Energy: An Environmental and Economic Dilemma; Seminar 2: Energy and Ecosystems Production
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ENERGY
AN ENVIRONMENTAL AND ECONOMIC DILEMMA

2. ENERGY AND ECOSYSTEMS[1]

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The energy problem is intimately related to other concerns facing the world today. It is time to think about energy usage as seriously as we have about the environment over the last decade.

Although it is impossible to totally destroy this planet's environment, there is enough energy to pollute the earth and render it useless for several lifetimes.

Decisions about energy and environmental issues are based heavily on economic considerations, but economic growth, a clean environment and energy conservation are not necessarily at odds with each other.

One way to approach these issues is from an economic standpoint. Good economics is good ecology, or more traditionally, "Waste not, want not."

The cost of energy will have to increase because alternative energy sources will cost more per BTU[2] than conventional sources cost now. The environmental expense of interim energy sources will also rise.

Even if we decided today to switch to a clean power source, such as solar power, we would need coal and/or nuclear power to bridge the gap between the fossil fuel and fledgling solar technologies that we are rapidly developing.

The present crisis is due partly to federal price controls. The unrealistically low prices paid for natural gas over the past 10 years have kept the economy growing. Until recently, problems of unemployment, inflation and foreign trade were ordinarily solved by generating economic growth through increased emphasis on style, disposability and novelty. However, treating problems such as unemployment or pollution as separate entities creates new problems.

PROBLEMS WITH THE SYSTEM

Most of the expanding Gross National Product (GNP), translated into energy consumption, is not population growth but growth in per capita consumption. But while the population's demand for material goods has grown rapidly, the environment has stayed the same size.

Americans have traditionally manipulated the earth's physical and ecological systems to meet their demands, while other cultures assimilated society into the environment. Therefore, the bulk of our energy drives a synthetic, not a natural system.

Limiting the environmental dimensions of synthetic energy and chemistry will challenge fundamental characteristics of our lifestyle. Americans have become the most individual-oriented society in the world. Our priorities differ substantially from those of primitive cultures, such as the Tsembaga of New Guinea. We ask people what they want, assess the way they spend money and then design to fill their demands. The individual has no say whatsoever in Tsembaga culture; the environment determines everything (Table 1).

Table 1—Hierarchy of constraints.

Tsembaga	America
1. Physical	1. Individual
2. Ecological	2. Economic
3. Economic	3. Socio-political
4. Socio-political	4. Ecological
5. Individual	5. Physical

Source: (1).

[1] *From a presentation by William Cooper, Professor of Zoology, MSU, at a seminar for community leaders of Genesee and Lapeer Counties on April 4, 1977, in Flint, MI. The series of four seminars was sponsored by Michigan State University's Cooperative Extension Service. Adapted by Bill Stout and Paul Parker, Department of Agricultural Engineering, MSU.*

Other titles in the series are: No. 1, Running out of Energy (Extension Bulletin E-1173); No. 3, Energy and World Food Production (Extension Bulletin E-1175); and No. 4, Developing an Energy Policy (Extension Bulletin E-1176).

[2] *British Thermal Units—common unit of measurement for energy in the United States.*

For people to continue to have choices in the future, trade-offs will become mandatory. We have to get over the notion that we can be happy, rich, mobile, independent and free without selling our nation away to the oil-producing countries.

We must also consider the environmental costs of individual-oriented decision-making. As now structured, the whole market system focuses on benefits, not costs. People and resources are exploited to make money. We look at the environment as separate from ourselves and use it to satisfy our wants.

A NEW LOOK AT COSTS

The energy and environmental crises are the result of neglecting to charge the real costs for what is taken from the environment (Table 2).

When environmentalists lobby to prevent building of a dam, a nuclear plant or a highway, they are usually trying to assess the real costs of that construction. Routing a freeway through inexpensive agricultural land looks economically sound until the calculation of real land value is based on future agricultural production potential. Some "bargains" of synthetic chemistry and energy production can become costly investments for society.

REAL COSTS OF POLLUTION

Energy production creates two kinds of pollution—organic and inorganic. The direct pollution that comes from the energy plants themselves is inorganic. Most of these direct residual problems, either chemical or thermal, can be eliminated by good site location and design. These include such pollutants as smokestack gases, radioactive wastes, thermal (heated) effluents and coal dust particles. Most of us know about copper, lead, mercury and zinc pollutants; we can monitor those metals, and the environment can handle them.

Organic compounds (e.g., PCB, PBB) are more dangerous because they last longer and cannot be monitored. It is difficult to isolate and identify organic compounds unless the scientist specifically looks for them. Furthermore, sample testing may cost up to $5,000 and can be done only in special laboratories.

A major problem in this country is the lack of a good disposal program for toxic organic compounds. Many of these do not break down at low temperatures. A kiln at 2700°C can burn Kepone 80 percent of the way in 10 seconds. The hottest industrial incinerator in Michigan reaches only 800°C and will not burn PCB.

Buried wastes must be kept away from water—nature's universal transportation system — and transformed physically so they do not become soluble. This is another expensive task.

It is probable that compounds that cannot be destroyed will not be marketed in the future. Or perhaps any industry that markets a questionable product will have to assume the responsibility of handling the residuals.

Table 2—Partial list of environmentalists' concerns.

Water pollution	Noise pollution
Air pollution	Visual pollution
Resource depletion	Wilderness preservation
Radioactivity	Urban decay
Solid waste disposal	Suburban sprawl
Thermal pollution	Agricultural malpractices
Pesticides	Feed lots—"sewage" disposal
Land use	Fertilizer runoff
Energy utilization	Soil misuse—erosion
Transportation—	Wildlife preservation
Mass transit	Bad lumbering—clear cutting
	Oil spills

Source: (2).

These problems arise because our system gives people choices, including the right to gamble and win or lose economically and environmentally. The problem is that the public often ends up paying when the gamble turns out to be bad.

Small companies will gamble on a risky investment or dangerous product because they have little to lose. If their product sells, they can make it big. But a large company, like Allied Chemical which lost a $15 million lawsuit over Kepone, has a lot to lose. Companies dealing with toxic organic materials may soon be denied the opportunity to gamble.

REAL COSTS OF NUCLEAR POWER

Engineers are locating and drilling every potential waste disposal site in the United States because nuclear power plants are running out of on-site storage space for radioactive waste. Michigan citizens have already opposed plans to dispose of radioactive waste here. They are concerned because nuclear power means breeder reactors, which imply transportation and storage of plutonium, a potentially dangerous element.

High-risk situations are inevitable in transportation networks, and consumers may not want to take chances with radioactive wastes traveling highways, rails and waterways.

The transportation issue can be avoided by placing all facilities in one location. While such design is safer, it is very energy-intensive. Plutonium enrichment and recycling facilities use enough energy to warrant construction of a reactor at that site. This requires locating a waste storage site near a water source for cooling the reactor (Figure 1).

With the water supplied by the Great Lakes and the salt deposits available for waste storage, Michigan

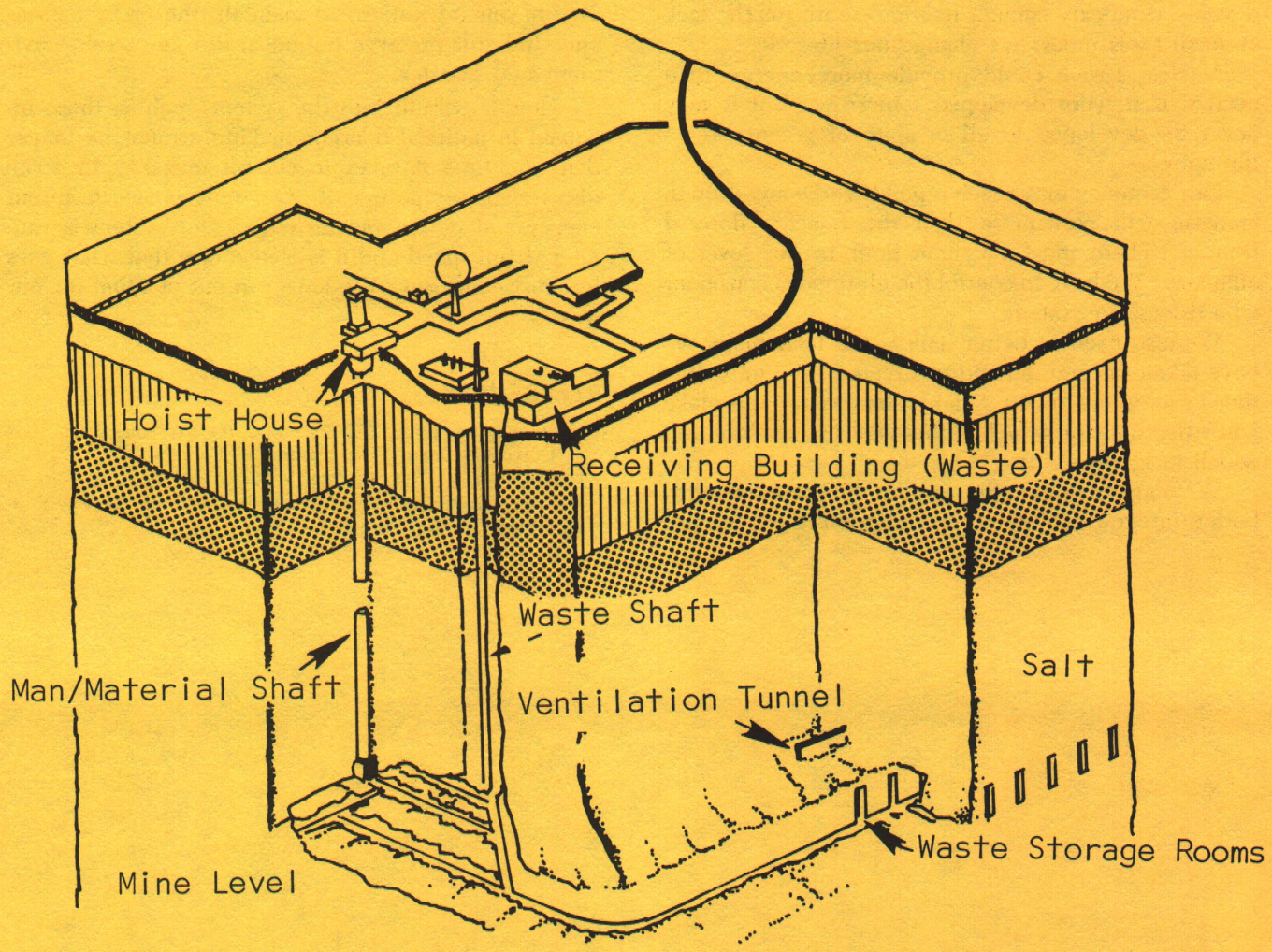

Figure 1—Artist's conception of a bedded salt repository for solidified high-level radioactive wastes. The Storage area is 1,000 to 2,000 feet underground. (Photo courtesy Oak Ridge National Laboratory and U.S. Atomic Energy Commission.)

provides an ideal site for reactor operation and waste storage.

Relatively speaking, nuclear power might be safer than coal, not only in terms of environmental cost and capital investment, but in dollar, water, net energy and human labor costs as well .

REAL COSTS OF COAL

Environmental limitations to coal are seldom discussed. When coal burns, carbon dioxide (CO_2) escapes into the atmosphere which (1) raises the CO_2 levels in the ocean and (2) increases atmospheric density.

Increased CO_2 concentrations in water create lime, which displaces water and raises its level. Even small changes in sea level could wipe out hundreds of cities and millions of acres of agricultural land across the globe.

Scientists predict that an increase in atmospheric density will lead to a climate change, though they cannot agree whether the climate will be warmer or cooler. Any change will lead to a decrease in food production, since crops are geared to the present climate.

Other factors affecting the upper atmosphere density are:

- — the supersonic transport (SST) and hypersonic aircraft.
- — fluorocarbons 11 and 12 in spray cans.
- — nitrogen-base fertilizers.
- — the space shuttle.

LIMITING OUR COSTS

Neither coal nor nuclear power are the safest alternative energy sources for the future. Solar energy has few environmental costs, but probably cannot be

developed quickly enough to compensate for the lack of fossil fuels unless we change our lifestyle.

Nuclear fusion could provide more energy than needed if it were developed tomorrow. But it may never be developed at all in spite of recent breakthroughs.

Our economy may reach a point where any growth increase will cost more than the benefits derived from it. There must be some limit to our level of affluence. We have to control the gluttonous consumer who drives our system.

We also need to better handle the technology we have taken for granted and mistreated. We must further develop our institutional system so we can make wiser decisions on which technologies to explore and which to ignore.

We must monitor the system for contaminants, better integrate solutions and shorten the response time of our institutions to maintain the present economy and still preserve public health and avoid environmental disaster.

Time lags built into the system, such as those involved in political decision-making, cannot be longer than the time it takes to correct mistakes, or some disaster may wipe us out. Our only choice is to cut energy and environmental costs. Our system is running at full speed and it is elementary that what goes in, must come out. We have run out of room for our wastes.

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