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TEN MODERN PLAGUES

How might the world end? Some have considered cataclysms like the sun exploding or a meteor hitting the earth. Much more likely is that humans will poison and destroy the planet. A short list of today's environmental concerns reads like an enumeration of ten modern plagues.

Pharaoh of old knew that the ten plagues spelled the doom of Egyptian civilization. He therefore agreed, at last, to let the children of Israel go. We, likewise, must free ourselves from the spheres of moral and physical contamination in order to save our world. Unlike Pharaoh, we dare not harden our hearts, lest we drown in our own pollution.

The Jewish tradition places the responsibility for preserving the purity and integrity of the environment upon humanity. "The earth is the Eternal's and all that it holds" (Psalms 24:1) implies that humanity is the guardian and protector of nature, obliged to cherish and preserve God's works. The biblical law *ba'al tashhit* states that an army besieging a city must not destroy its fruit trees (Deuteronomy 20:19-20). The Rabbis of the Talmud expanded this law to prohibit unbridled destruction of any natural resources. Indeed, the law prohibits the wanton destruction of anything that may be useful to others. This alone is enough to condemn deforestation, pollution, and the willful destruction of plants and animals!

Later authorities affirmed the classic rabbinic view of *ba'al tashhit*. Rabbi Shneur Zalman in the eighteenth century wrote, "This biblical commandment prohibits the spoiling of any object from which humankind may benefit," and Rabbi Samson Raphael Hirsch in the nineteenth century wrote, "Under the concept of *ba'al tashhit* the purposeless destruction of anything at all is taken to be forbidden, so that our text becomes the most comprehensive warning to human beings not to misuse the position that God has given them."

We now turn to brief explanations of ten specific ecological problems - our modern plagues.

1. Water Pollution:

Water is an essential resource for life. Yet pesticide run-off, municipal sewage, manufacturing by-products, and mining waste threaten both ocean and freshwater supplies. A few examples will suffice: High levels of bacteria, caused mostly by human waste dumping, were responsible for more than 2,000 ocean beach closings and advisories against swimming in the 12 American coastal states that monitor beach water quality (of 22 total), according to the National Resources Defense Council. In rural northwestern Arkansas, chicken and livestock wastes have severely polluted nearly half of the 600 miles of streams. Finally, in the western United States, the use of cyanide in the gold mining industry has poisoned thousands of miles of rivers.

The Great Lakes - which contain some 20 percent of the world's fresh water - are an exemplary study of how water pollution occurs. First, manufacturing cities along the lake shore have for decades used the lakes for their waste disposal. Second, air currents bring pesticides, including DDT (now banned in the United States), to the Great Lakes from as far away as Central America. Industrial chemicals and metals also find their way to the lakes via the atmosphere. (Approximately 90 percent of the highly toxic PCB's - polychlorinated biphenyls - in Lake Superior drift there on air currents.) According to the International Joint

Commission, a United States and Canadian advisory group responsible for the boundary waters, 362 toxic chemicals now affect the lake ecosystems - the water, plants, fish, and other animals that live there. Many of the 35 million people living in the Great Lakes region are warned not to eat the local fish. And although progress is being made in cleaning up the mess - phosphate levels, for instance, have dropped considerably because of improved wastewater treatment - it will be a long time before the Great Lakes will be environmentally sound.

The same pollutants that fouled surface waters make their way underground, where they endanger drinking water. In addition, underground gasoline tanks may be leaking petroleum products. A study by the National Wildlife Federation found that American community water systems (which serve more than 40 million people) had violated federal water quality standards over 100,000 times between October 1986 and September 1987.

2. Air Pollution:

At present, over 150 million Americans live in communities that do not meet federal ambient air quality standards. Some of the worst culprits in polluting the air are listed below:

Suspended particulates are actual pieces of ash, soot, dust, or liquid droplets released to the air by the burning of fuel, industrial processes, agricultural practices, and by some natural causes. Larger particles tend to settle out of the air fairly quickly, but the smaller particles can remain aloft for a long time. When inhaled, these small particles can lodge in the lungs and contribute to respiratory disease.

Smog forms when nitrogen oxides and volatile organic compounds escape to the atmosphere. (Nitrogen oxides result from the burning of fuel, with cars and trucks contributing 72 percent of emissions. Volatile organic compounds result from the unburned hydrocarbons of automobile fuel tanks and from a wide variety of commercial processes.) In the presence of sunlight and heat, these chemicals combine to form a mixture of 100 different compounds. The result is the hazy, dirty brown air known as smog. The most important compound in smog is ozone, a toxic gas that causes eye irritation and respiratory problems. Ozone is also toxic to plants, damaging leaves and slowing growth; it is thought to reduce crop yields in the United States by 5 to 10 percent.

Sulfur dioxide is a gas that is released when fuels such as coal and oil are burned. Like the pollutants listed above, it is implicated in respiratory disease. Furthermore, sulfur dioxide is a major source of acid rain.

Carbon monoxide is released when fuel doesn't burn completely. This poisonous gas has no odor; once inhaled, it interferes with the body's ability to absorb oxygen and causes drowsiness, headaches, and ultimately death. As a component of air pollution, carbon monoxide exacerbates heart disease and respiratory problems. Cars and trucks are the main source of carbon dioxide, responsible for 68 percent of emissions.

Toxic air pollutants include a wide variety of chemicals that are hazardous to health. Refineries, chemical plants, and dry cleaning establishments are frequent sources. Cars burning leaded gasoline are another source. The volume of toxic air pollutants emitted is very small compared to the forms of air pollution listed above, yet their potential impact on human health is disastrous.

3. Pesticides and Other Agricultural Chemicals:

Many of the pesticides now in use were initially developed for the purpose of warfare in World War II. There are many types of pesticides: insecticides (kill insects and mites); fungicides (kill mildew, mold, and other fungus); herbicides (kill weeds and other plants); nematocides (kill worms); and rodenticides (kill rats and other rodents). The Environmental Protection Agency reports that over 845 million pounds of pesticides are used for agriculture in the United States each year. Additional agricultural chemicals are growth regulators and synthetic fertilizers. Pesticides and other agricultural chemicals are used by farmers to maintain or increase crop yields, to improve the appearance of foods, and to prolong shelf life.

These chemicals, though they may contribute to short-term agricultural successes, have devastating long-term impacts. First, chemical use is a treadmill of addiction: As plants and pests adjust to the chemicals, even more chemicals must be used to achieve past results. Thus, American farmers today lose roughly the same percentage of their crops to pests - 33 percent - as they did in the 1930's before the advent of pesticides. Clearly, many pests have mutated to become immune to the very chemicals produced to kill them.

Second, the chemical runoff from farms contaminates streams, rivers, and underground aquifers, severely compromising drinking water quality. The Environmental Protection Agency considers farming the primary non-industrial source of water pollution.

Third, the application of the chemicals by farm workers leads to illness and even death, especially in the developing world, where farm workers receive little, if any, training in pesticide use and usually wear no protective clothing. (One fourth of the pesticides exported by American companies are restricted for use in the United States because of the threats they pose to human beings and the environment.)

Finally, pesticide residue on foods are believed to negatively affect human health. We actually know little about pesticides and other agricultural chemicals. The Environmental Protection Agency states that complete health data are lacking for about 80 percent of pesticides currently in use. Only about 10 percent have been adequately tested for their ability to cause genetic mutations; only about 40 percent have been adequately tested for their ability to cause birth defects; and only about 20 percent have been adequately tested for their ability to cause cancer.

4. Toxic Chemicals:

Production of chemicals has surged worldwide since World War II. Of these, large proportions are toxic. Rachel Carson, in *Silent Spring*, vividly describes the irreversible effects of toxic chemicals on the environment. Certain chemicals have long been used without an adequate understanding of their consequences. Vinyl chloride, for instance, had been widely used since the 1940's to produce polyvinyl chloride (the main ingredient in plastic bottles), but only in 1973 was it shown to produce a rare form of liver cancer.

Each year, American industry generates some 80 million tons of toxic waste, and only about one-tenth of it is safely disposed of. The Congressional Office of Technology Assessment has identified over 31,500 hazardous waste sites. Indeed, during the 1980's, 15 industrial accidents took place in America in which the toxicity and amounts of chemicals released to the environment were greater than those released at Bhopal, India, where 5,000 people were killed. Only luck prevented similar results in the United States.

5. Acid Rain:

Acid rain results from industrial emissions of sulfur dioxide and nitrogen oxides. These dissolve in the rain, making it strongly acidic. Acid rain has corrosive effects upon buildings and monuments, and it also affects soil and bodies of surface water. Acidity has caused some streams and lakes to become inhospitable to indigenous fish. For example, in 1989, the New York Department of Environmental Conservation announced that 25 percent of the lakes in the Adirondacks were too acidic to support fish. Acid rain also attacks trees, and has thus far caused the deterioration of forests in Central and Northern Europe. In Poland, for instance, 75 percent of the forested land has been damaged by acid rain. The same scourge now affects large areas of forests in the eastern United States and Canada.

6. Global Warming or the Greenhouse Effect:

The timing and amount of global temperature variations are the subject of vigorous scientific debate, yet most scientists agree that the greenhouse effect is altering the planet's balance.

Carbon dioxide (CO₂) and methane are the primary greenhouse gases. Released into the atmosphere, they trap heat - creating a greenhouse effect - and thus threaten to warm the planet. Virtually all the greenhouse gases come from burning fuels: wood, coal, oil, and natural gas. Methane levels have doubled since pre-industrial times, and carbon dioxide levels have risen 25 percent and continue to rise every year. In the United States, more than 50 percent of carbon dioxide emissions are from cars, trucks, and buses. Livestock are an important source of methane. Ruminant animals release perhaps 80 million tons of the gas each year in belchs and flatulence, and animal waste at feedlots and factory-style farms emits another 35 million tons. (Manure that falls in fields decomposes without releasing methane.)

The greenhouse effect may have already committed the earth to a temperature increase averaging 1.8 to 2.7 degrees Fahrenheit. Even a nominal rise in global temperature may be magnified in cities, where high energy use and the absorption of solar radiation by asphalt, concrete, and black roofing tar creates a "heat island" effect, which facilitates the production of smog.

7. Ozone Destruction:

The upper-atmosphere ozone layer acts as a shield to block ultraviolet (UV) radiation from reaching the earth. Thinning of the ozone shield occurs through the release into the atmosphere of chlorofluorocarbons and other chlorine compounds. When these chemicals reach the upper atmosphere, UV rays break them apart. The resulting chlorine atoms react with the ozone molecules and destroy them. As the ozone shield thins, more UV radiation reaches the earth.

Chlorofluorocarbons and other chlorine compounds are used in air conditioners, refrigerators, foam products, and as industrial solvents. Military use of ozone-depleting chemicals is, however, the single greatest threat to the ozone layer, as a 1992 study by the National Toxics Campaign Fund found. Near the the South Pole, where the annual ozone hole occurs in the winter months, scientists are finding decreased production of ocean phytoplankton (floating plants), the basis of the ocean food web. In 1992, Earth Summit Secretary General Maurice Strong noted that UV radiation in South Africa and Chile was already 28 times the normal background level.

The ozone layer above the entire earth has thinned significantly over the last twenty years. Scientists predict that increased UV radiation exposure will cause millions of skin cancer cases, as well as cataracts and blindness. Increased UV radiation also leads to increased smog and respiratory diseases. Furthermore,

greater UV radiation adversely affects plants, causing crop and forest destruction, while in the oceans; UV radiation contributes to the decay of coral reefs.

The last three plagues result from environmental interventions as old as humanity itself. With contemporary technology however, the effects of these interventions - which in themselves would seem almost benign - are magnified to an unprecedented degree. "Locusts invaded the land of Egypt and settled within all the territory of Egypt in a thick mass; never before had there been so many, nor will there ever be so many again. They hid all the land from view, and the land was darkened; and they ate up all the grasses of the field and all the fruit of the trees which the hail had left so that nothing green was left, of tree or grass of the field, in all the land of Egypt" (Exodus 10:14-15).

8. Soil Erosion:

The primary causes of soil erosion are deforestation and agriculture. Other important causes are construction, urbanization, war, and mining. Soil erosion has serious implications for soil productivity, as it reduces available water capacity, reduces the depth to which root development can occur, and removes nutrients from the soil. Furthermore, erosion leads to compaction and crusting; both are unfavorable to germination and seedling establishment.

In the early 1960's, the United States Soil Conservation Service's guidelines for soil loss tolerance set a maximum of 5 tons per acre per year. In actual practice, soil losses 10 times as great are common throughout the country. In many other countries, rates of soil loss are just as great, and in tropical regions with intense rainstorms and sloping terrain the loss can be even greater.

9. Deforestation:

In tropical regions, the conversion of forest to cropland is the leading cause of deforestation. Virgin tropical forests are rich in nutrients because of the extraordinarily rapid growth and rapid decay of organic matter; the soil itself, however, is low in nutrients. A few years after the forest is cleared and farming has begun, the soil becomes so depleted that still more forest tracts must be cleared. In the past, depleted tropical soils had been able to regenerate over time, but today the pressure for new land is so great that the forest has no chance to grow back.

Commercial logging is also responsible for rainforest destruction, particularly in South America, Southeast Asia, and the Asian Pacific Islands. If the current rate of deforestation continues unabated, most of the world's tropical forests will have disappeared by the year 2000.

The burning of trees and the decomposition of organic matter, which occur when virgin forest soil is cleared by fire and cultivated, result in the release of carbon dioxide into the atmosphere - a major factor in the greenhouse effect. Clearing of tropical forests has been estimated to account for 20 percent of the total global emissions of carbon dioxide.

10. Loss of Biological Diversity and the Destruction of Habitat:

The diversity of plants and animals is believed to be nature's basis for success. Over 1.4 million different species have been identified, and many scientists now believe the total number of the earth's species to be between 10 and 80 million. Biological diversity maintains natural ecosystems. For example, predators driven to extinction no longer keep populations of rodents or insects in check; earthworms or termites killed by pesticides no longer aerate soils; mangroves cut for firewood no longer protect coastlines from erosion.

Genetic variation within a species affords resistance to epidemics and limits the difficulties associated with inbreeding. The disappearance of thousands of local food crops and subtypes of edible plants means that farmers rely on an increasingly uniform genetic base, so that pests and diseases pose greater threats than ever before.

Mass extinction has already begun. Deforestation alone condemns at least one species of bird, mammal, or plant to extinction daily. Tropical forests are particularly diverse, with many plants and animal species that have great potential for medicine and agriculture. Yet these forests are disappearing at a phenomenal rate. Seed banks have been established to preserve plant diversity, but the ability of the seeds to survive outside of their natural environments is itself doubtful.

Over-fishing and the deterioration of both ocean and freshwater environments have led to the loss of many fish species. The picture for invertebrates is even grimmer. Harvard biologist Edward O. Wilson estimates that nearly 140 invertebrate species become extinct each day!

Loss of animal and plant species results from the destruction of the habitats in which they live, from the draining of swamps to the unintended growth of deserts. According to the National Resources Defense Council, the virgin forests of the eastern United States are almost entirely gone, as are 90 percent of the forests of the Pacific Northwest. In the Midwest, less than 1 percent of the tall grass prairie remains.

Wetlands cover only 6 percent of the world's land surface, yet many are more productive biologically than even the most intensively managed agricultural fields. Coastal wetlands support flora and fauna ranging from plankton to reeds, from cypresses to mangroves, and from shrimps to bass. Wetlands serve as the spawning grounds for fish and the breeding grounds for waterfowl. Today, many wetlands are menaced by drainage, development (agricultural, industrial, and urban), peat mining, and pollution. It is estimated that in the United States, more than half of the original wetlands have been lost since European settlers first arrived. The remaining wetlands are disappearing at a rate of about 1 percent annually.

Coral reefs - in many ways the undersea equivalents in biological diversity of tropical forests - are deteriorating because of coastal pollution from soil erosion, fertilizers, and sewage, as well as direct damage from fishing and tourism.

Source: COEJL