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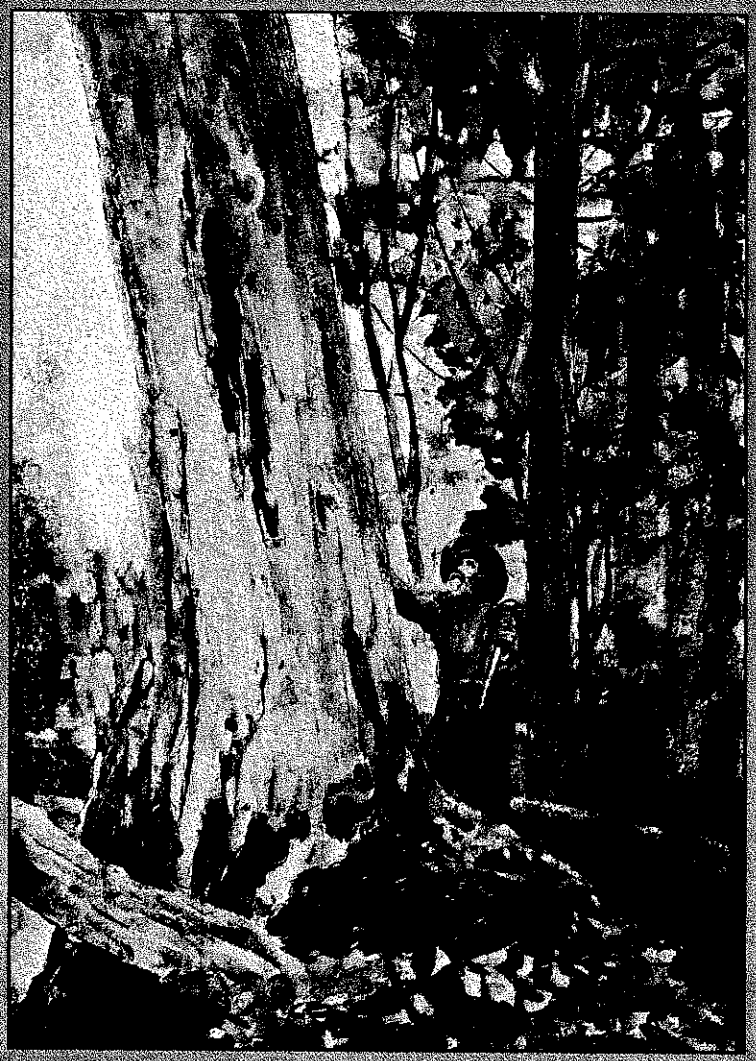
CONSTRUCTING NATURE

Readings from the American Experience



RICHARD JENSETH
EDWARD E. LOTTO

CONSTRUCTING NATURE

READINGS FROM THE AMERICAN EXPERIENCE

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PRE

As its title suggests, *Constructin* nature is more than a biological or this book views nature as a cultural construct nature not in the literal se world but rather in that we shape t and interpretations. As individuals group, or a generation, we experie and these differences have implic value. No matter what the particul banning the use of pesticides—we fundamental beliefs about what (o it.

Such an approach to nature—s politically contested idea, as well a to accomplish some important intel think critically about some of the m global warming to local questions disposal, environmental problems in the most extreme cases, our very it is easy to think in black-and-whit as evil industrialists who are raping consider its opponents soft-headed realities of modern life—jobs, livi critical thinking fostered by consid and their sources and implications calling.

This insistence on seeing nature as a site of continuing debate *Constructing Nature* presents a full our complex and changing relation the reports of scientists and natural social critics, at poetry and fiction

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Assignment Sequence

CAROLYN MERCHANT

Carolyn Merchant (b. 1936) is professor of environmental history, philosophy, and ethics in the Department of Conservation and Resource Studies at the University of California, Berkeley. Merchant's first two books, The Death of Nature: Women, Ecology, and the Scientific Method *(1980) and* Ecological Revolutions: Nature, Gender, and Science *(1989), offer a radical rethinking of the way nature has been conceived in contemporary society. Both nature and women, Merchant contends, have been the subject of male domination, which means that the solutions to our ecological crisis cannot be separated from the struggle by women for social justice. In her most recent book,* Radical Ecology: The Search for a Livable World *(1990), Merchant outlines (and advocates for) what she calls the "new social vision" of radical ecological movements such as ecofeminism, ecowarriors, and Deep Ecology. Merchant argues that radical ecology in all its forms is a necessary response to the "crisis" in the industrialized world, a crisis whose roots are to be found in our most ancient and comfortable philosophical traditions. What interests Merchant is how these traditions have led us to see the destruction of nature as a logical and even necessary price of economic progress. As she prepares to argue that the "search for a livable world" will demand nothing less than an intellectual and economic revolution, Merchant opens her book with this uncompromising account of our current global ecological crisis.*

The Global Ecological Crisis

The world of the late twentieth century is experiencing a global ecological crisis, one that is both a product of past ecological and economic patterns and a challenge for the future. From Chernobyl radiation to the Gulf War oil spill; from tropical rainforest destruction to polar ozone holes; from alar in apples to toxics in water, the earth and all its life are in trouble. Industrial production accentuated by the global reproduction of population, has put stress on nature's capacity for the reproduction of life. Pollution and depletion are systematically interlinked on a scale not previously experienced on the planet. 1

As we approach the millennium of the twenty-first century, perceptions of planetary destruction and calls for the earth's renewal abound. Can planetary life sustain itself in the face of industrial assaults? How is the current environmental crisis in production manifested? How are the planet's 2

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airs, waters, soils, and biota interconnected? How might life be restored to the planet? A new partnership between humans and nonhuman nature is needed.

During the past decade the dimensions of a global ecological crisis 3
have become painfully visible. In January 1989, *Time* magazine's person of the year award went to "The Endangered Earth," graphically illustrated by sculptor Christo as a suffocating globe wrapped in plastic and bound with twine. With increasing public awareness of global problems, public concern has mounted. The Alaskan oil spill alerted millions to the tragic transformation of a pristine Alaskan shoreline surrounded by lush rainforest into black, motionless, silent beaches of dead birds, seals, sea otters, and contaminated waters devoid of sustenence for local fishers and their families. In June 1989, a *New York Times*/CBS poll found that an astonishing 80 percent of all Americans questioned overwhelmingly agreed with the statement: "Protecting the environment is so important that requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost."

Air

Today the hot air of the "greenhouse gases" threatens atmospheric 4
chemistry balances. As the amount of carbon dioxide and other gases in the atmosphere increases from the industrial processes and the burning of fossil fuels, global temperatures are predicted to rise from 3 to 10 degrees Fahrenheit over the next century. Perhaps the most widely-felt evidence of global warming was the intense hot weather experienced by Americans during the summer of 1988. "The greenhouse effect is already here and it will worsen," warned scientists and policy analysts at Congressional hearings held that summer. According to Senator Timothy Wirth, "The greenhouse effect is the most significant economic, political, environmental, and human problem facing the 21st century." Three countries, the United States (21 percent), the USSR (19 percent), and China (10 percent) together produce 50 percent of all carbon dioxide emissions. With the greenhouse effect, winters would become stormier, summers hotter and drier. Seas could rise one to three feet over the next half century; hurricanes would become more powerful as the oceans warm. Waterfront homes will be flooded, midwestern droughts will increase in severity, grain growing regions will move north, and whole forests and wild species will be lost. Although there is much debate over the timing of the effect, a series of measures to slow it have been recommended, such as stopping global deforestation, planting trees, conserving heating fuel, and shifting to alternative energy sources.

Ozone depletion is another global disruption caused by industrial production. In 1985 scientists reported a hole in the ozone layer over the Antarctic. As a result of worldwide concern, 24 countries meeting at Montreal in 1987 agreed to reduce production of the prime culprit, chlorofluorocarbons (CFCs), by 35 percent by 1999. CFCs are used as refrigerator and air conditioner coolants, as primary components of styrofoam, and as propellant gasses in spray cans (banned in the United States in the 1970s, but still used in other countries). Whenever we buy a hamburger or a cup of coffee in a styrofoam container, whenever our automobile air conditioner leaks, or we turn in an old refrigerator for a new one, we are inadvertently contributing to upper atmosphere ozone depletion. Alternatives to CFCs are now being sought, but much work needs to be done by science, by Congress in regulating CFCs, and by all of us in changing the habits of our everyday lives. These disruptions of the atmospheric balance of gases by industrial production are intimately connected to disruption of global waters.

Water

From high mountain lakes to wild rushing rivers, the waters of the United States are threatened by acid rain. Beaches are inundated by solid wastes; globules of oil float on the surface of even the remotest oceans. Plastic wastes in the oceans are causing the deaths of upwards of 2 million birds and 100,000 marine mammals a year. Dead and dying birds entangled in plastic six-pack rings appear on beaches every day. The plastic rings will go on for another 450 years, outliving the generations they are extinguishing. Seabirds, fish, turtles, and whales lunch on small plastic pellets produced as wastes in the plastics industries. Diving birds and mammals are entrapped in plastic drift nets 6 to 30 miles in length used primarily by Japanese and other East Asian fishers. Seven hundred miles of nets are lost each season in the Pacific ocean. When these nets escape they go on trapping marine life until they sink under their own weight. Global water pollution needs to be halted and water quality restored.

Soils

Soil erosion and pollution from insecticides with long lasting half-lives are threatening croplands and ground water quality. In the United States two billion tons of topsoil is being lost annually through wind and water erosion, threatening one-third of our croplands. If allowed to continue over the next fifty years, United States' grain production will sink to about half of what it exported in 1980, affecting millions of people around the

world. In India, land has been used with only 5 to 10 percent of the According to conservationist Vanc techniques have now replaced trac ers "to forget about the hunger of t their own hunger for profits." Soil ture based on the wisdom of trac with many of the positive advance

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world. In India, land has been used to feed people for over forty centuries, with only 5 to 10 percent of the surpluses leaving the local villages. According to conservationist Vandana Shiva, Green Revolution farming techniques have now replaced traditional methods, teaching Indian farmers "to forget about the hunger of the soil and the stomach and to go after their own hunger for profits." Soil conservation and sustainable agriculture based on the wisdom of traditional peoples need to be combined with many of the positive advances in twentieth-century agriculture.

Biota

Today, the reproduction of life itself is being aborted. in the words of *Time* magazine, "the death of birth" poses another immense global threat to all nonhuman species. A National Science Foundation study predicts that a quarter of the earth's species of plants, animals, microbes, and fungi will become extinct over the next several years unless extraordinary measures are taken to protect the ecosystems in which they live. Only 1.4 million of the 5 to 10 million species of life in the world have ever been named. Increased efforts must be taken to identify them, understand their ecology, and to educate the public in the need for preservation. International agreements have been reached on halting some of the most visible threats. The United States and Europe have recently banned imports of ivory from the African elephant. Japan has reduced imports of some endangered species such as the Hawksbill Turtle used for exotic ornaments and wedding gifts. But changes in policies and practices may not be in time to preserve the lives of known endangered species, much less those not even identified.

Forests that absorb carbon dioxide and produce oxygen, linking air, water, and biota in a unity, are disappearing at a rapid rate. Tropical forests, which cover 2.3 million square miles of the earth's surface, are disappearing at the rate of 100 acres a minute or more and the rate of destruction is increasing. If the destruction continues, it is predicted that little will be left by the year 2040. The United States imports enough timber from tropical rainforests each year to cover the state of West Virginia. In Central and Latin America, rainforests are being cut down to pasture cattle for the fast food industry. In Indonesia, 500,000 acres of rainforest have been converted to eucalyptus plantations to produce toilet paper for North America. Much of the rainforest being slashed in Malaysia is used by Japan to construct throwaway construction forms, boxes for shipping, and disposable chopsticks. In every inlet along the coasts of Papua New Guinea, Japanese ships anchor to receive timber, leaving behind slash as waste on beaches. Quoting Mahatma Gandhi at a June 1989 conference

on "The Fate and Hope of the Earth" held in Managua, Nicaragua, Martin Khor of Indonesia admonished, "There are enough world resources for everyone's need, but not for everyone's greed."

In the United States, Pacific old-growth redwood and Douglas Fir 10
forests are threatened by logging for export to the Far East. Seventy percent of the total harvest of uncut logs are exported—enough for 37,000 jobs in the wood products industry. Through modernization over the past decade, labor-intensive lumber mills are being replaced by automation, reducing by one-third the number of jobs available. In the process, the Spotted Owl is threatened with extinction and loggers and millers with job losses. Trying to resolve complex problems such as these will require enormous sensitivity, as well as lifestyle changes on the part of northern hemisphere citizens.

Threats to the reproduction of nonhuman life are directly linked to 11
affects on human reproduction. Toxic chemicals range from factory emissions, smog, and radon in the air, to pesticides in the soil, to trichloroethylene in drinking water. According to environmentalist Barry Commoner, humans and other living things are being invaded by an immense number of toxic chemicals unknown to biological evolution. "An organic compound," he argues, "that does not occur in nature [is] one that has been rejected in the course of evolution as incompatible with living systems." Because of their toxicity, "they have a very high probability of interfering with living processes." Over the past thirty years the production of organic chemicals from petroleum has increased from about 75 billion pounds per year to over 350 billion. In 1986 concerns such as these led California citizens to pass Proposition 65, an anti-toxics initiative with a 63 percent vote. There are presently 242 chemicals on the state's list being examined for their risk of causing cancer or birth defects. Citizen actions, such as those being undertaken by the National Toxics Campaign, along with scientific research, are a vital part of the current effort to reduce toxics in the environment.

The global ecological crisis involves all levels of society—production, 12
reproduction, and worldviews—and differentially affects First, Second, and Third World peoples. The mixing and transferring of our planet's air, waters, soils, and biota that are publicized as global warming and ozone depletion are not solely the results of interacting physical, chemical, and biological systems. Such a scientific systems view ignores the linkages among processes of production, reproduction, consumption, depletion, and pollution that accompany human economies. Through commodity production and exchange, the rich soils, fossil fuels, minerals, and forests of the Third World end up in the First World as wastes in landfills and pollutants in rivers. Outlawed pesticides and toxic wastes from the First World make their way to the Third World for sale and disposal. When the price

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of oil rises in the Persian Gulf, First World consumers pay more at the pumps, but Third World tractors are idled and women walk an extra mile for cooking fuel. In First and Second World countries, production and consumption lead to overloaded ecological systems, while in Third World countries, resource extraction leads to exhausted and depleted lands. Economic development is uneven—centers of commerce and consumption toward which goods flow become "overdeveloped"; places on the periphery from which goods and resources flow remain "underdeveloped."

The relationships between ecology and production lead to the first 13
contradiction that constitutes the global ecological crisis. Human production systems put increasing stress on nonhuman nature through the biogeochemical cycles and energy exchanges that unify all ecological processes. As depletion and pollution accelerate, they exceed the resilience of nonhuman nature, severely undermining its capacity to recover from human-induced assaults. Systems of production, however, can be oriented toward basic subsistence, as they are in much of the Third World and indigenous cultures, or toward market exchange, as they are in First World capitalist economies and dependent Third World colonial economies. Different systems of production have different ecological impacts that result from historically different patterns of economic development.

Political Economy

The patterns of uneven development and their differential economic 14
and ecological effects are the products of a global market economy that has been emerging since the sixteenth century. The growth of a capitalist system in the European world was intimately connected to and dependent on a colonial system in the New World. As feudalism—based on the payment of goods and services to a lord by serfs bound to the land—broke down, a dynamic market system began to exploit both land and labor in more efficient ways. Mining and textile production were the first industries to be capitalized. Each expanded through the establishment of a company whose entrepreneurs pooled their wealth to take the risk of developing a mine, establishing a colony, or combining the operations of textile production under a single roof. The capitalists employed laborers who were paid in set wages from which they purchased their own food and clothing, rather than producing it from the land.

European capitalism expanded through the establishment of colonies 15
in the western and southern hemispheres that supplied both the natural resources and cheap labor that extracted them from the earth. The former

hegemony of the Mediterranean world gave way to the new hegemony of the Atlantic. Triangular trading patterns established Europe as the center of manufactured goods, Africa as the source of slave labor, and the American colonies as the "inexhaustible" supply of natural resources. The oceans were charted, the new lands mapped, and the natural histories of the peoples, animals, plants, and minerals found there catalogued. European explorers and colonizers brought with them an ecological complex of diseases that devastated native peoples and livestock, crops, weeds, and varmints that invaded native lands. The colonies were maintained by force of arms, by economic dependency on trade items, by enslavement, and by religious ideologies as missionaries worked to supplant animistic religions with Judeo-Christian theologies.

Accumulation of economic surplus occurred as natural resources (or 16
free raw materials) were extracted at minimum costs (minimum wages) and manufactured goods were sold at market value. This accumulation of economic surplus through mercantile expansion helped to fuel eighteenth and nineteenth century industrialization. Textiles and shoes, guns and ammunition, mechanized farming equipment, and standardized consumer products all depended on atomized replaceable parts and atomized replaceable laborers. Fewer people lived off the land by subsistence and more worked in cities fed by specialized market farmers. Since the period of Europe's industrial revolution (1750–1850) and North America's (1800–1900), no countries outside of those in the former Soviet bloc have been able to industrialize without economic assistance and dependency.

Today's global capitalist system is based on this same fundamental di- 17
vision between the industrialized or center economies of the First World and the underdeveloped or peripheral economies of the Third World. Unlike the industrialized nations the peripheral economies export low cost primary goods such as coffee, tobacco, sugar, jute, rubber, and minerals, and import luxury goods and military equipment for élite consumption. Mass consumer goods are produced through northern hemisphere capital (Western Europe, North America, and Japan) and southern hemisphere labor (Asia, Latin America, and Africa) for purchase by northern consumers and Third World élites. Instead of enslavement by force or theft of resources, neocolonialism uses economic investments and foreign aid programs to maintain economic hegemony. Today the cost of interest on debt equals or exceeds total export earnings. The poorer countries have become increasingly dependent on the industrialized countries.

While much of the development aid to the Third World is based on First 18
World development patterns, this undifferentiated growth model is inadequate for breaking the Third World dependency cycle. Environmental problems in the Third World are rooted in poverty and hunger, population pressure on marginal lands, and unbalanced land distribution, while those

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A major problem confronting the capitalist system is the inherent ne- 19
cessity for economic growth. Capitalists make money for further expansion by creating products that consumers will purchase. They do so by fabricating needs for more and fancier food, clothing, and homes, as well as producing luxury items such as better cars, television sets, video recorders, electric shavers, blenders, and microwave ovens. Why not stop the growth mania and focus on quality of life items that fulfill basic needs? If any given producer curtails growth, she or he will be bought out or forced out of business by a competitor. If all capitalists agree together to curtail growth, massive unemployment will occur in a system in which population continues to grow.

Capitalism, however, is not isolated from government. Legislation, reg- 20
ulation, and citizen activism are powerful forces that can mitigate the effects of environmental pollution and improve environmental quality. Yet capitalism is historically subject to fluctuating cycles of inflation and recession and of output and unemployment. In periods of recession, concerns for environmental quality are overridden by attempts to increase productivity and employment. Governmental regulation may decline in the attempt to shore up the economic recovery. In relatively affluent periods, citizen demands for environmental quality tend to increase, as reflected in environmental movements and legal actions. Yet over time environmental quality may tend to lose ground, not returning to former levels during the peaks of relative affluence. Additionally, the environmental preferences and commitments of the political party in control of government agencies and legislatures during any given period may have positive or negative effects on the level of government regulation. All these factors are part of the structure of the social relations of the economic system of a given country and must be seen as interacting with the economy and adding to the complexity of environmental problems and their resolution.

Environmental Problems in the Second World

The former Soviet Union and eastern European countries are experi- 21
encing environmental problems of a different character than those of the First and Third worlds. Former president Mikhail Gorbachev's policy of *glasnost,* or openness, revealed massive amounts of industrial pollution threatening air, water, and food qualities to such an extent that citizens have become increasingly alarmed about their own health. A gas-processing plant in the city of Astrakhan pumps a million tons of sul-

phur into the atmosphere a year. Local people have been issued gas masks for emergency protection. In the industrial city of Nizhni Tagil, 700 miles east of Moscow, the smog is so thick that drivers turn on their headlights at noon. Throughout the commonwealth, vehicles use older engines that operate on gasoline with high lead content. In Arkhangelsk, workers contracted diseases that were traced to the Chernobyl nuclear disaster of 1986. Although animals grazing in the area of Chernobyl were "officially" killed to prevent radiation contamination, some of the meat was transferred to remote areas and mixed with other meat to make sausages, causing the illnesses. In the cotton-producing areas of central Asia, the Aral Sea has dried to form a dustbowl. A pulp processing factory on the shores of Lake Baikal, the largest, clear fresh-water lake in the world, has created a 23 mile wide polluted area and its smoke emissions have affected 770 square miles of surrounding wilderness.

In Poland, in an industrial area near Cracow, people retreat to a clinic 22
in an underground salt mine to breathe cleaner air when smog levels are especially high. High concentrations of toxic metals such as lead, mercury, and cadmium are found in the placentas of birthing women caused by sulphur dioxide and carbon monoxide in the air. Premature births and miscarriages result from low oxygen levels in fetuses stemming from chemical changes in the mother's blood. In agricultural areas, soil is contaminated by wind and water that spread the sulphur emissions from coal burning plants over large areas. In Czechoslovakia, 50 percent of the country's drinking water does not reach minimum standards, and in Prague people complain of continual headaches, asthma, and nausea from polluted air. In eastern Germany, cancer, lung, and heart disease rates are 15 to 20 percent higher than in Berlin.

Both the governments and citizens of Second World countries are tak- 23
ing action to curtail pollution. The former Soviet Union created a State Committee for the Protection of the Environment. Citizen groups have spearheaded conservation efforts and demonstrations against industrial polluters. Gorbachev, whose training was in agriculture, emerged as an outspoken world leader on environmental issues, and under his regime fines were levied and factories closed.

How do Second World environmental problems compare with those of 24
the First World? Do the capitalist and socialist systems have the same environmental problems? Do economic systems matter when it comes to questions of environmental deterioration? In searching for answers, it is important to recognize both differences of kind and differences of degree. Some observers have argued that because pollution is found in both types of economies, either the problem lies in industrialization or that capitalism's problems are less severe and more easily resolved. An example of this approach was presented by economist Marshall I. Goldman in his

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1970 classic paper, "The Convergence of Environmental Disruption," whose subheading encapsulated his argument: "From Lake Erie to Lake Baikal, Los Angeles to Tbilisi, the debates and dilemmas are the same." By matching cases of environmental disruption in the two countries, he drew the conclusion that they were equally polluted. His convergence thesis was as follows:

> Most conservationalists and social critics are unaware that the U.S.S.R. has environmental disruption that is as extensive and severe as ours.... Yet before we can find a solution to the environmental disruption in our own country, it is necessary to explain why it is that a socialist or communist country like the U.S.S.R. finds itself abusing the environment in the same way, and to the same degree, that we abuse it.

The United States and the former Soviet republics are all committed to 25
economic growth. The Soviet Union and eastern European countries achieved growth through an all-out effort to raise standards of living by means of industrialization and full employment. Central government planning was the decision-making method and bureaucrats were rewarded for gross productive output. The environment suffered the consequences. Yet an important distinction exists between environmental problems in the US and the former USSR. In the Soviet Union environmental disruption stemmed largely from the effects of industrial production rather than from consumption. Packaging, plastic products, cartons, disposable diapers, styrofoam containers, household products, spray cans, aluminum soft drink cans, paints, newspapers, paper products, and other accoutrements of a disposable consumer-oriented society that choke United States' landfills and pollute its soil, air, and water are not major environmental problems in the Second World. Twenty choices of cold cereals in gaudy boxes, fifteen types of frozen diet dinners with plastic microwaveable trays, and nineteen varieties of soft drinks in nineteen different colored aluminum cans do not line the shelves of Soviet stores. Heaps of rusting automobile bodies and mountains of used tires do not adorn Soviet landscapes. Corporations and advertizing agencies do not multiply products and needs in order to compete for consumers' cash.

Yes, environmental problems exist in both the capitalist and socialist 26
systems, but the problems are not the same for both. There is no valid convergence argument based on qualitative examples and no valid quantitative formula for comparing the relative effects of environmental disruption between the two systems. A significant structural difference does exist, however. Economic growth is inherent in capitalism; it is not essential to socialism. Both systems have historically been committed to growth; both systems have experienced bureaucratic inefficiency, poor planning, ineffective regulation, and citizen protests. It is not yet clear how the Second

World will resolve its current economic and environmental crisis, or how much the push to adopt market economies in the new republics will exacerbate environmental problems. Perhaps new systems will emerge from the environmental crises in the three worlds. Perhaps these syntheses will deal with environmental problems in different ways. The environmental movements in the First, Second, and Third Worlds will play important roles in the outcomes.

Population

While the first contradiction of the global crisis emerges from the interaction between human production systems and nonhuman nature, the second contradiction arises from the interaction between production and reproduction. The impact of humans' biological reproduction on the environment is not direct, but mediated through a particular system of production. Social norms and ethical systems, as well as government policies concerning abortion, welfare, and employment, help to regulate the numbers of children born into a given society. Moreover, different modes of production support different numbers of people in particular ecological habitats. The second contradiction is thus between reproduction (both biological and social) and production. The ways in which population affects the environment must be considered within the context of biological and social reproduction and their interaction with production.

The world's population has been growing steadily during the modern era. In 1987 it reached 5 billion people and is predicted to surpass 6 billion by the year 2000. It could reach 10 to 15 billion before stabilizing sometime during the next century. Sheer numbers, however, tell only part of the story. Distribution of numbers, food, and wealth are integral to the total picture. William Keppler of the University of Alaska describes population distribution in terms of a global village:

> The present population of the world is approximately five billion people. If we could, at this very moment, shrink the earth population to a village of precisely 100 people, but all the existing human ratios remain the same, the world village would look like this:
>
> There would be 57 Asians, 21 Europeans, 14 western hemisphere people of both North and South America, and 8 Africans. Seventy would be non-white, 30 would be white, 70 would be non-Christian and 30 would be Christian. Fifty percent of the entire world's wealth would be in the hands of only 6 people and 5 of the 6 people would be citizens of the United States of America. Seventy percent of the population would be unable to read; 50

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When one considers our world from such an incredibly compressed perspective the need for both tolerance and understanding in a global way becomes glaringly apparent.

The population bomb, say biologists Paul and Ann Ehrlich, has now ex- 29
ploded. Ten thousand years ago, the world population was about five million people, but by 1650 the number had increased one hundred fold to 500 million, and by 1850 to about a billion. Since the mid-twentieth century world population has been growing by 1.7 to 2.1 percent a year, doubling about every forty years, with some nations, such as Kenya, doubling in half that time, and others, such as those in northern Europe, doubling at much slower rates. By 1990 the world growth rate had slowed from about 2.1 percent in the 1960s to about 1.8 percent in 1990, that is the doubling time increased from 33 to 39 years. Thus, at current rates, if the population reaches 6 billion in 2000, it will double to about 12 billion by 2040. The world would become a vast feedlot for the human species.

The Ehrlichs see all environmental problems as stemming from popu- 30
lation: "Global warming, acid rain, depletion of the ozone layer, vulnerability to epidemics, and exhaustion of soils and groundwater are all ... related to population size.... We shouldn't delude ourselves: the population explosion will come to an end before very long. The only remaining question is whether it will be halted through the humane method of birth control, or by nature wiping out the surplus."

Questions of population size and control are extremely sensitive issues. 31
They impinge on the most fundamental questions of human freedom. Freedom of how many children to bear and support, where to live, how goods and services should be distributed, a woman's right to abort a pregnancy, and the right of an unborn fetus to life. In rural China, an attempt to reduce population by a government policy of limiting families to one child resulted in the widespread abortion of female fetuses, brought about by an age-old agrarian preference for male labor. In India, Indira Gandhi's policy of pressuring sterilization of government employees after three offspring produced a backlash against its family planning program. In the United States, a woman's right to choose to abort a fetus versus the right of the fetus to life has become a major political issue in all elections, and in presidential appointments to the Supreme Court.

According to the Ehrlichs, reduced fertility depends on five factors: 32
ad equate nutrition, proper sanitation, basic health care, education of women, and equal rights for women. When women receive education they apply the results to preparing better meals, keeping cleaner, more sanitary homes, and improving the quality of life for their families. Education teaches them about family planning and contraception and

affords them access to status other than through bearing and raising children. Men, on the other hand, use their education to obtain higher income producing jobs, raising their status, and decreasing the need for large families. These approaches, say the Ehrlichs, rather than overall development followed by the so-called demographic transition to lower birth rates, are the keys to population control.

While the interaction between population and the environment is 33
certainly of critical concern, as are issues of women's opportunities and choices, an analysis that links all environmental problems to population growth and sees population control as the answer, say political ecologists, is too monolithic. To emphasize the impact of population on the land to the exclusion of economic development is to present a narrowly "Malthusian" perspective on the population question. In his 1798 *Essay on Population,* Thomas Malthus had argued that population tends to increase in a geometric series (2, 4, 8, 16, 64 ...), whereas the food supply increased according to an arithmetic series (1, 2, 3, 4, 5, 6 ...). Thus, even if the food supply could be doubled or tripled it could not keep pace with population growth. Environmental checks on population expansion, such as disease, famine, and warfare keep down the rate of increase. Rational checks such as those provided by education and foresight into the economic consequences of large families, induce birth limitation through abstinence, contraception, late marriage, and so on. Malthus argued that the educated upper-classes kept their populations down, whereas the poor reproduced at high rates. Social welfare simply encouraged them to maintain their low standard of living and their high rate of reproduction. Instead, incentives directed at individual self-interest should be provided, such as healthy work opportunities and agricultural improvement techniques.

But the analysis of this "population problem" can be approached from 34
another direction—one rooted in political economy. Geographer David Harvey argues that population, resources, and the ideologies related to their use and control must be seen in connection with economic modes of production. The number of people that a given environment can support is related to the technologies and social relations that people use to turn nonhuman nature into resources for human use.

To function at an optimal level, capitalism requires a balance between 35
the supply of labor and the demand for goods. If the labor supply (i.e. population) increases, wages fall. Then the workers do not have enough money to buy subsistence goods. More importantly, they do not have the money to purchase commodities about the subsistence level that the capitalists wish to sell—there is no effective demand for the capitalists' products. Thus for capitalism to expand by selling more goods, wages must be kept above the subsistence level. On the other hand, if there are too few

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workers (i.e. a shrinking population), then wages will be too high and the capitalists will not reap sufficient profits to reinvest and expand production. For Malthus, the solution was to stimulate wants and tastes in the upper classes (landlords, state bureaucrats, etc.) thus creating fresh motives for industry. For others, such as nineteenth century economist David Ricardo, the problem could be solved by maintaining an equilibrium between capital and population, i.e. between supply and demand. Ricardo's rational, normative approach held that internal harmony within the system would allow a gradual expansion of capitalism.

A third approach is that of Karl Marx. Marx did not see a Malthusian 36
"population problem," but a poverty and exploitation problem. Marx replaced the inevitability of the Malthusian pressure of population on the land with an analysis of the historically specific relationship between the labor supply and employment within the capitalist mode of production. Instead of the Malthusian emphasis on "overpopulation," he developed the concept of a relative surplus population. For capitalism to function smoothly, there must be a "reserve army of labor." This consists of a small percentage (about 4–5 percent)—of, for example, unemployed males, immigrants, and women,—who can be hired when the workforce shrinks and laid off when the workforce expands. In this way the capitalist can regulate both wages and demand.

When capitalists keep wages above the subsistence level, workers can 37
purchase enough goods to maintain a reasonable quality of life. Too many children become an economic liability, rather than an asset for producing agricultural subsistence or support for the parents in old age, keeping population growth low. If population grows too fast, however, capitalism is threatened by riots, strikes, and revolution. It thus walks a tightrope between capital, effective demand, and population. Inherent in capitalism and *essential* to its existence are abundance and scarcity, growth and natural resource depletion, and an economic division between capital and labor, i.e. between haves and have nots.

Marx envisaged a society in which poverty and misery would be re- 38
placed by a system that fulfilled all people's basic needs, not just the greed of the few. Whether one agrees or disagrees with Marxist goals, a Marxist perspective offers a critical stance from which to analyze other approaches. A Marxist approach is dynamic and relational. Neither population nor resources can be understood independently of their economic context. A given part of nature is a resource or not depending on its use in a particular system. Thus gold and oil were not resources to Native Americans, but became so for European immigrants to the Americas.

Environmentalist Barry Commoner approaches population as a prob- 39
lem related to standards of living. The demographic transition to lower population levels is characteristic of both the industrialized world and the

developing countries, but the two processes are different. As industrialization proceeded in Europe and North America, the standard of living rose and death rates declined from an average of 30 per thousand in 1850, to 24 per thousand in 1900, 16 per thousand in 1950, and 9 per thousand in 1985. Subsequently the birth rate also began to decline as fewer infants died, people lived longer, and the perceived need to bear additional children changed. The average birth rate began to decline after 1850 from 40 per thousand in 1850, to 32 per thousand in 1900, to 23 per thousand in 1950, and 14 per thousand in 1985. Overall population sizes grew during the nineteenth century, but the rate of increase slowly declined to the present rate of 0.4 percent.

In the developing countries the rate of decline has been slower. The 40
average death rate was about 38 per thousand in 1850, 33 per thousand in 1900, 23 per thousand in 1950, and 10 per thousand in 1985. But the average birth rate has remained higher and declined much more slowly. It was 43 per thousand in 1925, 37 per thousand in 1950, and 30 per thousand in 1985. The rate of increase has slowed to about 1.7 percent a year. While death rates are about the same as those in the industrialized countries, birth rates are higher.

As the living standards improve and infant mortality declines, couples 41
no longer need as many children to replace those who die. Instead of an economic asset to help support the parents in old age and to provide labor in agrarian communities, children become an economic liability. Costs of housing, clothing, food, travel, and a college education associated with a higher quality of life increase, providing incentives to keep family sizes smaller. Better health and childcare, better nutrition and education, steady employment, and old age security are the strongest incentives to reduction in family sizes. In addition, family planning education and safe birth control methods (as opposed to coercion and unsafe methods) provide added impetus to lowering birth rates.

In the developing countries the demographic transition has lagged be- 42
cause of the political and economic relationships between the center economies of the north and the peripheral economies of the south. Much of the wealth in Third World natural resources, which has been developed with northern capital and southern labor, has been removed from the southern countries. This wealth helps to fuel population decreases in the north while preventing the rise in living standards in the south that would tend to lower birth rates. The developing countries are also thwarted by enormous debts that further stall the demographic transition.

World food production is currently above the level needed to support 43
its population and the food supply is growing faster than the population. Nevertheless, that food is not evenly distributed. Some nations, such as those in Africa, have large numbers of starving people while others, such as the United States, have large food surpluses. Not only improvements in

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Commoner concludes his analysis with a recommendation: 44

> The world population crisis, which is the ultimate outcome of the exploitation of poor nations by rich ones, ought to be remedied by returning to the poor countries enough of the wealth taken from them to give their peoples both the reason and the resources voluntarily to limit their own fertility. In sum, I believe that if the root cause of the world population crisis is poverty, then to end it we must abolish poverty. And if the cause of poverty is the grossly unequal distribution of the world's wealth, then to end poverty, and with it the population crisis, we must redistribute that wealth, among nations and within them.

Steady State Economics

Ultimately growth oriented economies need to move toward a steady- 45
state world economy, argues Herman Daly. While a rapid slowdown would disproportionately affect poor countries and peoples, a gradual transition to a no- or low-growth economy could help to bring about a sustainable and socially just world. A steady-state economy, Daly says, is "an economy with constant stocks of people and artifacts, maintained at some desired, sufficient levels by low rates of maintenance 'throughput.'" The throughput is the flow of matter and energy from nonhuman nature, through the human economy, and back to nature as pollution. A steady-state economy would use the lowest possible levels of materials and energy in the production phase and emit the least possible amount of pollution in the consumption phase. The total population and the total amount of capital and consumer goods would be constant. The economy could continue to develop, but need not grow. Culture, knowledge, ethics, and quality of life would continue to grow. Only physical materials would be constant.

While the rest of the biosphere lives off solar income, human beings, 46
since the transition to an inorganic economy, have been living off non-renewable geological capital. This means that humans are no longer in equilibrium with the rest of nature, but are depleting and polluting it, overloading the natural cycles. All capital, according to twentieth-century mathematician A. J. Lotka, is a material extension of the human body. Clothing, houses, and bathtubs are extensions of the skin; food, drink, and cooking stoves of the digestive system; toilets and sewers of the elimination system; television and radio of the sensory organs; computers and books of the brain.

Services in the form of psychic satisfaction for humans come from 47
increasing the numbers of artifacts and from the natural resources of the

ecosystem. Creating and maintaining the artifacts requires energy throughput which in turn depletes and pollutes the ecosystem. In terms of the laws of thermodynamics, the total amount of energy in the universe is constant (the first law), but the energy available for useful work is decreasing (the second law). The total entropy (the energy unavailable for work) tends toward a maximum and the universe as a whole moves from order to disorder. As the economy uses low-entropy raw materials, it transforms them into higher-entropy artifacts, and emits high-entropy waste. "The laws of thermodynamics," states Daly, "restrict all technologies, man's as well as nature's and apply to all economic systems whether capitalist, communist, socialist, or facist." While the economy and its artifacts achieve greater order, the ecosystem tends to greater disorder. At some point the ecosystem will be no longer able to provide the services required by the economy. These costs to nature, however, cannot be planned in ordered sequences as can economic costs.

Is a steady-state economy possible, and if so how? Can the world of the twenty-first century move toward a stable no- or low-growth economy as population growth slows and standards of living rise? To move toward a steady-state economy, depreciation of artifacts must be reduced. Planned obsolescence gives way to planned longevity. Cars, refrigerators and television sets are engineered to last. Obsession with growth is replaced by obsession with conservation. The goal of higher gross national product gives way to the repair of gross national pollution.

Conclusion

Ecology, economic production, and reproduction all interact in any given society. The global ecological crisis is a result of contradictions between systems of economic production and ecology and between reproduction and production. First, Second, and Third World political economies interact in ways that exacerbate many of the problems inherent in individual countries. The political economy of the First World is legitimated by a mechanistic worldview that has been dominant since the seventeenth century and an egocentric ethic that assumes that what is best for the individual is best for society as a whole.

QUESTIONS FOR DISCUSSION AND WRITING

1. In her often complex discussion of population as an environmental problem, how does Merchant explain the relationship between "production" and "reproduction"? How does wealth or "standard of living" affect

the levels of population growth?
tions does Merchant propose to
sion"? How are such solutions d
being attempted?

2. In Merchant's view, how wil
ics help to solve the persistent ar
in this chapter? Based upon
longevity" and the "obsession wi
the ways that American consume
their expectations. Does such a s

3. As a Marxist thinker, Mercha
problems that is quite different fr
ists, including many other radica
causes and solutions to our pres
Merchant to identify her own pos
her own views? Are there places
for change seems to go beyond
concerns?

ıing the artifacts requires energy
ıd pollutes the ecosystem. In terms of
l amount of energy in the universe is
rgy available for useful work is de-
entropy (the energy unavailable for
the universe as a whole moves from
uses low-entropy raw materials, it
y artifacts, and emits high-entropy
ɜ," states Daly, "restrict all technolo-
ply to all economic systems whether
ist." While the economy and its arti-
ystem tends to greater disorder. At
longer able to provide the services
ɔsts to nature, however, cannot be
economic costs.

and if so how? Can the world of the 48
able no- or low-growth economy as
ds of living rise? To move toward a
f artifacts must be reduced. Planned
ngevity. Cars, refrigerators and tele-
session with growth is replaced by
al of higher gross national product
ıal pollution.

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ecology and between reproduction
rd World political economies inter-
ıe problems inherent in individual
he First World is legitimated by a
ı dominant since the seventeenth
ssumes that what is best for the in-

SION AND WRITING

ɔf population as an environmental
:he relationship between "produc-
ealth or "standard of living" affect

the levels of population growth? Given her position, what kinds of solutions does Merchant propose to control the world's "population explosion"? How are such solutions different from or similar to solutions now being attempted?

2. In Merchant's view, how will the transition to "steady-state" economics help to solve the persistent and perilous ecological crises she outlines in this chapter? Based upon what Merchant says about "planned longevity" and the "obsession with conservation" (par. 48), speculate on the ways that American consumers would have to change their habits and their expectations. Does such a solution seem realistic? Why or why not?

3. As a Marxist thinker, Merchant is arguing for a view of environmental problems that is quite different from that offered by other environmentalists, including many other radical environmentalists. As she discusses the causes and solutions to our present environmental crisis, how careful is Merchant to identify her own position? How does she characterize or label her own views? Are there places where, in your view, Merchant's agenda for change seems to go beyond what you think of as "environmental" concerns?