the past. With every tree that is cut, with every river that is soiled, the possibility that our children will not be able to survive in a world stripped of all its resources and polluted beyond redemption increases.

The recent collapse of communism and the consequent rise of capitalism have had much of the world rejoicing. World peace no longer seems to be completely out of our reach. Yet capitalism alone cannot solve the world's problems. It is a system that, like any other, is not flawless. In order for it to succeed, selfishness must exist; indeed, it must be encouraged, for profit is the driving force of capitalism. However, selfishness is the environment's greatest nemesis. Many people have not yet realized that the deterioration of the environment affects all of us and that in turn each one of us affects it.

Environmental degradation is no longer considered to be a "hippie" concern; it is now recognized as being a truly global problem that has transcended all national boundaries. From politics to economics, race to religion, no one has been left untouched.

In recent years the polarization between the North and the South has become more evident. The widening gap between developing and developed nations and its relationship to the environment is only now beginning to receive

the attention it deserves. After all, most environmental problems throughout the world can ultimately be linked to development and/or industrialization. The world has realized that we cannot attempt to solve one of these problems without taking into account the other.

This year marks the twentieth anniversary of the United Nations Conference on the Environment held in Stockholm. The resolutions passed at that time were not all adhered to. Since then the world's perspective on the environment has changed drastically, with a growing recognition of the link between the environment and development. This June world leaders will convene in Rio de Janeiro at the United Nations Conference on Environment and Development. Perhaps by addressing both issues at once, the participants will come closer to succeeding in solving these problems.

We too have chosen this topic for our conference. Preservation of the environment is our common responsibility. While we are aware that as students we have little influence in the resolution of the world's problems, we hope that by better understanding them we as the first future generation may be able to act as catalysts for change.

## Background

### Population Growth

In prehistoric times the growth rate of the human population was roughly 2 percent per one thousand years. During the 1950s this rate of population growth became two percent annually [1]. Ten thousand years ago, when agriculture was first invented, roughly five million people lived on the entire planet Earth [2]; now New York City alone houses more than twice that number. Every day the human population grows by 240,000 people, every year by over 95 million (the number of people in Mexico)[3]. Although population growth has declined slightly from the rate of the 1950s

(except in parts of Africa) to a rate of about 1.8 percent and is expected to continue to decline, the population continues to increase alarmingly.

Most population growth takes place in the developing world, where improved health care has lowered death rates and birth rates remain high. By the year 2000 births may outstrip deaths by 82 million in the developing world [4]. There are now 5.4 billion people on the Earth; by the year 2000 there are expected to be 6.25 billion [5]. In the first decade of the new century the world's population is expected to double, reaching numbers anywhere from 11.5 billion (the most optimistic figure) [6] to 14 billion people [7]. There are just not enough resources available to satisfy the needs of a population growing at this rate.

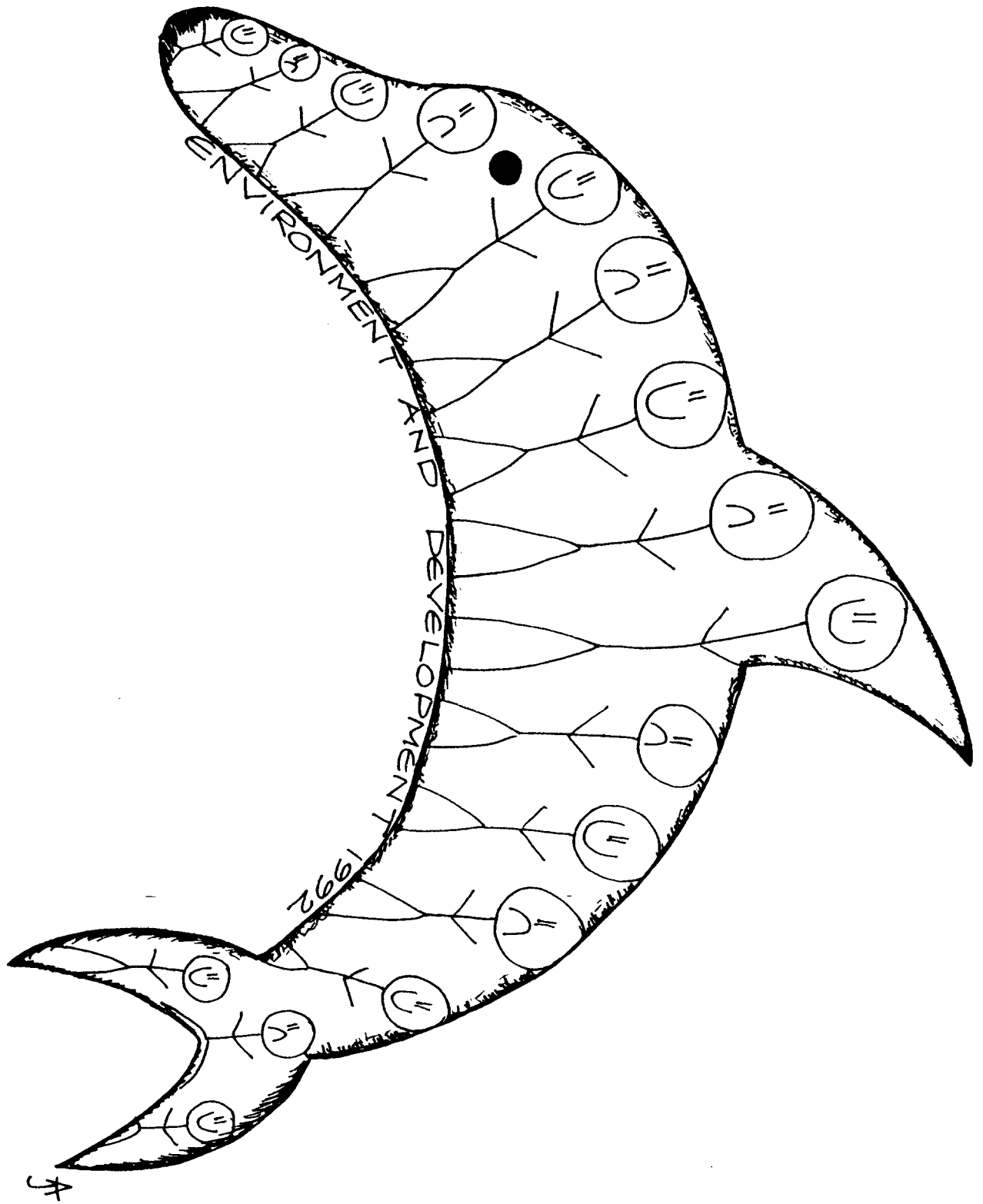
One of the most disturbing points in population growth is the Earth's limited ability to produce enough food to feed its human inhabitants. As Thomas Malthus postulated, without intervention population increases geometrically while food production increases arithmetically. Fertilizers have intervened to help food production keep up with the growing population, but they have been steadily losing their efficacy through overuse. Since total cropland area is expected to decrease in proportion to the population through desertification and population growth, the land available to provide basic nutrition per person is expected to shrink by 1.7 percent a year. This means that grainland, for example, will be reduced by one sixth during the 1990s, and grazing land by one-fifth or more [8].

Despite these figures, there is still enough land to provide basic nutrition for the world's current population. Indeed at today's rates of food production (a total annual global food production of 4,072,132,000 metric tons [9]), the Earth could produce enough to feed a population of six billion people a healthy vegetarian diet. Yet 1.02 billion people in the world are undernourished, and 800 million people live in what the World Bank refers to as "absolute poverty" without enough food to sustain

life [10].

This blatant inequity proves to be even greater when considered in the light of the North/South division. Those in the North (the Developed World) consume a far greater proportion of the world's produce, especially of animal products, than do those in the South (the Third World). It takes ten times the energy to produce a pound of meat than it does to produce a pound of grain; the energy used to make one 2,000 calorie steak could be used to produce ten 2,000 calorie vegetarian meals [11]. The food shortage in the South, which contains far less arable land than the North, is exacerbated by erosion, droughts, bad farming policies, and overuse. The United Nations estimates that almost sixty countries will have experienced critical food shortages by the year 2000 [12], a far greater proportion of those sixty continues coming from the South than the North.

The population issue as a North/South division can also be seen in terms of energy use. Of the world's energy 60 percent comes from coal, oil, and liquid gas, another 20 percent from natural gas, 10 percent from generated electricity, and the remaining ten percent from traditional fuels such as wood. Countries in the North have the lowest population rates (due to a low number of births, and a death rate reflecting an aging population), yet these same countries consume the greatest percentage of energy, especially that generated by fossil fuels. Countries in the South have much larger population growth rates but consume barely half of what the industrial North does, relying more heavily on traditional fuels. For example, North American consumption is indexed by the United Nations Fund for Population Activities (UNFPA) at 285 gigajoules (equivalent to about 0.163 barrels of oil) per capita, compared to Southern Asia (including Bangladesh, India, and Pakistan among other countries) which is indexed at 11 gigajoules [13]. China (although geographically in the North, grouped socioeconomically with countries in the South) contains one-fifth of the world's population but has a surprisingly low



energy consumption level.

An important problem in population growth is rapid urbanization. Cities put stress on the environment because of their enormous and concentrated demands for food, water, and the disposal of waste; and the larger the city, the greater the stress. In 1950 there were only ten cities on the entire planet with more than 5 million inhabitants: New York City (12.4 million), London (10.4), Shanghai (10.3), Rhein-Ruhr (6.9), Tokyo-Yokohama (6.7), Beijing (5.7), Paris (5.5), Tianjin (5.4), Buenos Aires (5.3), and Chicago (5.0). By the year 2000 there may be as many as forty-eight cities with populations of 5 million or more, thirty-seven of them in the industrial world [14]. In cities, normal environmental problems become much worse. The air in most cities, especially in the developing world, is so heavily polluted that it has become a health hazard, and the water has been made undrinkable through inefficient sanitary systems. Cities also put stress on the surrounding environment. Raw sewage is dumped into rivers and oceans in parts of the developing world, having devastating effects in regions downstream.

Global climate change now seems inevitable with scientists only debating the extent of the change. The technology demanded by a growing population is thought to be responsible for almost two-thirds of the carbon dioxide now present in the atmosphere. The tropical forests that once helped keep carbon dioxide in balance are being destroyed (at a rate of 11 hectares a year), to make room for cattle ranches, and land is being desertified at a rate of 10 hectares a year. The increasing human population is responsible for 80 percent of this destruction.

Only through family planning can population growth and its attendant disasters be controlled. The government should provide information about contraception and supply birth control products. Because overpopulation has largely been ignored by politicians, it remains one of the most serious problems facing the environment and the underlying cause of other

environmental problems; it needs to be recognized and addressed.

## Health

The problems that plague our environment have grave effects on our health. In both First and Third World countries chemical pollutants have caused an increase in worldwide disease such as cancer. And dirty water, contaminated food, and polluted air, especially in developing nations, are some of the major causes of disease and death.

Dirty water is one of the world's major causes of disease. Of the 5.3 billion people inhabiting the Earth in 1990, 1.2 billion lacked safe drinking water, and there were 1 billion reported cases of diarrhea one of the leading causes of infant mortality in the Third World.

One cause of contaminated water is the leakage of chemicals, such as solvents, pesticides, paints and dyes, into the ground water, resulting in the contamination of drinking wells. Because over 90 percent of rural households get their water from drinking wells, their contamination has been the cause of serious health problems.

The pollutants that do not sink into the wells may affect plants and vegetables. Since 1978, twice as many carcinogenic pesticides have been sprayed on food, resulting in an increase in incidents of cancer. Since 1950, cancer in children has increased nearly 32 percent. While many pesticides in food cause diseases, and often result in deaths, pesticides are not alone in damaging food. In developing nations, poor drying and storage of food encourages bacteria to grow, bacteria that can also weaken immune systems and cause disease.

Chemical pollutants are not the only causes of health problems resulting from environmental degradation. The continuing depletion of the ozone has led to higher levels of ultraviolet radiation hitting the Earth, especially over Antarctica where the hole in the ozone was

first discovered. This has had serious effects on algae and many other surface-dwelling creatures who are greatly harmed by exposure to unfiltered sunlight. But one of the greatest problems is the increase in incidents of skin cancer. In the last ten years, there has been a steady increase in the number of reported cases of skin cancer in the United States, especially among Caucasians. The continual destruction of the ozone layer will result in an increase in the number of cases of melanoma, the deadliest form of skin cancer. Another major problem is that ultraviolet radiation can reduce the body's ability to fight infectious disease. Inoculations will not work on an immune system that has been damaged by overexposure to radiation.

Along with ozone depletion, the air is filled with many noxious chemicals like lead, sulphur dioxide, and carbon monoxide. Most of these chemicals are released by automobiles and other machines with internal combustion engines as well as by industry. These pollutants all have pernicious effects on our health, ranging from coughs and colds to bronchitis, emphysema, lung cancer, and bone and tissue diseases. In industrial cities various toxic emissions pollute the immediate and surrounding air; in 1985, it was discovered that a mere seventeen toxic air pollutants increase the number of cancer cases a year by 2,000.

Millions of people are affected annually by the pollutants that we fill our land, air, and water with everyday. Not only are we destroying our Earth, but we are damaging our health and the health of future generations.

## **Environmental Degradation**

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### **Air**

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#### **Air Pollution and Climate Change**

Air pollution and climate change are two of a growing number of man-made wounds inflicted on our planet. Warnings of the dam-

age to our health and quality of life are growing louder, and right now we are at a critical point.

Take California, for example. California, once known as America's promised land, is now known for having the dirtiest air in the nation. The causes of such air pollution are the 27 million people, 8 million cars, trucks, and other vehicles, and 31,000 businesses that are spewing 1,246 tons of noxious gases into the air every day.

There are five major classes of pollutants in the air: carbon monoxide, particulates, sulfur oxides, hydrocarbons and nitrogen oxides. Carbon monoxide (CO) is a colorless, odorless, extremely poisonous gas which reacts with hemoglobin, reducing the amount of oxygen transported to the brain and other parts of the body. CO is released into the air when the combustion process in which carbon fuel is burned is incomplete, causing the carbon to be only partially oxidized into carbon dioxide. The largest single source of CO is the internal-combustion engine.

Particulates include solid or liquid substances, like soot and smoke, suspended in the air, and some can be so small that they can only be detected with an electron microscope. They are primarily caused by stationary fuel combustion and industrial processes. Forest fires also account for a small percentage of particulate emission.

Sulfur oxide, a corrosive, acrid, poisonous gas, is produced when fuel containing sulfur is burned. Most sulfur oxides are derived from utility and industrial plants that burn coal and oil, both of which contain sulfur. The burning of coal causes approximately 60 percent of the sulfur oxides emitted each year around the world.

Nitrogen oxides are produced when fuel is burned at very high temperatures. A major source of nitrogen oxide is transportation vehicles and combustion processes used in electrical power plants. Industrial boilers account for one half of all nitrogen oxides emissions.

Hydrocarbons, like carbon monoxide, are the result of unburned and wasted fuel. Incineration, evaporation of industrial solvents, and combustion of coal and wood all produce hydrocarbons. But the leading producer of hydrocarbons is the evaporation of gasoline and the internal-combustion engine. Sixty percent of all hydrocarbons are produced in urban areas where there are high concentrations of automobiles. Although they are not usually toxic by themselves, when combined with nitrogen oxides, they form photochemical oxidants, including ozone, nitrogen dioxide, peroxyacyl, aldehydes and acrolein. These oxidants, when combined with some particulates, in turn form what is commonly known as smog. Smog causes an increase in respiratory infections, nosebleeds, and emphysema.

Each of these pollutants, perhaps, present serious problems, but the soot emissions, produced by diesel engines, are most the serious. Carbon monoxide and hydrocarbon emissions can be cleaned by catalytic converters in petrol-powered engines, but there are no catalytic converters for diesel engines. Diesel buses and trucks, a growing source of particulate emissions, can cut visibility, cause chronic lung disease, and disfigure buildings. While air pollution poses serious long-term threats to health, it also causes the "greenhouse effect". The "greenhouse effect" describes the condition in which the atmosphere allows light rays from the sun in, but does not let the heat rays, generated by the ground when it absorbs the sunlight, escape: the heat is trapped. The greenhouse effect is brought on by an increase in carbon dioxide generated by the combustion of fossil fuels. It is exacerbated by the use of chlorofluorocarbons (CFCs), which create holes in the ozone layer, allowing more ultraviolet rays to penetrate and increasing the temperature in the earth's lower atmosphere.

In the 1980s, burning fossil fuel released 5.6 billion tons of carbon dioxide annually. Cutting down forests also increases the level of carbon dioxide released in the atmosphere. First as wood decays, it releases the gas into the air. Second, deforestation and combustion

have increased the carbon dioxide level in the atmosphere by 25 percent since 1860. These levels are higher now than any time in history. And CFCs and nitrogen oxides may trap as much heat as carbon dioxide.

If the resultant warming is allowed to continue, some scientists believe that, by the year 2100, global temperatures may have increased 5°C (9°F)—a rate of climate change ten times faster than the average rate of natural change—causing to melt polar ice caps, the sea level to rise, and coastal areas around the world to flood. Rainfall and soil moisture patterns would also be disrupted, making crop growth and flood control more difficult.

In the Southern Hemisphere, the warming is greatest over Australia, southern South Africa, the southern tip of South America, and the area over Antarctica near Australia. In the north, warming is greatest over Alaska, northwestern and eastern Canada, southwestern Europe, most of the Soviet Union, and parts of southern Asia.

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Six of the eight warmest years on record occurred in the 1980s; 1990 broke the record as the hottest year. On average, the 1980s were about 0.6°C warmer than 1880, and 1990 was 0.7°C warmer. This seemingly small difference in temperature is in fact significant, since it only took a rise of 5°C to bring the earth out of the Ice Age. The Intergovernmental Panel on Climate Change (IPCC) says that global warming is inevitable, and changes in climate are irreversible.

Air pollution has come to present an environmental dilemma in most countries around the world. We have come to be dependent on our

cars, on the goods produced in polluting factories; at the same time we know that even if immediate measures were taken our planet would continue to feel the effects of air pollution for decades to come.

Put all these factors together, and it becomes clear that we have an extremely serious problem on our hands, one that cannot be solved easily if at all. One major stumbling block is our unwillingness to abandon the internal combustion engine and the lifestyle it has made possible. Some people are beginning to recognize that such changes are essential. We can only hope that it's not too little too late.

## Ozone Depletion

The ozone layer is the earth's shield against ultraviolet rays. Located in the higher atmosphere, 9 to 30 miles above the earth, the ozone layer absorbs UV-B rays, ultraviolet sunlight that would otherwise harm organisms on the Earth. These rays cause sunburns, skin cancer, eye cataracts, and a weakening of the immune system. Similarly, it affects the flora and fauna by reducing soybean yields for example, and damaging surface dwelling fish. As a result of human activity, the ozone layer is rapidly being depleted and its ability to serve as protection is being undermined.

Ozone molecules (O<sub>3</sub>) are formed when oxygen gas (O<sub>2</sub>) is bombarded by ultraviolet light. This layer of molecules can now absorb the harmful UV rays, thereby protecting the planet. Ozone is constantly being broken down by natural chemical processes, such as that effected by nitrogen-bearing compounds that result from microbe activity and fossil-fuel combustion. In order for the ozone layer to remain an active protector of the Earth, the rate of making and breaking down of ozone particles must be balanced.

Unfortunately, the production and release of chlorofluorocarbons (CFC's) throw this rate off balance. CFCs, used in air conditioners and refrigerators, foam packing and aerosols,

start a chain reaction, breaking down ozone. When ultraviolet light hits CFC, chlorine atoms that break ozone down into oxygen molecules are released, rendering ozone unable to absorb ultraviolet rays. The chlorine is not consumed in the process but remains free to break down additional ozone molecules. For every chlorine atom released, an estimated 100,000 molecules of ozone are removed from the atmosphere.

In October of 1991, eight scientists from twenty-five countries held a conference under UN auspices in Geneva to discuss startling revelations on the destruction of the ozone layer. Predictions of the accelerating rate of ozone depletion suggest that the ozone layer could be reduced by 3 percent over the next decade, boosting the rate of skin cancer by 10 percent. The National Academy of Science estimates that for every 1 percent drop in ozone levels, 10,000 more cases of skin cancer could develop.

The area most affected by ozone depletion is above Antarctica, where the "ozone hole" was first discovered. Since the late 1970s, total stratospheric ozone amounts over an Antarctica has been decreasing each year: 90 percent of the ozone layer over Antarctica has been lost in total, 50 percent in the last decade alone.

Chilean farmers, living near the ozone hole, have reported that their sheep, rabbits, and other wildlife have been blinded by the increased ultraviolet radiation, although most scientists have dismissed these accounts. Still, excessive ultraviolet radiation has been shown to cause eye cataracts, and many Chileans have taken to wearing sunglasses whenever they leave the house.

In the middle latitudes, where the majority of the world's population lives, the depletion, though less dramatic, has certainly been significant. Satellite measurements reveal that spring and summer ozone levels have decreased by about 6.2 percent in the Southern Hemisphere and by about 2.9 percent in the

Northern Hemisphere. The area around the middle latitudes suffers an annual loss of 8 percent.

Only by reducing production of CFC can we decrease the rate of ozone depletion substantially, but because CFCs take many years to rise to the stratosphere, even eliminating them today would not result in noticeable effects until the next century. An international agreement to reduce CFC productions, the Montreal Protocol, now requires elimination of CFCs and other ozone destroying chemicals by the year 2000, but the U.S. law doesn't call for CFC elimination until the year 2030. Every year of delay in the elimination of CFCs means the continuation of rapid depletion of the ozone layer. Eliminating the production of these harmful chemicals can't wait.

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## Land

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### Deforestation

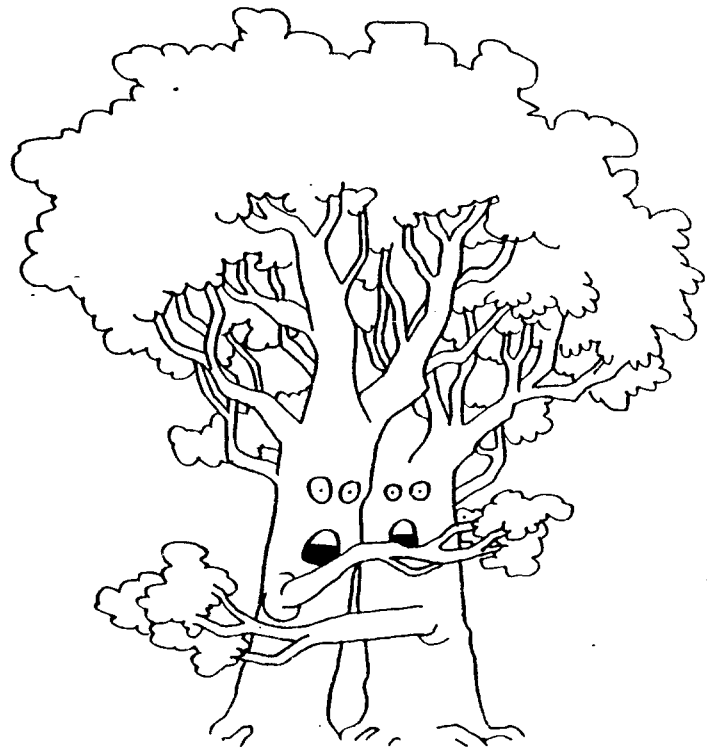
Trees provide the world with oxygen and, in the process, remove carbon dioxide from the atmosphere. Carbon dioxide forms a shield around the atmosphere that allows heat to enter, but not to leave, thereby causing global warming. This rise in global temperature could melt the polar ice caps, flooding many coastal cities. Trees contribute to the preservation and restoration of our already damaged environment. Unfortunately, deforestation is affecting people around the world.

According to many environmentalists, trees should come to be considered a nonrenewable resource: They are cut down more quickly than replacements are planted and mature. Speeding up replanting does not necessarily solve the problem. Often, if the replanting is done by a commercial company, all of the mature trees (which take eighty to ninety years to grow, or fifty to sixty in a managed forest) are cut and replaced with seedlings. Frequently, all of the seedlings are of the same species, which strips the forest of its original

biodiversity. At the same time, single species forests radically limit animal diversity as well. When one species is cultivated exclusively, diseases can have a devastating effect, as we saw with the effects of the potato blight in Ireland in the 1840's and the Dutch elm disease early in this century.

The destruction of the world's tropical rainforests is a particularly serious problem. Although these forests make up only 2 percent of the earth's total surface area, they harbor half of the world's plant, animal, and insect species and produce 40 percent of its oxygen. If deforestation in Amazonia continues at the present rate, by the year 2000, 15 percent of the world's plant species will be extinct. Many plants provide medicines to both the industrial world and the indigenous people who live in the rainforests. For example, diosgenin from Mexican and Guatemalan wild yams is the major component of birth control pills. No one knows what other species may offer; if they are destroyed, no one may ever know.

Tropical rainforests are being depleted at such a rapid rate in part because they are largely



located in developing countries. While these nations are aware of the damage being done, they often lack alternative exports to pay for their imports. Often the poverty of these nations poses the greatest threat to the rainforests. For example, in some countries, such as Brazil, Colombia, and the Ivory Coast, desperate farmers from rural areas are overflowing into the "virgin territories." These farmers clear the forests using a slash-and-burn method that contributes up to 30 percent of the world's carbon dioxide emission. Once cultivated, these lands quickly cease to be productive as only a two-inch layer of the soil contains nutrients, which are soon eroded or exhausted. And the desperate farmers are faced to move on to new areas, leaving their old farmlands to erosion and desertification.

Most industrialized countries choose to import unprocessed logs from tropical rainforests of developing countries because of favorable trade incentives, such as getting logs duty-free with minimal tariffs. Many of these trees were harvested through a process called selective felling, in which only certain trees or species are removed, but many other trees are destroyed in the process. For example, for every ten trees taken deliberately in Asia, thirteen are seriously damaged or killed but left behind. Countries such as the United States and Japan import 12 to 15 million tons of tropical hardwood each year.

Because wood is such a basic necessity and is used in the production of so many things, eliminating its use is not a feasible alternative. However, as with any nonrenewable resource, trees must be used with moderation. For example, recycling paper reduces the need to use 'fresh' wood, thereby reducing the number of trees that need to be cut. Also, consumption can be cut by increasing trade duties that discourage clear-cutting. Finally, logging companies must be encouraged to replace the trees they take with trees of varied ages and species. For if we continue to destroy our forests wholesale, we will certainly destroy ourselves.

## Soil Loss

Topsoil is the thin mantle of fertile earth, 15 to 20 cm thick, on which all agricultural products are cultivated. Soil loss, the loss of this topsoil, is occurring at an alarming rate. This is an especially pressing problem because it can take several centuries for 1 cm of topsoil to regain full fertility.

There are several causes for the loss of topsoil. One of these is construction. New buildings may be built on land whose soil is rich in those minerals necessary to produce the best crops. When hydroelectric plants are built, too, any fertile land in that area becomes submerged and unusable.

However, the main cause of soil loss is erosion. Erosion is the gradual wearing away of soil due to the action of the sun, wind, and rain. It occurs when land no longer able to support plant life becomes dry and barren, losing the plant roots necessary to keep the soil from eroding. The topsoil, dried up by the sun, is carried away by wind and rain. In dry areas, the soil left behind gets baked hard, leaving it unable to absorb even small amounts of rain. This may result in the formation of a desert. In more humid areas, productive land is transformed into unproductive wasteland.

Under natural conditions soil erosion occurs very slowly. However, human activities have increased the rate of erosion dramatically. Farmers are constantly using new methods of irrigating and newly developed fertilizers and pesticides to try to maximize crop output. The overuse of irrigation is leaving land sterile and saturated with salt, which is detrimental to the growth of plants.

And fertilizers and pesticides are draining the land of some important minerals. Once soil is left dry and infertile, it is a prime target for erosion.

Erosion may also result from the overgrazing of animals. They may consume so much of the vegetation covering the land that there is

nothing left to hold the land together. The barren, loosely packed earth makes soil loss very probable.

Massive soil loss ultimately means a shortage of food. These shortages have already resulted in famine in Ethiopia and the Biafran region of Nigeria, and may eventually prove fatal to the human race if people do not change both their attitudes towards the land and their methods of farming.

Environmentalists have suggested that some of the problems of soil loss could be slowed by a return to the old-fashioned methods of farming; using natural fertilizers, irrigating carefully, and leaving fields fallow periodically, thereby allowing them to replenish their natural nutrients. However, such an approach would result in a sharp decrease in agricultural output; it is seen by many as digression rather than progression.

A more widely accepted solution for the retardation of soil loss involves more prudent use of fertilizers and the technologies of modern farming. In developing nations, farmers might be advised on how to use more efficient farming methods so that they do not have to burn down forests in order to gain land and increase productivity.

It seems that today's technology has only worsened soil loss. However, perhaps it is possible to use our advanced technology to solve the problem we have created.

## **Desertification and Drought**

Every year the population of the world increases by approximately 80 million people. This means that there are 80 million more people to feed in addition to the billions of already hungry mouths. There is, however, no proportional increase in the earth's food production to support these staggering numbers of individuals. Two of the reasons for the lack of such an increase are drought and desertification.

Droughts are the result of lower than average rainfall and temperature far above average for an extended period of time. Unfortunately, there is no way of accurately predicting when or where droughts will occur, because they are dependent on irregular cycles of global weather (drier-than-normal periods which alternate with wetter-than-normal periods).

In regions where no proper irrigation exists, the lack of rain and the high temperatures that accompany drought place stress on plants and can cause crops to wither and die. A drought may cause a sharp decline in crop output, which may in turn lead to widespread hunger, and, in some developing nations, to starvation. But even in developed countries, the decreases in crop production that result from droughts lead to higher prices which affect everyone in the nation.

Forest and grass fires are also more frequent and spread more quickly during periods of drought, leaving behind earth that nothing can grow on for years afterwards.

One of the most drastic results of drought is desertification. The step toward desertification occurs when topsoil, made arid by drought, is blown away. Topsoil erosion leaves behind unproductive wasteland, whose fertility can take centuries to recover. In dry regions of the world, this land can turn into desert, never to regain its original food-growing capacity.

Desertification can also be the result of poor agricultural practices such as the persistent use of the same plot of land for the same crop, which drains the soil's nutrients and erodes its topsoil. These practices can force farmers to desert their fields, leaving behind dry and virtually unusable land. And these farmers must also move to different lands, often cutting down forests to make way for new fields, and leading to yet more topsoil erosion.

The loss of land due to desertification may decrease a food supply often already undermined by drought, and in turn upset the already fragile economies of developing coun-

tries. In order to improve their economies, the governments of these nations often concentrate on earning foreign currency rather than on replenishing food supplies, initiating a vicious cycle that culminates in widespread famine. This has occurred in many African countries in the last thirty years. Most frequently the core of the problem is a combination of severe drought and improper agricultural techniques.

The solutions to desertification and drought, while quite simple, are not easily implemented. This can primarily be attributed to the lack of governmental financial support and to the minimal degree of education received by farmers concerning the most efficient and ecologically beneficial methods of agriculture. Some progress is being made, however. For instance, in an effort to prevent the desertification of the region in Northern Africa directly above the Sahara Desert. The money necessary to irrigate the region and to train farmers in simple, environmentally sound practices such as crop rotation has been found. This massive operation, "green-planting," should be able to hedge the desert in and keep much of the soil from being useless.

Most scientists agree that there are many ways to halt soil and land degradation. The problem lies simply among the farmers and governments of individual nations. If cooperation between these two groups can be achieved, desertification and drought should not pose as serious a problem to the population of the world in the future as they do today. Without such cooperation, however, millions of people born each year may not be spared the famines that have plagued us in the past.

## **Fertilizers and Pesticides**

In the 1920s, given good soil and animal fertilizer, production of seventy-five 100-pound sacks of potatoes per acre was considered an exceptional crop. By 1940, this figure had risen to 82 sacks. In 1950, the figure was 165. By the 1980s, 275 sacks of potatoes were produced per acre in a good year. How was this

staggering increase of 200 sacks per acre possible? The answer lies in the introduction of modern agriculture, its fertilizers and pesticides.

A fertilizer is any material added to soil in order to increase its fertility. Fertilizers are widely used in agriculture to increase the amount and quality of crops produced. There are two main types of fertilizers: natural and synthetic (artificial). The former comes from animal and vegetable decay. The latter are man-made, usually containing nitrogen, potassium, and phosphorus, and are called nitrate fertilizers.

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*Pesticide contamination of the water supply may lead to cancer in children and may leave the water unsafe to drink for as long as one hundred years.*

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Pesticides are the substances used to kill pests and to prevent their spread. There are three main groups of pesticides, all named for the type of pests they aim to destroy: insecticides for insects, herbicides for weeds, and fungicides for fungi. Most pesticides are man-made chemicals.

The use of both fertilizers and pesticides have their pros and cons. Not all the fertilizer applied can be used up completely by the crops. A certain amount of nitrates seep from the soil into rivers, and some scientists feel that this could be a threat to our drinking water. While dangerous levels of nitrates have not yet been discovered in tap water, fertilizers do remain one of the causes of water pollution.

Fertilizers have, of course, contributed positively to the agricultural industry. It is the mass-production of synthetic nitrate fertilizers that has more than anything else allowed for the immense increases in agricultural production in the last fifty years. In developed nations, synthetic fertilizers have helped to lead to record harvests and, in developing nations, they have allowed food production to

double. In the case of fertilizers the pros seem to outweigh the cons.

The same cannot be said for pesticides. Like fertilizers, pesticides can seep into and contaminate ground water. Pesticide contamination of the water supply may lead to cancer in children and may leave the water unsafe to drink for as long as one hundred years.

Some pesticides, it seems, kill species other than pests. In Nebraska some farmers have noted the practical elimination of song birds and bull snakes (snakes that control the mouse population). In some instances, pesticides have wiped out the population of species which naturally control the pest population, resulting in a dramatic increase in the number of pests. For example, cotton farmers used to spray their fields with DDT to control the boll weevil. In the process they also eliminated the natural predators of two other insects—the tobacco worm and the boll worm. Until the application of DDT they had never been a problem, but without any predators their populations multiplied and they became major cotton pests. As time goes on, pesticides will become more and more ineffective because pest populations build up resistances to pesticides, which they pass on to future generations.

Above all else, the aspect of pesticides that evokes the most concern is its effects on farmers. In California alone, several hundred cases of serious pesticide poisoning of farmers occurs each year.

There are some benefits to pesticides. Their production means the employment of hundreds of thousands of workers in the agricultural industry and billions of dollars of income. And it would not have been possible to produce record harvests with fertilizers alone. Still, while fertilizers and pesticides have made food production keep up with the need for food, we need to work to control the costs of fertilizer and pesticide use, while continuing to produce bountiful harvests.

Because of the high levels of risk involved when using both fertilizers and pesticides, and particularly in the use of pesticides, the best way to address this problem might be in an effort to cut down on their use, and eliminate the use of the more dangerous ones in developed nations that can better afford to do so.

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## Waste

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### Hazardous Waste

Hazardous wastes are solids, liquids, and sludges generated by a wide variety of industrial, commercial, agricultural, and domestic activities that pose health and environmental threats.

Hazardous wastes have become recognized as presenting a serious problem over the last twenty-five years. The United Kingdom was prompted to take action, for example, in February 1972 when there was a public outcry over the discovery of drums containing cyanide salts (a waste with acute toxicity), in a vacant lot where children played.

Japan was one of the first countries to introduce comprehensive hazardous waste controls following the Minamata incident in the late sixties, when many people died from eating fish contaminated with mercury discharged into the sea.

Unfortunately, action to control improper disposal of hazardous wastes in the first place has all too often taken a back seat to dealing with the results of toxic waste. Proper control of hazardous wastes is costly, but experience in a number of developed countries suggests that cleaning up the "sins" of the past is much more costly in the long run than proper disposal in the first place. Here in the United States, the disposal of improperly managed waste has been estimated to cost as much as one hundred times the original proper disposal would have cost.

Considerable progress has been made over the last ten years in controlling hazardous waste in a number of developing countries. Some countries have already put effective legislation into place to help control toxic wastes by closer supervision of waste treatment and disposal as well as by increasing the number of licensed waste treatment and disposal centers.

In a number of countries, however, it is not the absence of facilities that presents the problem, but rather the cost difference between illegally dumping hazardous wastes in landfills and using proper treatment facilities. Landfills tend to be less expensive than waste treatment centers in the short run, and so of course they are often more appealing.

Almost all countries see a need to improve the enforcement of and compliance with regulations regarding the disposal of hazardous wastes. But environmental issues tend to be regarded as less important than other more pressing bread-and-butter issues. Governments may feel that they do not have the money to set up proper waste treatment centers or to hire enough inspectors. Unfortunately, like all environmental issues the problem of waste will not disappear if it is ignored. It will only become worse.

## **Waste Removal**

It is shocking to realize that each person in the United States produces roughly one barrel of trash a week. What happens to all this garbage?

Until fairly recently, open dumping of garbage was advocated as an effective way of reducing trash. Wastes were simply dumped into lots, a filthy practice which caused the spread of disease. Trash was also dumped in wetlands, important breeding habitats, but this practice proved dangerous, not only for the animals that bred there but for the human beings in the area as well. The water in these wetlands would become contaminated by the trash, producing a toxic liquid, called "leachate," which would

seep into aquifers and contaminate the water supply.

Ocean dumping of wastes continues to be a popular method of waste disposal, as the medical waste that washed upon the New Jersey shore in the summer of 1990 reminded us all. The dumping of sewage (also called "domestic waste water") and refuse at the shoreline is common because it is inexpensive and convenient. Unfortunately, this method has detrimental consequences. The excess nitrogen found in the sewage, when dumped in the ocean, causes an overgrowth of plants that clog up bodies of water. Sewage dumped in the ocean can also kill the animals living near the dump site.

A better alternative to simple dumping is the use of sanitary landfills: Trash is buried in disused quarries or some similar spot, where aerobic microorganisms decompose some of the trash and gases, including carbon dioxide, are given off. These landfills must be located on porous clay, but open areas of such soil are becoming more and more difficult to find. Thus, this resource will present only a temporary answer to our waste disposal problems.

Incineration is another method of reducing our astronomical quantities of refuse. In this method wastes are burned in furnaces at temperatures between 1,600 and 1,900 degrees Fahrenheit, and the resulting ash is then buried. The high cost and potential danger of this process are drawbacks; expensive air-pollution control devices are often required both to reduce the harmful effects of change to oxides of nitrogen on the ozone layer and of carcinogens on human health that are produced during the process. Resource recovery plants are a modified version of incineration. Trash is burned as fuel in these plants, and the heat generated is used to change water to steam, turning turbines that produce electricity. Despite the fact that the electricity can be sold, this process is more costly and therefore is not a popular method of disposal.

Waste water is treated through a sewage sys-

tem. When piped into a treatment plant, the waste water is separated into effluent waste water and sludge, the remaining sediment. The sludge, after being broken down further, is dumped into landfills or the ocean, or is used as fertilizer. Sometimes industrial wastes, which are not supposed to be mixed with the waste water, get into the system. When this happens, the system fails because the industrial toxins kill the micro-organisms that break-down the sewage.

The recycling of reusable materials is quickly emerging as the most environmentally safe option for reducing wastes. This process requires the separation of recyclable materials from the rest of the garbage and then separating the recyclables further into categories. Junk mail, milk cartons, newspapers, and telephone books might make one category, aluminium foil, tin cans, another, plastic soda bottles, bags and plastic another, and corrugated cardboard yet another.

The benefits of recycling, like saving trees and saving the natural resources that go into producing recyclable materials, are great. However, in order to make recycling a realistic solution, people must be willing to do the initial sorting of recyclable materials. And getting people to cooperate can be difficult.

Waste reduction can also be done at a household level. Organic garbage can be recycled at home through composting, a safe process by which piles of garbage are covered with soil and broken down by aerobes in the dirt into humus, a sponge-like product. Similarly, "grey water," like the water in the last reuse cycle of the washing machine and water that slips down the drain while you're taking a shower, can be reused to flush toilets for example. Waste can also be reused by choosing products that have less packaging, are made with recyclable materials or that can be recycled.

In addition, wastes can sometimes be converted into energy. We mentioned above how this is done at resource recovery plants. Take, for

another example, the process of pyrolysis, in which solid waste is converted into fuel that can be transported and stored.

Finding sufficient environmentally safe ways of removing wastes poses a daunting problem to our society. To start we must find ways of controlling the amount of waste we generate. And we must find new, safe ways, using what we can't help but produce. To meet the challenge we must also find a willing and cooperative spirit.

It is if we all become aware of the severity of the problem we the zeal to discover environmentally safe ways of dealing with the waste problem.

## **Environmental Challenges**

### **Biodiversity**

Biodiversity is the variety of living species, genetic material, plant and animal life, which makes up our natural environment.

So far only 1.4 million plant and animal species of an estimated 30 to 80 million species have been identified and catalogued. Even fewer are presently used by humanity. Still, the loss of any species can negatively affect an ecological system. During the 1840s, for example, the one single species of potato grown in Ireland fell victim to an epidemic, wiping out basic food that the Irish depended on. Had more than one crop been cultivated, or even perhaps more than one species of potato, only a part of the country's foodstuffs would have been affected; fewer people would have died.

The diversity of an ecosystem accounts for its stability and resistance to pollution and other environmental stresses. A monoculture or system with little genetic diversity is more prone to destruction by disease, weather, and other outside factors.

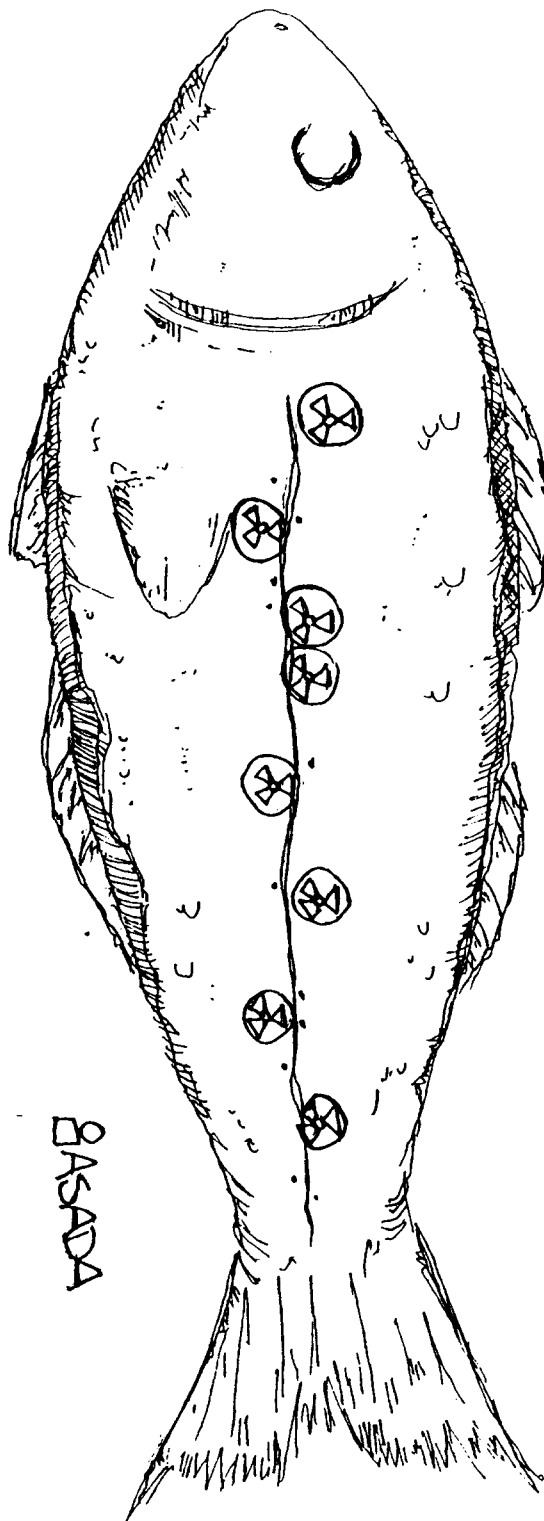
Nature's organisms provide the very basics of human civilization, in the form of crops, domestic animals and the raw materials used for industrial products and many important medicines. While the plight of endangered species such as the bald eagle or the snow leopard have been well publicized, more humble organisms may prove more important to the future of mankind.

In Cuyuhoga Valley National Recreational Area near Cleveland, Ohio, for example, lichens able to change nitrogen into a nutrient usable by other plants have disappeared. These lichens acted as a natural nitrogen fertilizer; they could have been used to fertilize with little threat to the environment.

The primary cause for the decrease in biodiversity is not direct exploitation of a species, but the habitat destruction caused by human activity and population growth. Giant pandas may go the way of Ohio's lichens because the bamboo woods they inhabit are being cut down to make room for the expanding population of the region. Currently, thousands of animals and smaller organisms are becoming endangered, the vast majority of which are destined to become extinct, as their habitats are destroyed through industrial growth, excessive farm expansion, and increased urbanization.

The plight of the wetlands provides an example of habitat destruction, comparable to that of rainforests. Wetlands are essential breeding areas for many species, but more than half of U.S. coastal and freshwater wetlands have been destroyed. Many parts of Europe, as well as the tropics, have lost nearly all of their natural wetlands. In developing countries such as Chad, Bangladesh, India, and Vietnam, wetland destruction already exceeds 80 percent.

Controlling the loss of biological diversity is extremely difficult. Merely setting aside a preserve is no longer enough. Some scientists set their hopes on biotechnology that might be able to engineer all the species necessary for human survival and ecological balance.



Several years ago, the first gene plasm banks were set up around the world to preserve some endangered species. However, lack of funds, and political instability have kept many gene banks from living up to their expectations.

With an international convention on biodiversity being negotiated, what seems to be the most pressing issue at hand is awareness. Every species that becomes extinct is a nonrenewable resource. In the words of UNEP, "...Time is short. The countdown to extinction for many animals and plants is quickening." Humans are in the process of destroying their own habitat. Professor Paul Ehrlich predicts that if the elimination of species continues at the current rate in a hundred years, humankind will be predisposed for extinction. Time is short.

## Urbanization

Human beings have an ineradicable tendency to overindulge in pleasures. This greed has resulted in the rapid deterioration of our environment. The necessities and enjoyments of people have caused apparently irreversible alterations in the environment that are proving to have hazardous consequences especially in areas where humans are highly concentrated.

Since ancient times, certain areas of the world have hosted greater population densities than others. For example, Augustan Rome may have had a population of as much as one million people. Such cities probably made considerable demands on environmental resources because of their large populations. But large cities in antiquity were few, so their effects would have been minute in comparison to the extensive demands on the environment that cities in the last few centuries have made and the damage that has resulted from these demands.

The Industrial Revolution in the eighteenth century transformed culture and technology, dramatically reducing the space required by an individual to live and increasing the intensity

of the demand on resources and the strain on the environment. Populations have also continued to increase due to improved health care and modern science. And as populations increase, they place a greater stress on the environment.

This process of urbanization has proceeded exponentially: the UN estimates that by the end of the century over 3 billion people will live in cities; in 1970 less than half that number, 1.4 billion people, lived in cities. Large cities are now facing an array of environmental problems. If this trend towards urbanization keeps up, many cities will become so overcrowded that they will put untenable stress on their environment. For example, Mexico City, already noted for its air pollution, will become home to an estimated 30 million people, three times the population of New York City.

Urbanization has had devastating effects on all aspects of the environment. Industrial pollutants for example, had a clear impact on aquatic systems and marine life. In Biscayne Bay, Florida, industrial and municipal wastes from Miami are thought to be responsible for the high numbers of tumors found in marine fish. In San Diego harbor in 1962, an estimated 37.8 million fish were killed off by pollution. Such incidents are often linked to industrial accidents.

Excessive urbanization also causes thermal change in the environment. Huge numbers of industrial, commercial, and domestic residents have made the climates in these urban areas resemble the desert. City surfaces, pavement and buildings, absorb solar radiation through their high walls and dark-colored roofs, reflect this radiation back trapping the heat in the city and thinning into a huge hot house. (i.e. the Greenhouse effect). Lack of vegetation just makes it hotter and drier.

The thermal climatic change that occurs within cities has many implications, each of them altering the normal trends of the environment. For example, plants in the city bloom earlier

than those in rural areas, and the heat in the city is stressful for human beings. Every summer, stories of the elderly overcome by heat are reported.

Urban areas also put stress on the environment because of the large amounts of contaminants they house. Such contaminants are derived from litter, garbage, animal waste, horticultural treatments, vehicle waste, industry, construction, and the chemicals used for snow and ice clearance that are dumped on the urban area. In New York City, for example, about half a million dogs leave up to 20,000 tons of pollutant feces and up to 3.8 million liters of urine in the city streets each year, all of which is flushed into the gutters. The sheer bulk of wastes to be accommodated in cities is taxing and limiting resources to their maximum, often beyond.

Humanity and nature are inseparable. People have always tried to dominate the land they depend upon; in urban areas the environment strikes back. "Diseases of civilization," like tension, ulcers, heart disease, allergies, criminality, suicide, and neuroses, take a heavy toll on the quality of human life. But urbanization continues apace. Human beings must take action or suffer the consequences.

## A New Approach

### Sustainable Development

Environment and development present two formidable sets of problems facing the world today. The World Commission on Environment and Development states in *Our Common Future* that "environment and development are not separate challenges. Development cannot subsist upon a deteriorating environmental base; part of the solution to the questions raised by this challenge is what is known as sustainable development."

Although very hard to define, sustainable development is typically characterized as

development that meets the needs of the present generation without compromising the needs of future generations. The two most important concepts of sustainable development are meeting the needs of the world's poor and understanding and dealing with the dangers facing the environment's ability to sustain present and future generations.

A necessary condition for sustainable development is economic growth in those less developed countries where people's basic needs for food, shelter, and medical care aren't being met. Development's major objective is to satisfy human needs, and the demands are extremely urgent in developing countries. In these countries living standards must be raised. Such countries are prone to ecological crises as more people are forced to rely on marginal land and limited resources for immediate survival. In order for sustainable development to be attained a certain degree of productivity must also be achieved and, needless to say, sustainable development must be accompanied by a fair distribution of income and equal opportunities for all. In other words sustainable development can only be achieved justly.

An increase in population growth can increase pressure on resources and undermine living standards. Thus, sustainable development can only be maintained if population growth is checked. And it is important that a country not exploit its nonrenewable resources with abandon. For obvious reasons the kind of economic "growth" or "development" that depends on such exploitation is not sustainable.

Often, sustainable development is defined as an attempt to preserve and maintain all resources. This is not accurate. Although nonrenewable resources, like fossil fuels and minerals, once depleted are no longer available for consumption, it does not follow that such resources should not be used at all. Technology must be reoriented towards alternatives that help reduce the consumption of nonrenewable resources. Moreover, sustainable development requires that we avoid polluting any of the 'free goods' such as air and

water. These resources are necessary for the well being of all ecosystems.

Sustainable development is, therefore, a combination of growth and regard for all ecological systems. It attempts to strike a fine balance between development and the future of the planet. We must regard not only the needs of today, but also the needs of tomorrow. The interests of future generations are just as important as those of the present. The goal of sustainable development is to bear this constantly in mind.

## Indigenous People

When the environment is threatened, not only are animal and plant species endangered but entire human populations are endangered as well. Indigenous people are the people native to an area. Indigenous people are directly dependent upon their environment, so they consume the minimum amount of resources needed for survival and at the same time allow their environment. The Yanomamo of the Amazon rainforest, for example, hunted, fished and cultivated crops. In return, they contributed to the environment by carefully cultivating particular species of plant life, which added diversity to the forest. The Yanomamo were careful not to overcultivate any particular area by periodically drifting to different areas, in order to allow the land to rejuvenate itself. They respected their environment, taking their living from the land and putting something back as well.

Problems arise when the industrialized developing world comes in contact with the non-industrialized world of native peoples. The fragile balance between the tribal society and its environment is disrupted. Not only do resources become scarce, but the cultural

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*. . . as many as 40,000 of the world's estimated 265,000 species of plants may have nutritional or medical properties for humans.*

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integrity of these tribes also suffers and the tribe members' vast knowledge of their environment is lost.

And this knowledge could be important to us all. The World Health Organization estimates that 3.5 to 4.0 billion people rely on drugs derived from plants for their primary health needs. According to the director of the New York Botanical Garden's Institute of Economic Botany, as many as 40,000 of the world's estimated 265,000 species of plants may have nutritional or medical properties for humans. Of these, only 1,100 have been thoroughly researched by Western scientists.

The devastation of indigenous people accelerated dramatically with the Age of exploration and "development," which caused drastic changes in their lifestyles. Tribes were forced off their land and then expected to adapt to the industrialized developed world. John Hemlock of the Royal Geographical Society of London estimates that since 1500 B.C, the population of the native tribes of the Amazon River Basin has dropped from 3.5 million to 200,000.

Changes are still taking place today. The industrialized world continues to threaten the existence of native tribes both directly and indirectly. The directly imposed threat involves land and people and arises when the resources that indigenous people are dependent upon are destroyed. Deforestation in Brazil has undermined animal and plant resources, as well as the forest dwellers water supply. As the areas inhabited by these tribes are being industrialized, the Indians are forced off their land, but have nowhere else to go. The cattle ranching estates in Brazil have cut down millions of trees so they can occupy vast areas of land, yet very few jobs have been created for the displaced populations. In 1985 the total area of Brazil's cultivated land was estimated at 40 million hectares and was occupied by only 152 estates. For the Indians forced from their land there is nowhere to live but the overcrowded, polluted cities where they are consigned to poverty. The Penans of the

Malaysian rainforest have met a similar fate. In 1980, there were 10,000 Penans in the forest. Today, due to deforestation and pressure from the Malaysian government to move them to the villages of the developed world, there are less than 500 Penans remaining in the forest.

The other threat is subtler and has to do with the power and allure of the industrialized world. As indigenous people become worn down by pressure from their governments and the wealth and power of the developed world, as they become frustrated with their inability to stop the destruction of their environment, they abandon old traditions. In the words of a Maya farmer of southern Mexico, "The outsiders come into our forest and they cut the mahogany and kill the birds and burn everything. Then they bring cattle, and cattle eat the jungle. I think they hate the forest."

In Brazil, 90 of the 270 tribes have disappeared since 1900. Of the remaining tribes, many have lost their land or left their traditional ways. The young are often seduced away from the tribe by the allure of the Developed World.

Inevitably, cultural integrity is damaged. It is estimated that half the world's 6,000 languages will be wiped out simply because the young no longer learn to speak these languages. Much knowledge of the medical values of plants is also being lost because traditions are no longer passed on to the successive generations. As the elders of a tribe die, a rich store of culture and traditional knowledge dies along with them.

It is only recently that the indigenous people have begun to rebel against the industrialized world. The Penans of Malaysia have made efforts to stop the deforestation of their environment as have the rubber harvesters of the Amazon rainforest. Other efforts to save indigenous people are being made in the Western industrialized world, where many believe that it is possible for indigenous people to maintain their traditional uses of the environment and still interact with the developed

world. A group called Cultural Survival, for example, is working to protect the habitat of indigenous people through economic incentives and thereby keeping culture and knowledge alive. Moreover, groups such as the National Cancer Institute are moving rapidly to collect threatened plants and to investigate their natural medical properties.

Clearly, the attitudes of the developed world must change. Only with fundamental change of attitude can we hope to curtail the threat posed to indigenous people. And only through curtailing this threat can we ensure the survival of indigenous people.

## **Environmental Discrimination**

Among the many problems that relate the environment and social development is that of environmental discrimination. Environmental discrimination occurs when people are exposed to environmental hazards because of personal or national poverty. Studies show a clear relationship between level of income and exposure to environmental hazards. In Third World countries governments have little money to provide their population with adequate land, services, and facilities. Often clean water and sanitation are lacking, and the result is decrepit, over-crowded housing with primitive facilities and disease closely tied to an unhealthy environment.

Because of the amount of hazardous waste produced and the high costs of disposal, industrialized countries often export their residues to Third World countries. Frequent rains and poor soils in tropical areas, however, often cause large proportions of the chemical wastes to seep into ground water supplies. One such case, in 1988, involved 3,800 tons of toxic waste from Italy dumped in the small Nigerian port town of Koko. Residents of Koko complained that the odors given off by the leaking sacks and containers of waste made them ill. What the long term effects of that dumping will be on the residents of Koko are yet to be seen.

## Technology/Energy Sources

### **Non- Renewable Resources**

Often, in Developing countries, lead pollution is a greater problem than in developed countries, and investigations conducted by the World Health Organization show that the levels of pollution in many kitchens in developing countries match the severe levels of outdoor air pollution in London in 1952. In Developing cities, high concentrations of industries lead to unacceptable levels of air, water, noise, and solid waste pollution, which dramatically affect the lives of their many inhabitants.

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*One such case, in 1988, involved 3,800 tons of toxic waste from Italy dumped in the small Nigerian port town of Koko.*

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Environmental discrimination can also occur in urban areas of developed and underdeveloped countries alike. Water supply systems leak, and because of the low water pressure, sewage often seeps into drinking water. Large parts of cities are not equipped with proper piped water or storm drainage. A growing number of urban poor suffer from environmentally based diseases; acute respiratory diseases, tuberculosis, intestinal parasites, and diseases linked to poor sanitation and contaminated drinking water (diarrhea, dysentery, hepatitis, and typhoid) are usually major causes of illness and death, especially among children. Many slums crowd close to hazardous industries, since this is the land that no one else wants.

The basic root of environmental discrimination is inequality between nations or within societies. The gap between industrialized and developing nations must be closed and the needs of the poor must be looked after in both developed and developing countries; adequate housing and other services must be provided, pollution levels must be controlled, and safety measures must be installed to prevent ecological disasters. Only then can environmental discrimination be eliminated.

“The Consumption of energy per person in industrial market economies is more than 80 times bigger than in sub-Saharan Africa.” Rural areas of the developing world have little or no access to modern energy technologies and supplies, yet more than half of the world’s population lives in these areas. Energy is necessary for survival; future development depends on its longterm availability. Since the aim of a developing country is to accelerate its industrialization, economic growth must be accompanied by an increased demand for energy. The energy consumption of sub-Saharan Africa is going to have to catch up. As a result, there will be a greater consumption of finite commercial primary energy provided by coal, oil, and natural gas. But thousands of years are needed for these resources to renew themselves, so if they are depleted, simply waiting for them to regenerate themselves is not a viable solution. Alternate energy sources must be found and measures must be taken to conserve finite resources so that the consumption of nonrenewable resources can be decreased.

Some resources once believed to be inexhaustible are now being deemed nonrenewable. One such example is trees. Forest depletion, once thought to be one acre per second on the average, is now known to be closer to two acres per second. While some places, such as Chile and New Zealand, plant one replacement tree for each tree that has been harvested, other places, such as North America make virtually no attempt made to replace harvested trees. For example, in Canada, more than a quarter of the 1985-86 harvest has not yet been replanted; less than 3 percent of the forestry budget goes to intensive forest management. In Sweden the figure is 40 percent. But even a vigorous replanting scheme can't solve the

problem, since most trees take several decades to mature, and this maturation rate isn't nearly fast enough to keep up with the average rate of forest depletion.

The term "nonrenewable resource" implies that such resources are finite and therefore that using them reduces their availability in the future. However, it does not follow that the use of such resources should be eliminated. Rather, they should be used sparingly, taking into account the fact that they are limited. We do not yet know how much of these resources we have left, but as the limit is neared, higher prices will become a barometer of their increasing scarcity. The availability of alternative resources and of technology to reduce the rate of their consumption should be critical factors in determining the quantity of resources that should be used, as well as the direction of their allocation. By economizing and recycling the complete depletion of these nonrenewable resources can be postponed until suitable alternatives can be found and made available.

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*One such example is trees. Forest depletion, once thought to be one acre per second on the average, is now known to be closer to two acres per second.*

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## **Biotechnology**

Although the uses of genetic engineering today are primarily medical (for instance the synthesis of insulin for the treatment of diabetes), they can also be applied to the protection of the environment. Every day millions of tons of waste are produced, predominantly through industrial processes. Problems arise because the rate at which this waste decays is slower than that of its production. However, the rate of decay can be increased by genetically engineering microorganisms that feed on such wastes, thereby degrading or disposing of those wastes quickly. Genetic engineering

makes it possible for us to speed up the degradation process and specifically to tailor each microorganism to particular kinds of waste in order to clean up the environment.

However, as with many new and unfamiliar fields of scientific research, genetic engineering has been under considerable scrutiny. Some scientists, along with the general public, fear hazards involved with the manipulation of genetic material. They fear that the accidental or even planned releases of genetically altered bacteria and other microorganisms into the environment could cause epidemic diseases or ecological disasters.

When word first spread that techniques had been developed for altering genetic material, some people began to believe rumors about terrible plagues sweeping the planet. So far there have been no documented cases of illness or injury caused by genetically engineered organisms. But, in an effort to assuage these concerns, scientists have proposed installing "genetically engineered safeguards," such as making sure the organisms have limited lifespans to prevent them from spreading far.

Using genetically engineered microorganisms to clean up the environment is a relatively new concept. So there is still much room for exploration, for improving methods in terms of efficiency as well as safety. But if genetic engineering proves controllable, it offers hope for regenerating our environment without giving up the advantages that industrialization has brought.

## **Solar Energy**

Every hour the sun radiates energy to the earth equivalent to that of about 400 billion tons of coal. However, the earth absorbs only about 30 percent of all the energy that reaches it from the sun. Today's technology enables us to use solar energy more efficiently, allowing us to convert this radiation into solar energy. By using solar energy we can relieve pressure on our nonrenewable resources, like oil fuels.

How can we use solar energy efficiently? Although the sun radiates a tremendous amount of energy, this energy is scattered over a large surface area, so its intensity is relatively weak. Solar collectors enable us to gather and concentrate these scattered rays of the sun. Collectors concentrate light rays to produce thermal energy, which may then be used generate electricity indirectly by using it to boil water to produce steam to turn turbines, or it may be used directly for industrial high-temperature processes.

“Photovoltaic cells,” a kind of solar battery known as solar cells, are another means by which solar energy can be used to produce electricity. A solar cell is made of a thin layer of silicon (composed mostly of sand) in addition to small amounts of other substances (like gallium arsenide and cadmium sulfide). When the cell is struck by sunlight, it generates heat which in turn forces water to disperse electrons and produce a small amount of electrical current. Since 1958 solar cells have been used to power satellites and to generate electricity for approximately 12,000 homes worldwide with half of these in United States. Solar units are found mostly in isolated areas where the cost of running electrical lines to each house is expensive.

Buildings using solar energy are constructed differently from other buildings. Many solar cells are wired together to create a solar panel able to generate at least thirty watts of electricity. A group of these panels are then connected to each other and placed on a roof or a rack to absorb sunlight and produce electricity for the building.

Solar cells have many important advantages. If used efficiently, they could generate 20 to 30 percent of the world's electricity by 2050, preventing the need for creating new large-scale nuclear or conventional power plants and reducing the number of existing nuclear and coal-fired power plants needed, thus reducing the amount of pollution generated. Unlike nuclear and coal-fired plants, solar cells do not produce dangerous by-products.

Although there are several advantages to solar energy, there are some disadvantages. One of the greatest problems with solar energy is the cost. Present cost of solar cell systems is extremely high, while their total energy yield is relatively low. Often developing the appropriate technology as well as producing it is so expensive that solar energy becomes an economically unfeasible alternative. However, the initial cost is usually recovered over time. And if we add clean up costs into the generation of energy by nuclear and conventional means, solar energy becomes cheaper still.

Another obstacle to solar energy is that in order for it to become the main energy source, it must be sunny year round. Without bright sunlight it is impossible for solar cells to produce energy. But with energy storage improving, we may be able to overcome this drawback too.

The disadvantages of solar energy are greatly outweighed by the advantages. Solar energy is a viable alternative that can help solve the energy crisis and deserves to be supported. Perhaps it's our hope for the future.

### **Wind as an Alternate Source of Energy**

In these days when the earth's fossil fuel resources are rapidly being diminished, wind has become a promising source of energy, for it will exist as long as the Earth itself does. Wind also offers advantages as an alternate source of energy because it is a force, not a fuel: It does not burn and give off harmful fumes. So far there are two types of wind energy-generating systems (WEGS). They both have a system of gears that catch the wind and transform its force, through the use of water pumps and generators, into electricity.

Despite the facts that wind is clean, inexhaustible, free, and available everywhere on the planet, there are a few setbacks to harnessing it as a source of energy. The most obvious of these is the cost of WEG systems. The

machinery that harnesses the wind is not cheap either to build or to maintain. Only recently have classes been offered in running and maintaining wind turbines, so mechanics are scarce and, thus experience. The Department of Energy has set a goal of bringing down the cost of wind generated electricity to between two and four cents per kilowatt-hour. Only then will it be priced competitively with more conventional energy sources. However, as the cost of oil goes up, the cheaper wind-generated electricity becomes. Because wind is free, the savings in raw materials will more than cover the cost of developments. And if we add the cost of cleaning up the environment to the price of conventional energy sources, WEGS become even more competitive.

Another major problem is that WEGS emit and generate microwaves, that disturb the microwaves of other transmissions (i.e. television transmissions). They can be quite dangerous, for instance, causing pacemakers to behave erratically. At certain speeds, the blades send out waves ranging from 1000 MHz to 300,000 MHz, which can affect respi-

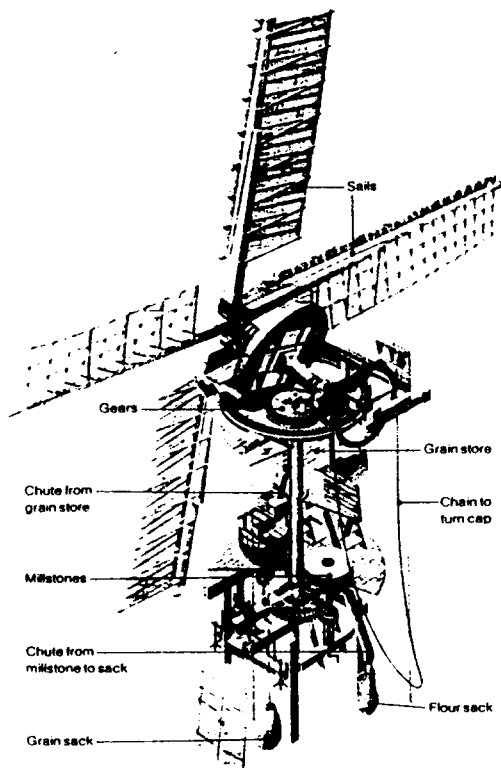
ration and heartbeat even in healthy individuals. However, scientists are currently at work on ways of preventing these harmful waves from affecting the people who live around WEGS. In time, they should be able to reduce the impact of WEGS-generate microwaves substantially.

At present, the goal of manufacturers is to design wind turbines that will be stronger, and produce more electricity with less wind. Currently, WEGS can harness 59.3 percent of the wind passing through. A promising design, the Super Speed Turbine (SST) could improve this figure. The SST is very lightweight. Instead of being constructed of steel, it is made of wood and glass fiber. And this lightness means it can generate more revolutions per minute with lower wind velocity. It is estimated that by the year 2000, wind energy will make up 5 to 10 percent of the nation's electricity. As technology continues to improve more and more of our electricity can be provided by clean, readily available wind.

## Nuclear Power

Our energy needs in the past few decades have increased tremendously, mainly as a consequence of industrialization. Once it was discovered that radioactive isotopes of certain elements such as uranium and plutonium could be used to generate energy, it was hoped that they might be able to act as a substitute for fossil fuels in some industries. The main benefit of nuclear energy over fossil fuels is that the generation of such energy does not produce CO<sub>2</sub>—the chief cause of global warming. Yet it seems from the very beginning that nuclear power has been surrounded by controversy.

Nuclear energy is produced inside a reactor. The thermal neutrons of the decaying uranium, for example, "bounce" around inside the reactor. The kinetic energy of the neutrons is then converted into thermal energy that is used to boil water to produce steam. This steam is then used to drive the turbines that create electricity.



THE MECHANISM OF THE WINDMILL.

Though the builders of nuclear power plants take preventative measures in their designs, nuclear accidents such as those at Chernobyl and Three Mile Island have still occurred. At Chernobyl the nuclear reactor overheated, resulting in a meltdown of the core. With the core of the reactor sinking into the earth, radiation leaked into ground water, contaminating drinking water and grazing fields. The effects of Chernobyl are still being felt nearly six years after the disaster occurred.

Still, meltdowns are estimated to take place on average once every fifty years. The design of reactors has changed significantly since the first nuclear power plants were built. And these changes have greatly reduced the threat of the release of cancer causing radiation. Given the catastrophic consequences of a meltdown or a considerable release of radiation, the danger of nuclear power remains great.

Another environmental problem associated with nuclear power is thermal pollution. Thermal pollution is caused by the cooling system of a reactor. Since the water of the reactor reaches very high temperatures, cool water from rivers is used to bring the temperature of the core reactor down. This water absorbs much of the heat; then it is sent back to its original source. Since large amounts of water are used in the process, there is often an increase in the temperature of the source body of water. High water temperatures kill fish and other water wildlife and vegetation.

The depleted uranium created by nuclear reactors adds to the dilemma of whether or not to use nuclear energy. Scientists and engineers have not yet found a safe way to dispose of the highly radioactive uranium. This waste has temporarily been stored in tanks filled with water. A possible disposal site for the future may be in stable rock formations in Washington State, for example, where earthquakes do not occur very often. Whether or not this will prove to be a tenable solution is yet to be seen.

Clearly with our fossil fuel stores being rapidly

depleted and our planet faced with the threat of global warming, nuclear power remains an appealing source of energy to many. Given its many dangers, however, perhaps changing our lifestyles to conserve energy is a better solution.

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## Prevention and Control

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### Education, Prevention, and Control

During the 1970s, recycling took place mainly in college towns and environmentally conscious communities around the United States. Participation in such programs was low, profits were minimal, and the idea of mass recycling was simply that, an idea. Like many environmental problems, today's waste could have been better controlled if more people had been educated and informed about recycling.

Two ways people can be educated about the need for environmental protection is through the media (print, video, and television), and school curriculum. Thus far, the media have proved the best vehicle for education. Magazines such as *National Geographic* have published special articles and television stations have produced documentaries dedicated solely to informing people about the importance of protecting the environment.

But schools have also begun to integrate environmental awareness into their curricula. Many schools would like to give students information pertaining to environmental problems, but have faced an obstacle in lack of funds. For some teachers, developing a suitable environmental curriculum has been difficult, since many of them have to pay for materials and texts out of their own salaries. Fortunately new policy initiatives are making environmental education a priority, and innovative teachers are developing low cost ways of helping students learn about the environment. One of the most successful and inexpensive methods so far has been the "hands on" approach where students go out in the

field to do studies. Students learn and environmentalists get unpaid assistance.

Because they reach a tremendously large number of people almost every hour of every day, television and film have been ways of educating the public. Because schools can gear their environmental message to the age of the audience, the ability of individual students, and the experience of those students, schools can be a particularly effective vehicle for conveying the message of ecology. When the arts and the pulpit begin disseminating the message of environmental protection, perhaps this message will really get through.

## **Media**

Environmentalists, through such media as newspapers, magazines, television, and radio, can inform the public of practices and policies that are harmful to the environment in this way, environmental issues and problems are brought to public attention, prompting the public to pressure offenders into changing their policies.

The media can inform people living in industrial areas of industrial policies that might affect their health, giving them a chance to protest these policies. For example if a factory is releasing carcinogenic agents into the air, and that release is reported in the media, the people living in that area can protest the methods of production that are at fault, and bring pressure to bear by refusing to buy the company's products. Realizing that it is risking the loss of consumers, the company might be willing to incur the expense of revamping its production methods to make them more environmentally sound. Similarly, media exposure of the growing hole in the ozone layer has encouraged the public to pressure companies into abandoning the use of harmful chlorofluorocarbons in aerosol sprays.

Not just businesses are affected by the media's promotion of environmental awareness. Since public opinion is a crucial factor in the career

of a politician, the exposure of a problem by the media can often serve to encourage the passing of laws that benefit the environment. Media attention to the relationship between car exhaust and the destruction of the ozone layer has led to a public outcry resulting in laws setting standards for car emissions, for example. The media can also encourage people to demand better public transportation, decreasing the number of polluting vehicles, especially in urban areas.

The media can also benefit the environment in developing countries, whose industries are often too poorly funded to use and research technology that is friendly to the environment. Media exposure of the problems faced by developing countries can encourage the industrialized world to help them acquire the technology they need. The media can also help ensure that the environments of developing nations are not exploited by the unfair practices of foreign corporations who abuse the environments of these countries for economic purposes.

The media is a strong catalyst for change in environmental policies and practices throughout the world. The media brings attention to environmental problems and can change human values about the importance of safeguarding the environment.

## **Religion**

When Buddhist monk Kiranthidiye Pannasekera Thera arrived in the southwestern Sri Lankan village of Galahitiya in the early 1980s he conducted a series of surveys that clearly showed high levels of malnutrition, poor sanitation, watershed deforestation, landlessness, and lack of health care there. To help this village, Monk Thera became a link between the government and the villagers. He helped to get land grants for the villagers, encouraged them to boil water, build latrines, plant gardens, and build a road to bring in services and make health care more accessible. This is one example of how religion and religious leaders can become catalysts for change.

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## Economic and Political Systems

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### Using the Market System to Save the Environment

Often, environmental disasters can be prevented or controlled if people and communities are better educated and informed. Because the influence that religious leaders may have over their congregations is often great, religious institutions are important avenues for the dissemination of information.

In 1990 the United Nations Environmental Programme organized an environmental sabbath, from June 1 to June 3. Members of the Baha'i faith, Buddhists, various Christian groups, Hindus, Moslems, Jews, Native American religious groups, members of the Religious Society of Friends, and Sikhs all participated in Earth Rest Day. The message sent to the many congregations focused on the essential earth human relationship, and how scripture, wisdom, spirituality and environmentalism all tied together.

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*Because the influence that religious leaders may have over their congregations is often great, religious institutions are important avenues for the dissemination of information*

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However, in the same way that religion can be useful in instructing, it can also serve as an obstacle to human and environmental consciousness. Theocracies keep development stagnant, impairing education through censorship. And religions tenets can prevent people from implementing programs that could help alleviate problems the world faces today such as overpopulation.

Despite these conflicts, in the main religion and environmentalism can work together. Many faiths already stress the importance of respect for the earth and of our responsibility to preserve it. Through the celebrations of nature that so many religions have always involved, people can become aware of their responsibility and be prompted into action. In this way, religion and the traditional values that it teaches, can help protect the future.

In a market economy the role of government is reduced to a minimum. Prices are controlled by supply and demand with competition serving as the regulatory mechanism and profit as the driving force. It is precisely these fundamental characteristics of the market system that can help prevent environmental damage.

Businesses look to expand production and use marketing techniques to increase their profits. With increasing concern for the environment, environmentally sound promotional schemes, products and services have gained considerable popularity. For example, stores such as Bloomingdale's, Lord & Taylor, Macy's, Nordstrom, and The Limited know that their customers are concerned over the exhaustion of our fossil fuel supplies so they have gone back or continued to use paper bags thereby saving oil, an important natural resource. In fact, Bloomingdale's and Macy's even use recycled paper to make their bags.

A number of firms have also established links with environmental groups as a means of getting ahead of their competition. M.C.I., for example, offers its customers the option of donating 5 percent of their telephone bill to one of four environmental groups: Nature Conservatory, Ducks Unlimited, the National Audubon Society, or the National Wildlife Fund. This has led many environmentally conscious customers of other long-distance telephone companies to switch to M.C.I.

Visa and Mastercard have also forged connections with environmental groups. Both credit card companies now offer their customers the option of using what are called "affinity cards." Whenever they are used, a portion of the sale price is contributed to various environmental groups.

Other businesses that have established a rapport with environmental groups include Nature Co., Sears, and K-Mart. The Nature Co. already sells environment-related merchandise through its 60 stores, and its catalog recently formed a partnership with the National Conservatory. The other two have started to use the logo of the National Wildlife Federation on various products like T-shirts and stuffed animals and are paying that organization for the privilege.

Environmental management and environmental clean up businesses are also burgeoning. Because countries are becoming concerned about the destruction of their natural resources, the demand for such services is on the rise.

In countries like Taiwan, Malaysia, and Singapore, for example, there is an increased demand for companies specializing in the clean-up of polluted waters. Air and Water Technologies Corp., a Honolulu-based firm, is cashing in on such opportunities. In South Korea, companies that sell computer systems to manage and process environmental information are also doing quite well. Clearly, the view that environmental protection is a luxury that hampers production is changing.

“Pollution rights” have also emerged as a product in the United States. Several state governments have set stringent pollution limits for various industries and will sell company the right to emit pollutants beyond this ceiling. If, however, a company creates less pollution than it bargained for, the firm may sell the leftover amount to another company. This new “product” eliminates companies that cannot bear the cost of pollution, and encourages the industrial sector of a nation to cut down on the amount of pollution it causes as well. As we all become more and more environmentally conscious, our market system will encourage companies to exploit this business niche, providing products and services that make our world a better place in which to live. Perhaps Adam Smith had the right ideas after all.

## **Economic and Environmental Costs of War and Military Defense**

War and defense entail both economic and environmental costs. Resources that could be used to develop a nation’s economy or to improve its environment are often used instead to support a nation’s military “needs.”

Military spending takes up a large percentage of the national budgets of both developing and industrialized countries. But while developed nations have usually been in a position to devote sizable portions of their revenue to economic renewal, less developed nations have not. Underdeveloped nations have often enhanced national defense at the expense of improving standards of living and developing their economic base. As a consequence of real or perceived threats, or because some less developed nations have been used by major powers as proxies in power conflicts, they use aid money from other nations or banks to buy arms rather than to buy bread or to build factories to make bread.

This has been seen most clearly in countries like Pakistan, India, and North Korea. These countries have spent millions on developing nuclear weapons while their people live in primitive conditions, facing famine and disease everyday. During the Cold War efforts to curb the arms race were begun in the United Nations and other forums. As long as twenty years ago a Nuclear Non-Proliferation Treaty (NPT) was signed by many countries, including North Korea, Iraq, Libya, Iran, USA, USSR, UK, France and China. Still, many underdeveloped countries refused to sign, and if they did sign they went forward with their weapons programs anyway. Israel, Pakistan, and India refused to sign, and North Korea and Iraq are notable scofflaws. It has been suggested by many that the only way to stop the arms race is to raise the price of arms, as well as the cost of arms production. This should make it more difficult for impoverished nations to continue expensive nuclear programs. Tighter import and export controls might also be advisable.

With the disintegration of the Soviet Union, however, there is bound to be great change. The United States and the Soviet Union were chiefly responsible for the arms race. These two countries worked out their conflict indirectly by supporting the militaries of less developed countries in Africa, Asia and Latin America. Now, because the Soviet Union has collapsed, military spending may decrease dramatically. The non-defunct USSR can no longer support the arms race around the world, and the USA is facing its own economic problems. However, relatively little can be predicted with any assuredness. War can begin unexpectedly, prompting military spending to go up drastically, as we saw in the Gulf War of early 1991.

In addition to economic hardship, the modern military also brings with it large-scale environmental devastation, as conflicts in Vietnam, Afghanistan, Central America, and the Persian Gulf demonstrate. The production, testing, and maintenance of conventional, chemical, biological, and nuclear arms generate enormous quantities of toxic and radioactive waste, which contaminate the Earth's soil, air, and water. Military wastes are beginning to surface both at home and abroad: Installations developing, testing, and manufacturing nuclear weapons, notably in Oregon and Colorado, are under increasing scrutiny for the danger they pose to the health of the people living around them, as well as to the people who have worked in them. And as some of the superpowers' troops and bases are withdrawn from foreign lands, unpleasant environmental discoveries are being made. The effects of decades of disregard for the environment in the weapons production industry simply cannot be hidden from public view.

### **Plight of the Environment in Relation to the Economy**

Every day, industries vital to the economic development of countries upset ecological systems and impair development in the future. This is a problem particularly in developing countries. Economic development and envi-

ronmental security can no longer be considered separate problems.

Since the 1980s it has become clear that environmental stresses and patterns of economic development are linked to one another. For example, agricultural policies may be at the root of land, water, and forest degradations: the agriculture of industrialized market economies produce surpluses that lower prices and shut out the often neglected agriculture of developing countries, which then feel forced to sacrifice the environment in favor of increasing production. Although countries may devise short-term gains, soils and other environmental resources suffer in both systems. In the longrun these soils will not be available for future generations.

For many years, industrialized countries have also been exploiting the weaknesses of Developing countries more directly. They have set tariffs that are astronomical compared to the incomes of these countries. So Developing nations have borrowed huge sums to foster development and now face disastrous interest payments. In order to realize these payments standards of living are taxed even further, making the plight of citizens increasingly desperate. But desperate people do not make for stable political situations. And politically unstable countries are less likely to attract investment, so Developing countries become increasingly reckless in their effort to improve their economies.

While trying to catch up with the output of industrialized countries, Developing nations have done enormous damage to their land, water and air. Fuels necessary for industry are being consumed at much too high a rate. And land is being deforested at an alarming pace in hopes of attracting development.

Powerful and wealthy countries can also develop ways to clean up the environment and they can also set standards for the amount of natural resources used and the amount of damage done to the environment in producing goods. Developed countries have the resources

to come up with new methods, whereas other countries cannot afford to. Finally, banks, with the help of governments and corporations, can forgive debt in exchange for land set-asides and enforcement of environmental regulations.

Both First and Developing World governments have to be made aware of the advantages of developing a more ecologically based economy. Already, important nations in the trade market are beginning to adopt stricter ecological regulations.

### **The Need for Intervention: An International Environmental Authority**

Many private enterprises contribute greatly to the degradation of the environment. While some businesses can and do help raise awareness about the environment, as well as prevent some environmental problems, voluntary cooperation is not enough. Many people agree that there is a strong need for some form of intervention.

On a national level, many governments have begun to impose stricter standards for pollution emissions, as well as penalizing those companies that violate these standards through taxation, fines, and the cancellation of bank loans. Many governments are also making the standards of carbon emissions from the cars more stringent. Still, governments have been slow to act when the environmental degradation occurs across the border. Because environmental degradation is a global problem, intervention on the international level is essential. It is only through international intervention that countries can be brought to consider the effects of their pollution on the world as a whole.

Some global intervention has already begun through the efforts of international lending and environmental assistance institutions such as the International Monetary Fund (IMF) and the World Bank. The IMF is a financial cooperative that uses the foreign currency reserves of

member states to help countries in need of economic assistance in exchange for the right to make that nation's economy more efficient and competitive. Recently, the IMF has begun to use this power to pressure countries to reduce their levels of polluting. The World Bank has been known for similar efforts in the field of development, and has now established a fund dedicated to the protection of the environment. This fund will provide \$1 billion to \$1.5 billion for projects such as the preservation of the rainforests so quickly being depleted around the world.

While these two institutions have helped, neither of them is sufficient, for neither is devoted solely to intervention for the sake of environmental protection. Without such a single focus, the needs of the environment might be made to take a back seat to other issues deemed more pressing in the short-term. An international environmental authority could formulate consistent international standards and implement them with less chance of being influenced by political considerations. It could enforce these standards by imposing fines or levying taxes on goods exported from nations that do not do enough to prevent the degradation of their environments, and it could aid those nations that do take measures to protect their environments.

However, an international environmental authority could do more than simply set standards, and penalize and aid nations based on their environmental policies. More importantly, it could convince the economic planners and policy makers of individual nations of the harsh realities of environmental degradation and the long-term financial and ecological advantages of environmental protection.

An international environmental authority could also enforce the laws that have been created through numerous conventions. After all, there is no point to passing international environmental laws that no international institution can enforce.

One of the main obstacles to founding such an organization, however, would be determining

just how far its power to penalize nations would go. How heavily can governments' exported goods be taxed, and is taxation in fact a fair penalty? How would the organization take into account the economic and political differences between developed and underdeveloped countries?

Although these obstacles have delayed any plans for the creation of an international environmental authority, an international coalition that would operate democratically and look after the developmental and ecological security of the planet would be invaluable. Only by taking such a step could we circumvent the impulse for nations to act in their narrow self-interests. Only by creating such an authority can we hope to foster environmental cooperation among nations and make sure environmental consciousness becomes a world wide goal.

## **International Debt**

The world's debt crisis came to a head in 1982, with a change in the flow of finances between advanced and developing countries. The almost one-way flow of money from the developed countries to the developing countries (in the form of loans) stopped, and the developing nations were left with huge debts to be paid with raw resources. Countries that are deeply in debt are now forced to use the natural resources to pay off the interest on debt accumulated in the seventies and eighties, instead of investing that money in their own development. These resources are used to make up payments, and the people, who have little or no monetary support from their governments, are also forced to use their resources, farming marginal land in order to survive, adding to the degradation of the planet.

The lack of capital makes it impossible for developing countries to invest adequately in forest protection, soil conservation, irrigation improvement, energy-efficient technology, or pollution-control devices. Little aid money supports ecologically sound development,

resulting in environmental damage, which could otherwise have been avoided.

The most visible impact of international debt is in middle income countries, particularly those in Latin America. In the 1970s, banks in the industrialized world were eager to invest in growing Latin American countries that were rich in natural resources and that promised to advance with great strides. But economies in Latin American countries plummeted. Banks, alarmed by the deteriorating economies, stopped lending money, and governments were forced to cut back imports by 40 percent of export earnings. The payment of these debts was achieved by adjusting policies and imposing severe cuts in wages, social services, investment consumption, and employment. This caused widespread poverty and increased pressure on the environment as more exports needed to be produced. These pressures have led to the overexploitation of natural resources, which are a large part of Latin America's exports: raw materials, food, and resource-based manufactured goods.

In these countries, natural resources are being used to meet the growing debts instead of being used for development or to raise living standards. This pattern merely causes greater longterm problems, because it is not sustainable. A growing number of financial institutions, including the World Bank and the International Monetary Fund, are coming to realize that these countries will not be able to grow unless this burden is eased. Solutions to this problem include new lending, forgiving parts of debt, longterm debt rescheduling, and conversion to softer terms. One new suggestion (pioneered by Fernando Collor de Mello, president of Brazil) are "debt-for-nature" swaps, in which a country has a portion of its debt forgiven in policies and practices for environmental protection. These schemes might at least minimize the problems caused by excessive debts, so that these countries can begin to concentrate on their internal needs and bring themselves out of the situations in which they find themselves today.

## International Trade

New developments in the trade policies of the European Community (EC) have shown how one country's attempt at environmental protection can become a trade barrier for goods in the eyes of another. Germany's new law on packaging, which has forced the EC to call for 60 percent of all Europe's packaging to be recycled within five years and for a freeze on all packaging output, has lately been under a lot of scrutiny for the fine line that it is said to have crossed between environmental protection and protectionism. This is one example of the link between environmentalism and international trade.

The importance of international trade to the development of any country has increased in this century. As a result, patterns of interdependence between nations have changed. In developed countries, exports in manufactured goods have grown substantially, and these nations have come to depend on imports of primary and mineral products from Developing World nations.

The main link between international trade and the environment is related to their changing interdependence and lies in the dilemma facing developing nations today. In order to face constraints on growth, developing nations have to use commodities-raw materials-as export goods. At the same time, they must attempt to minimize damage to this resource base which supports its growth. If protectionism raises barriers against manufactured goods, developing nations will have less chance to diversify on the goods they export: unsustainable development may arise from pressure to exhausting valuable resource bases, from the overuse of certain commodities, as well as from the overproduction of goods in manufacturing processes that are polluting. Countries in Latin America and Asia have tried to export manufactured goods, but have found themselves blocked by growing trade barriers in developed countries, particularly in textiles and clothing. Thus, dependence on primary commodities as export goods continues to be high:

in Latin America, such goods make up 52 percent of all trade and in Africa the level is at 62 percent. Commodities prices are not sufficiently high to make this trading very lucrative—in 1985, the United Nations Conference on Trading and Development commodity price index was 30 percent below the 1980 average (p.80), but countries with little else are forced to accept whatever they can get.

The main international response to these problems has focused on the development of international commodity agreements to raise nations' earnings on these products. Agreements could be improved on one crucial point: Economic shocks brought about by a decrease in the production of commodities, when environmental sustainability is close to the limit, could be compensated for with funds from multilateral institutions, thus encouraging producers to take a necessary long-term view.

## Case Study

### A Radical Environmental Group: Earth First!

Even more controversial than Greenpeace was in its early years, Earth First! is the newest and most despised direct-action environmental protection groups.

Earth First! (the exclamation mark is part of the name) had its beginnings in a bar in San Luis Sonora, California in 1980, Dave Forman, one of the group's founders and one of the most controversial members of Earth First!, was sitting drinking beer with four friends. The four got into a discussion about one of their favorite novels, *The Monkey Wrench Gang*, by the late Edward Abbey. In the novel a group of environmentalists tear through the Southwest, destroying bulldozers, taking down billboards, and cutting down power lines, all in the name of protecting the Earth. Inspired by their chat, Forman and his friends decided to start their own group of ecowarriors, concluding that they would from

then fight legally and illegally to “throw a monkey wrench into the work of progress.”

The group then went out on the road, spreading its radical ideals around the country, speaking, playing music, collecting money, and most of all collecting new members, who ranged from hippies to former forest rangers to scientists. The membership was kept informal to make it harder for investigators and authorities to keep tabs on who was in the group. Earth First! soon became the second fastest-growing environmental direct action group (second only to Greenpeace).

Following the slogan “No compromise in defense of Mother Earth,” Earth First! began its campaign of radical “eco terrorism.” Some of their deeds include trespassing, blocking roads, pulling up survey stakes, blocking bulldozers or pouring sand in their gas tanks, chaining themselves to everything from redwoods to machinery to the doors of national park visitor centers, and spiking redwoods to strip them of their value as timber. In 1987 a mill worker was seriously injured when he was hit in the face by a shard of saw blade that had broken off when it came in contact with a metal spike in the tree he had been cutting, Earth First! defended itself, saying that all the spikes in the redwoods had been flagged to avoid injury, but clearly at least one was missed. Recently Earth First! leader Judi Bari, herself paralyzed when her car was bombed, denounced tree spiking and is pressing for its end.

In the summer of 1990 Earth First organized a series of protests throughout California directed at Pacific Lumber, the largest private redwood-land owner. In preparation for “Redwood Summer” the participants had to take part in a two day nonviolence training session. The group stated that they would not use or condone violence, verbal or physical, towards any person during the protest, nor would they carry weapons or damage property.

Redwood Summer was a campaign to save the last of California’s old-growth redwoods, trees

that are 150 to 1000 years old. These trees are rapidly becoming extinct: Only 85,000 acres remain from the estimated 2 million acres of 200 years ago. Sixty thousand of these acres are in protected parks; Pacific Lumber owns almost half of the remaining unprotected redwoods.

Every day about 150 old-growth redwoods, some valued at \$10,000 (depending on the size and quality), are felled. Up until 1980 Pacific Lumber was a model company, felling trees at a moderate rate. But then it was taken over by Maxxam Inc. in a leveraged buy out financed by \$750 million in junk bonds. Soon after the takeover Pacific Lumber tripled its redwood consumption.

Redwood Summer, dreamed up by Judi Bari and Darryl Cherney, two of the most active members of Earth First!, was an enormous success according to the group. As a result of the protest Earth First! claims to have gotten the State Department of Forestry to reject numerous timber harvest plans. However, the director of the Department of Forestry, Harold R. Wait, denied the claims, saying that Redwood Summer in no way influenced his decisions regarding forest management.

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*Redwood Summer was a campaign to save the last of California’s old-growth redwoods, trees that are 150 to 1000 years old. These trees are rapidly becoming extinct: Only 85,000 acres remain from the estimated 2 million acres of 200 years ago.*

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And in August of 1990, around the time of Redwood Summer, Dave Forman and his wife Nancy Morton left Earth First!, claiming that the group had adopted an “overt counter culture/ anti-establishment style,” that it was turning from a “an environmental group into a leftist group”. But Mr. Forman had recently been indicted with three others in a U.S. district court in Prescott Arizona, on charges of conspiring to fell electrical power lines. On June 10, Forman with four others went on trial for

conspiring to sabotage power plants in three states and for damaging ski lifts and sawing through power poles.

Earth First! has gained some friends and a multitude of foes. One of the main groups of people Earth First! has a conflict with is the loggers themselves. The problem is one of immediate needs versus future needs: The loggers who work cutting down the trees need jobs and the money from them to support their families. In some small towns loggers wear yellow ribbons to show their solidarity against the group; merchants post signs in their store windows stating that their businesses are supported by the timber industry; some car owners have even adopted a bumper sticker that reads "I love the spotted owl—fried!" A group called Mothers' Watch, speaking of Redwood Summer, stated, "They're [Earth First!] not the workers' friend in any way. They're at war with the corporations and we're the victims." Earth First!, however, claims that the forests are being overcut and that at the current rate the redwood groves will soon be gone and the loggers will be out of work.

Earth First! has also racked up a lot of criticism from other environmental groups. The National Wildlife Federation called Dave Foreman a "terrorist and an outlaw." The Sierra Club said, "We've always deplored and denounced violence and call upon California law enforcement to act vigorously and importantly to maintain peace." The Sierra Club established that they would not participate in illegal events.

The media had been no kinder to the group. Mother Jones magazine called Earth First!'s political philosophy "murky, veering towards misanthropy, machoism and racism." And Katherine Bishop of the New York Times called the group "ecofacists."

The controversy over Earth First! and their policies lingers on, trees over people or people over trees, worry now or later. Their goals may be laudable, but their actions should continue to come under scrutiny.

## Conclusion

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*"We cannot change unless we survive  
and we cannot survive unless we  
change."*

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The end of the Cold War has given us the opportunity to focus our energies on the eradication of what is perhaps the most threatening problem of our time. Environmental degradation, like the escalation of the Arms Race, has become a "runaway train," en route to total ruin. In the past fifty years, the issue of the environment has had to take second place to the xenophobia that came to be called the Arms Race.

The events of the past two years have brought to center stage the issue of the environment, an issue which calls for immediate global action. Such global action requires cooperation between nations, a willingness to listen and unity in the struggle to achieve a common goal. The United Nations Conference on Environment and Development will provide a medium for this kind of change. However, this is not the only kind of change that is needed. We cannot afford to wait another twenty years to pass a new set of resolutions, and political change is not the only means of preserving the environment..

Far more important is the change brought about by individuals, but it is impossible to achieve this without education. We need to know more about the damage that is being inflicted on the environment and about what our role in restoring our earth should be. Knowing that the forest in Brazil is being cut is not enough. In addition we need to know how we can reduce the needs that are causing the deforestation. It is not enough to raise money for the poor we must find out what has led to their poverty and teach them ways to help themselves. But most importantly, we need not only to preserve the earth for future generations but also to educate the world's youth so that they will know how to care for our earth when they inherit it.

But before we act, we must realize that everything we do today will have ramifications for our successors. We must take into account the fact that the interests of our children are just as important as ours. The earth is not ours to destroy; it is ours to pass down to our children.

# Perceptions

When I was a little girl, I don't think I noticed that the the ghinko tree my father named Felipe, or any of the other trees that lined my sidewalk were really there. I didn't notice holes in the sky or imagine that one day the immensity of the Amazon, which I flew over so many, times was being cut down at a rate too incredible to visualize. Under the tall trees at Iguazu, I felt protected; I felt like nothing could ever happen, like there was something out there much larger than I that could cradle me in its stability for a long time to come.

So I feel cheated sometimes, when I learn that all the trees aren't there to protect me, and that suddenly I have to care for them and fight to keep them there. Then I feel lost, because I don't know how or where to begin. How is it that we have separated ourselves from nature so much, that we forget that we are still part of the links? This drives me to at least think that I really have to do something to preserve and inform.

Yet, I still feel irritated when people blame humans for every environmental catastrophe. I irritated when people deny the perfect links that mean that we cannot attempt to make progress in one area, with disregard for another. This is why the concept of sustainable development is so valuable to our survival. It takes into account human needs with the needs of the planet, without placing one on top of the other.

Sustainable development has taught me that I cannot care for the tree Felipe, any more than he can care for me. Thus, another perfect link binding me to nature in its purest form.

-Bettina Lerner

Before coming to UNIS in 1989 I had very little interest in the environment. I knew that there were problems, but I was tired of hearing about them. I think that this attitude is probably one shared by the vast majority of people in New York. Take the recycling program at our school for instance. Most people would throw their waste paper into a recycling box if given a choice, but there are few recycling boxes to be found in the school (due to vandalism). How many of these people will actually go and look for one before throwing their paper in the trash? They're quite willing to be environmentalists, but only if it's easy for them.

Perhaps the school recycling program is not a good example, but it help to illustrate what I feel is the biggest problem facing the environment in New York City, passivity. Everybody wants the environment to be saved, but not if it involves changes in the way we live. This is the feeling of most people in New York. The environment? It must be saved, but by other people-just so long as I don't have to start sorting my garbage. This attitude does not bode well for the city. People are so caught up in their own personal lives that they forget the larger picture. The city crumbles around them.

Luckily, there is the other side. Those people who do care what happens to the environment, and who choose to do something about it. Members of groups like Sierra Club are all volunteers. These people all have their own lives and jobs, yet make the time to work for the environment of the city and surrounding areas. They are highly organized, and have the ability to successfully halt many environmentally unsound moves of the city council keeping track of any new developments, and making sure that any news is passed down to everyone else involved. Environmentalists try to educate others about the problems facing the environment, making presentations in school and community centers. They reach many people; yet here they are hindered by the passivity of New Yorkers, most of whom are ignorant of many of the most serious environmental problems facing their local areas. While tabling once, some friends of mine were astounded to find that of all the people they approached, only one woman was aware of

the topic they were protesting. Though it seemed terrible to them, it was a typical experience for most city environmentalists.

I'm not trying to preach (though it may sound as if I am ); I myself am guilty of all the offences mentioned, I could do much more. This is simply a plea for people to become aware of the environmental problems that affect them, to become less passive. I'm not asking for you to run out and become an environmental activist, but couldn't you at least go searching for that recycling box? There are still a few around.

-Alicia Svenson

## Endnotes

[1] United Nations Fund for Population Activities, *Population and the Environment: The Challenges Ahead*, (New York: The United Nations, 1991), p. 8.

[2] Paul R. Erlich and Anne A. Erlich, *The Population Explosion* (New York: Simon & Schuster Inc., 1990), p. 14.

[3] United Nations Fund for Population Activities, *Population and the Environment: The Challenges Ahead*, (New York: The United Nations, 1991), p. 8

[4] United Nations Fund for Population Activities, *Population Images*, 2d ed., (New York: The United Nations), p. 6-7.

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[7] Will Steger and Jon Bowermaster, *Saving the Earth*, (New York: Alfred A. Knopf, 1990), p. 247.

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[9] Steger and Bowermaster, *Saving the Earth*, (New York: Alfred A. Knopf, 1990), p. 257.

[10] Ibid.

[11] Ibid., p. 259.

[12] Ibid., p. 249.

[13] United Nations Fund for Population Activities, *Population Images*, 2d ed., (New York: The United Nations, 1987), p. 34.

[14] Ibid., p. 10-12.

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