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About the Institute

The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

The Ecologist

Vol. 2 No. 1 January 1972

This document was drawn up by a team of British scientists and philosophers professionally involved in the study of global environmental problems. The aim of their full report is to "herald the dawn of a new age" in which "Man will learn to live with the rest of Nature rather than against it."



Introduction: the need for change

110. The principal defect of the industrial way of life with its ethos of expansion is that it is not sustainable. Its termination within the lifetime of someone born today is inevitable—unless it continues to be sustained for a while longer by an entrenched minority at the cost of imposing great suffering on the rest of mankind. We can be certain, however, that sooner or later it will end (only the precise time and circumstances are in doubt), and that it will do so in one of two ways: either against our will, in a succession of famines, epidemics, social crises and wars; or because we want it to—because we wish to create a society which will not impose hardship and cruelty upon our children—in a succession of thoughtful, humane and measured changes. We believe that a growing number of people are aware of this choice, and are more interested in our proposals for creating a sustainable society than in yet another recitation of the reasons why this should be done. We will therefore consider these reasons only briefly, reserving a fuller analysis for the four appendices which follow the *Blueprint* proper.

111. Radical change is both necessary and inevitable because the present increases in human numbers and *per capita* consumption, by disrupting eco-

systems and depleting resources, are undermining the very foundations of survival. At present the world population of 3,600 million is increasing by 2 per cent per year (72 million), but this overall figure conceals crucially important differences between countries. The industrialised countries with one-third of the world population have annual growth rates of between 0.5 and 1.0 per cent; the undeveloped countries on the other hand, with two-thirds of the world population, have annual growth rates of between 2 and 3 per cent, and from 40 to 45 per cent of their populations is under 15. It is commonly overlooked that in countries with an unbalanced age structure of this kind the population will continue to increase for many years even after fertility has fallen to the replacement level. As the Population Council has pointed out: "If replacement is achieved in the developed world by 2000 and in the developing world by 2040, then the world's population will stabilise at nearly 15.5 billion (15,500 million) about a century hence, or well over four times the present size".

112. The *per capita* use of energy and raw materials also shows a sharp division between the developed and the undeveloped parts of the world. Both are increasing their use of these commodities, but consumption in the developed countries is so much higher that, even with their smaller share of the population, their consumption may well represent over 80 per cent of the world total. For the same reason, similar percentage increases are far more significant in the developed countries; to take one example, between 1957 and 1967 *per capita* steel consumption rose by 12 per cent in the US and by 41 per cent in India, but the actual increases (in kg per year) were from 568 to 634 and from 9.2 to 13 respectively. Nor is there any sign that an eventual end to econo-

mic growth is envisaged, and indeed industrial economies appear to break down if growth ceases or even slows, however high the absolute level of consumption. Even the US still aims at an annual growth of GNP of 4 per cent or more. Within this overall figure much higher growth rates occur for the use of particular resources, such as oil.

113. The combination of human numbers and *per capita* consumption has a considerable impact on the environment, in terms of both the resources we take from it and the pollutants we impose on it. A distinguished group of scientists, who came together for a "Study of Critical Environmental Problems" (SCEP) under the auspices of the Massachusetts Institute of Technology, state in their report the clear need for a means of measuring this impact, and have coined the term "ecological demand", which they define as "a summation of all man's demands on the environment, such as the extraction of resources and the return of wastes". Gross Domestic Product (GDP), which is population multiplied by material standard of living appears to provide the most convenient measure of ecological demand, and according to the UN *Statistical Yearbook* this is increasing annually by 5 to 6 per cent, or doubling every 13.5 years. If this trend should continue, then in the time taken for world population to double (which is estimated to be just after the year 2000), total ecological demand will have increased by a factor of six. SCEP estimate that "such demand-producing activities as agriculture, mining and industry have global annual rates of increase of 3.5 per cent and 7 per cent respectively. An integrated rate of increase is estimated to be between 5 and 6 per cent per year, in comparison with an annual rate of population increase of only 2 per cent".

Computer predicts shattering environment problems

By Gerald Leach

Special from the London Observer

LONDON — The first attempt ever made to put the world's environmental crisis on a computer has produced such shattering results that the sponsors of the project have started urgent talks at the top levels of government in several countries.

The computer has shown that almost every "obvious" policy now being followed to improve man's lot or the environment — such as investing more in growing food or in cutting pollution — leads only to the build-up later of new and even worse pressures.

More daunting, it shows that most attempts to reduce these new pressures will bring on an even worse crisis. Several of the computer "scenarios" include a catastrophic and sudden collapse of population.

For example, one predicts that today's situation of declining natural resources eventually will force a steady reduction of

population and a declining quality of life. But if the drain on the Earth's resources is cut — either by saving critical materials or finding more of them — the result may be a runaway pollution crisis that brings population crashing to a fraction of its former level.

And if pollution is controlled . . .

Yet if pollution is controlled, the computer predicts that a crowding crisis will develop that will steady the population growth but drag down the quality of life severely.

The study comes from the prestigious System Dynamics Laboratory of the Massachusetts Institute of Technology and has been published as a book called "World Dynamics." Other major conclusions from the study are:

— Global population growth and industrialization are rapidly approaching the limits of the Earth's capacity to support them.

— We may now be living in a "Golden age" when the average quality of life is higher than it ever was in the past or will be in the future.

— Industrialization and capital investment disturb the world's environmental capacity more than population growth does. Highly industrial societies may be self-extinguishing, either from resource exhaustion or international strife over pollution and resource rights.

— Developing countries are in a closer environmental balance than industrial ones and may be in a far better condition to survive coming crises as long as they don't industrialize heavily (as they are trying to).

— Programs to control population may be inherently self-defeating. If they work and lead to higher material standards and food supplies for each person, as is hoped, these very improvements may relax the pressure on numbers and trigger another population spurt.

But by far the most disturbing conclusion is: In order to achieve improvements in the long run, the world has to adopt

policies that make life much harder in the immediate future. "This is especially treacherous," the book's author, Prof. Jay W. Forrester, writes. "We are at the point where higher pressures (on growth) in the present are necessary if insurmountable pressures are to be avoided in the future."

Full scale of distress shown

The full scale of the problems is revealed by the "best" long-term solution provided by the computer: "Quality of life—defined in the computer program as a combination of material standard of living, the degree of crowding, available food and pollution—is kept at approximately today's level while population growth is halted."

To achieve this optimum, the rate at which natural resources are used up must be cut by a staggering 75 per cent, pollution generation must be reduced by 50 per cent, capital investment slashed by 40 per cent, the birth rate reduced 30 per cent. Most significant of all, food production must be re-

Turn to Page 36

Buscher named new St. Charles school director

Alfred E. Buscher, 37, has been appointed superintendent of the Illinois State Training School for Boys at St. Charles.

He succeeds Samuel Sublett Jr., who made the announcement over the weekend. Sublett was recently promoted to administrator of institution services for the juvenile division of the State Department of Corrections.

Buscher, who has been assistant superintendent at St. Charles since 1965, had specialized there in academics, cottage life, recreation and clinical services.



ALFRED E. BUSCHER

A graduate of Illinois State University with a master's degree in education administration, Buscher previously had been director of the New Salem Forestry Camp, St. Petersburg, Ill.; director of the Kankakee State Boys' Forestry Camp at Manteno, and director of Oregon's Lowden State Boys' Forestry Camp.

Display Robert E. Lee oath of allegiance

RICHMOND, Va. (AP) — Robert E. Lee's oath of allegiance

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Computer forecasts environment disaster

Continued from Page 8

duced 20 per cent, since hunger always has been the most effective brake on economic and population growth.

More than 10,000 copies of the computer's findings have been sent to high-level decision makers throughout the world.

These sensational forecasts are certain to be attacked heavily once they become widely known, especially by politicians committed to the short-term beneficial policies that the computer predicts will cause long-term crises.

The sharpest attacks are bound to be on the crude oversimplification of the "world environmental system" that was fed into the computer before it churned out its forecasts. This considered only the level and growth rates of five key factors — population, capital investment, natural resources, pollution, and quality of life.

Factors broken down

These factors were broken down into several "indicators" — such as the fraction of investment going to food production, to pollution control, to raising material living standards. All the indicators were then linked by a total of 45 equations in such a way that altering one indicator had a preset effect on the others.

Given this "world model," the computer, was then told to forecast how the five key factors would behave up to the year 2100 if one took different assumptions for 1970. One such assumption was: "Increase capital investment by 20 per cent."

Though crude, computer models like this are good at reflecting the behavior of real-life systems, like a business or a city. They are far too complex for human minds to follow, so their conclusions are usually totally unpredictable.

An international team at MIT, headed by Prof. Dennis Meadows, has spent the last year improving the model, hunting out errors and adding many more indicators to bring it closer to what happens in the real world. Last week he said none of these alterations had made any major difference to the crisis forecasts or the crisis measures needed to avoid them.

It is for this reason that he and the sponsors of the MIT project are now urgently contacting decision makers up to the head-of-state level to warn them where their policies might be leading.

Shorter-term study begun

The MIT group also has started a series of computer studies that look only 10 to 20 years ahead. The idea is that if world leaders can't grasp the importance of taking the 130-year view of the main study, they might be prepared to act on the short-term forecasts. These also will be much more narrowly focused to make a sharper impact on politicians, legislators and technologists.

One of the most significant aspects of all this activity is the powerful and growing role being played in national and international affairs by the semisecret Club of Rome — the sponsors of the MIT computer project. Started about two years ago by a handful of eminent industrialists and academicians who were worried about the lack of response to what they saw as a looming environmental crisis, the club now consists of an international network of some 75 members.

They see themselves much as did Edgar Wallace's "Four Just Men" — shadowy background figures whose mission is to save the world by infiltrating their ideas into the corridors and dining tables of power.

According to Prof. Meadows, in the last two months Club of Rome members armed with the MIT computer's forecasts of crisis have made a "tremendous" impact and have reached the highest levels in several countries, including some in the Soviet bloc.

"Don't expect any immediate public announcements," he warned, "but you can take it that a lot of rethinking is going on."

that security.
"I remember everything that ever happened to me," said the toothless, slick-bald old man sitting amid a cutter of

right on amid one.
"You won't have to work," they said. Then you went on down into the hatch hole and that's when the boat left."

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Galbraith hits idea of endless growth

By Milt Freudeheim
Daily News Foreign Service

PARIS — John Kenneth Galbraith, one of the great needers of American industrial society, is going around Europe attacking one of its most sacred ideas — the desirability of growth.

He is living in England writing a book about it, interrupted by forays to the continent for lectures, debates and conferences.

Galbraith came to Paris for a sold-out debate sponsored by the leftist weekly *Nouvel Observateur*, which has just published his remarks.

"It is an odd idea that people might one day consume less, work less, and live more," Galbraith says wryly, but obviously with approval.

He portrays society in the "mindless" grip of a "technostructure" made up of business managers and their lawyers, admen and consultants, with the government playing the part of their "executive committee."

IT IS WRONG, ACCORDING TO Galbraith, to think that business people are motivated by profit-making. Their interest "is most strongly served, not by earnings but by growth."

Growth brings them bigger salaries, more perquisites, greater security, influence and power, he argues.

They achieve growth by manipulating the economy for more and more production of whatever is most convenient, regardless of consumer or citizen interests, he charges.

"Modern industrial society is somehow irrational . . . Some things such as automobiles are supplied in great and perhaps even excessive quantity.

"Other elementary needs, such as houses or urban transportation, are systematically in short supply."

These are topics that Galbraith, a Harvard economics professor, has treated at length in two of his most popular books — "The Affluent Society" and "The New Industrial State."

THE PUBLIC IS WAKING UP, he now says, and there is "new opposition" to many of the new projects. He cites the proposed supersonic transport, metropolitan airports, high ways, power plants and factories as examples of targets for this resistance.

The growth brings "heavy or even intolerable costs in polluted air and water and damaged and corrupted land scape," Galbraith contends.

"Environmental disharmony is the natural consequence of the disparate goals of the technostructure and the public."

New products are marketed without serious function, or which do not work." He lists detergents, cigaret filters, breakfast foods and automobiles as examples.

"Performance is secondary to what can be sold," he says, and there is an "inflationary bias" built in, which passes costs to the public.

Outlining his remedies, Galbraith begins by asserting that first "existing economics" must be discarded "as the instrument of the existing system."



John Kenneth Galbraith

Advertising, of course, is a servant of the enemy technostructure, and the "media is not neutral" either, he asserts.

He urges "developing the legislature as a principal instrument of power against the technostructure."

The state must be an "arbiter" instead of serving its present masters. Among its tasks: taking control of prices away from the present industry-union combination; protecting the environment; and supporting "weak sections of the economy," including housing, urban transport, municipal services and culture.

IN THE PARIS DEBATE, Galbraith was challenged by Marxist spokesmen for leaving aside such Marxist concepts as capitalist exploitation of workers and the alleged dependence of American capitalism on "imperialistic wars."

He was sorry his debating partners couldn't see that times have changed since Marx and Lenin, he replied. "If Marx and Lenin were alive today, I am sure they would have accepted this (change)."

On Vietnam, Galbraith said that he had been against U.S. policy there for 10 years (since he was President John F. Kennedy's ambassador in India). Money to finance the antiwar effort in the United States has come from industrialists and business circles, he said.

Answering a questioner who wanted him to accept the Black Panther revolutionary slogan of "all power to the people," he replied, "I am not a revolutionary. I don't accept the capitalist-communist dilemma.

"I believe that we can spare ourselves the trauma of a revolution and take on something that will be more satisfying than either communism or capitalism," Galbraith said.

Waiting for the end, boys . . .

GORDON RATTRAY TAYLOR:
The Doomsday Book
 335pp. Thames and Hudson, £2.2s.

It has become vital for us to know what has happened to our once comfortable equilibrium, and why we are now having to face decisions of a magnitude never before known. *The Doomsday Book* does not give us the information we require, but rather sensationalizes and over-dramatizes the whole situation. The book is mainly a review of the progress of man's development over the past three decades, coupled to a speculation on where he is going in the next three. For thousands of years we have known a world with seemingly endless resources, but today we know only environmental blood clots and lung collapse; a high price to pay for the over-indulgence of our forebears. The evil that men do certainly lives after them.

Mr. Rattray Taylor takes the attitude that the problems are so immense, that decay has progressed so far, and that our schemes for the coming thirty years are so enormous that even if we want to solve them nothing short of a miracle will succeed. The basic problem is that we are too numerous. By the year 2000 there will be 7,000 million of us, twice the number we are now, and by 2030 some 14,000 million. And a child born now will be only sixty years old by 2030.

Thus, world population galloped ahead following the industrial revolutions. Natural resources were plundered recklessly as man's needs increased geometrically. Cracks in the environment appeared, but were hastily plastered over with political platitudes. What of the North American dust-bowls? Or the deer on Kaibab plateau? The past decade has shown us that accounts in the energy bank cannot be run on credit indefinitely—resources are not unlimited.

Mr. Rattray Taylor then asks the obvious question: what can be done to curb world population? He puts little faith in the spread of contraceptive practice, which he estimates would cause an overall reduction in birth-rate of about 5 per cent. This is of little use in the most rapidly expanding populations, in South America for example, where a reduction of upwards of 40 per cent is needed. Short of plague, famine or nuclear war, for every one of us alive today there will be two by the year 2000. The solution is to convince couples that two children is the best number to have, but more than three-quarters of the world's population will take a lot of convincing.

The secondary problems get their momentum from the first—more people means more pressure on resources and more waste for disposal. Mr. Rattray Taylor takes a look at our growing need for water, and questions plans for dam-building on scales so large that the proposed weight of impounded waters might upset the earth's crustal forces to such an extent that we shall quake to pieces. He examines world temperature, and points out that experts are not in agreement about whether the world is heating up or cooling down. Some say that by 1990 the average temperature will have risen by 5 degrees Centigrade because of the increase in atmospheric carbon dioxide produced positively by man's breathing, his machines and his fires, and negatively by the felling of ancient forests. Such a rise would melt the polar ice caps and cause widespread flooding of cities at sea-level such as Amsterdam and London. Other experts say that the long-term build-up of ice in the North Atlantic, which has already half paralysed the Icelandic fishing industry and which caused that country to devalue her currency three times last year, will continue and cause untold financial ruin.

The author examines our relationship with the great cycles of nature. Thousands of tons of toxic chemicals, he says, are poured into the environment every year, with not so much as a thought for bacteria, viruses, and other humbler members of creation. Yet no engineer in his right mind would consider pouring detergent into a sweetly running engine just because it was less convenient to dispose of it elsewhere.

In this post-Carson era we are faced with new pollutants more deadly than ever before. World use of asbestos has rocketed in the past thirty years, and with it we have seen a huge increase in asbestosis and mesothelioma. We are all familiar with asbestos—the main constituent of car brake-linings—and are therefore exposed to a new deadly risk. Mercury, lead and cadmium stand not far away as pollutants on the increase (mercury in the manufacture of P.V.C.; lead in anti-knock additives to petrol; cadmium in the electro-plating industry), and all are substances that the human body intensifies and builds up until a lethal dose is reached. Beryllium, too, and thallium are making their debut as new killers when technology puts them to its use.

The dangers from ionizing radiation are well known, and Mr. Rattray Taylor is horrified by the statistically predictable nuclear reactor accidents

that will undoubtedly occur during the next three decades when significantly more of our electricity originates in little uranium cells. He campaigns for a lowering of the "acceptable risk" level of contamination laid down by governments. Is any preventable ionizing radiation, the most pernicious of all pollutants, "acceptable"? How are we to tell malformed and abnormal children that their mothers had certainly received less than the "acceptable limit" of radiation in their milk, butter, eggs and cheese?

Mr. Rattray Taylor is convinced that there will be a human population crash, and he only asks when. Such a population crash with a death toll at today's figures of about 3,000 million would solve, for a while at least, the primary problem, and those of us surviving would hope that the secondary ones would solve themselves. He compares a possible human population crash with those of deer and lemmings, but such a comparison is surely basically invalid. Many possible theories explain natural population crashes, but what seems certain is that food shortage is the main barrier to further increase. Once a certain level of food deprivation has been passed, breeding potential and survival drop, and the population goes into a decline. But man has the technology to manufacture synthetic foods, as well as to shorten his own food chains (by eating "Plankton-burgers", as the author so delicately puts it), and in this way to allow his numbers and density to rise higher

than would be possible if he were to starve when his numbers became short. It seems that our populations are regulated by the impact of limitation, the like of which can yet imagine.

What can be done, already too late? Mr. Rattray's conviction that we are the biggest failure of *The Book*; not only does it account of current research, but it leaves the very little hope indeed impression is the product of the author's sensationalism. Ecological sensationalists are doing power to educate marauders of resource and planners trained in entering local and national services. Great it have been made by administrators to clear rivers, polluted land and luted foodstuffs.

It is gargantuan proportion must accept, and we hard at interests not cooperate. Society as a grapple with the problem and of tax dis large families. We mustible men engaged in national parks and ecological complexity. velopment must run ality development, and of Britain and elsewhere happening. What is

Getting us taped

MALCOLM WARNER and MICHAEL STONE:

The Data Bank Society

244pp. Allen and Unwin, £3.

Malcolm Warner and Michael Stone have written an unusual and fascinating book. The subject is certainly better known and understood in the penumbra of the computer world than it is outside, but the alarm which the authors seek to sound from the first chapter onwards is one which will be heard with increasing frequency as the data banks grow in number, scope and interdependence.

The wide range of sources on which the authors have drawn to illustrate the possible misuse of data banks include the comprehensive and detailed inquiry undertaken by the United States Congress and debates on privacy which have recently taken place in both Houses of Parliament. The legislatures of the main computer-using societies are therefore aware of the problem, though the

developed countries fact that the revolu expectation is exponents of oceanographic environmentalists cost consequences of pollution. The system computers assist them scope and complexity tion models, find then able to assemble and data on the analysis possible solutions seem

The decision-make understandable wish, lik supersonic airliner, to on the ground before real thing. The comj vast associated data t this possible for C that realm of techn gain. They have also for the Chancellor o to "fly" a new tax b it; for a doctor to before he prescribe planner, to see how might behave before planning consents. However, though the significant and in

The Curse of Economic Growth

By Walter Weisskopf

Mr. Weisskopf is professor of economics at Roosevelt University and author of the book "Alienation and Economics."

For more than a century we have been hypnotized by the success of our economy and technology. It is time to recognize that technology and economic growth, which were thought to be the greatest strength of the Western societies, have turned out to be not blessings but curses threatening us with destruction.

Technology and economic "progress," in combination with hyper-urbanization, have created our ghettos, our traffic congestion, our air, water, and soil pollution, and disturbed the natural balance of our environment. In addition, economic growth failed to provide any solution for the problems of poverty and malnutrition even within the fantastically affluent United States.

Economic growth means more and more goods, regardless of the harmful effects of overabundance on the individual and on society. Technical progress means that everything that can be produced and sold at a profit must and will be produced and sold, again re-

gardless of the harmful effects on man and society.

For a long time, economists and businessmen believed that there was nothing to worry about as long as there was a free market. In such a market, the production of goods is a result of consumer demand. That kind of free market is dead and gone, killed by big government, big labor unions, and big business. This came about not thru a conspiracy but because organizations today are so large that they must make decisions which have an enormous impact on individuals and society, decisions based on a value system, with political goals and priorities.

A Need for Standards

The invisible superpersonal hand of the free market has been replaced by the visible hand of powerful companies, unions, and government agencies. Their choices and decisions require standards for what is right and wrong, politically and morally. The profit motive, the striving for power, the desire for reelection do not provide such moral and political standards.

These motives lead merely to more and more goods and more and more ill-considered control over nature thru the use of our vaunted technical virtuosity.

We are worshipping economic growth with bigger and better orgies of production and consumption until everybody is drowned in a surfeit of unnecessary goods.

For many years, I have attacked this lifestyle based on the ever-increasing Gross National Product—a lifestyle I call GNP-fetishism, because it distorts the human personality and is mentally, intellectually, and spiritually unhealthy. In an affluent society, more and more goods mean more and more "bads." Man needs more than goods produced for sale; he needs a balanced way of life, a life with meaning; he needs firm convictions of what is right and wrong; he needs a way to worship, a faith in "things unseen"; he needs an openness to feelings, fantasy, and imagination; and he needs warm human relationships thru love, friendship, and community.

Our overemphasis on technology and economic affluence, and on the stifling bureaucratic organizations which support them, deprive us of the necessary time and energy to pursue noneconomic and nontechnical goals. Thus, we have become alienated and estranged from the satisfaction of our most important needs.

'Ecological Armageddon'

The case against our neurotic fascination with economic and technological growth and change has recently been strengthened immensely by the warning of the ecologists. They talk about "man the pest," about an "ecological Armageddon," about the "dim chances of survival." What they mean is that overpopulation, shortage of basic materials and of fertile soil, and the poisoning of the environment by the waste products of industry will force us to abandon the idea of an ever-increasing production.

Already today it would be absolutely impossible to develop the underdeveloped countries and elevate their standards of living to the American level. There simply are not enough resources to Americanize the economies of the world. But, even within the United

States alone, economic growth along the same lines as in the past will soon be impossible because of shortage of basic resources and environmental destruction. If present trends continue, overpopulation and worldwide starvation will be the inevitable result.

For psychological and for ecological reasons we have to change radically our economic attitudes and lifestyle. We have to learn that more is not always better than less. We have to strive, as individuals and as a nation, to be satisfied with a relatively more stationary economy. Such an economy would have to produce the basic necessities thru a much more equitable distribution and a guaranteed minimum income.

Every individual should be taught to strive for a moderate "target income," an income that supports him on a level where he can devote enough time and energy to noneconomic pursuits which consume few scarce resources. We have to redefine what we mean by work, status, and self-respect. Status and self-respect should not be based on having a higher income than the other guy. We should make it possible to do meaningful work without necessarily aiming at a higher income. Necessities should be produced and distributed in a routine fashion. Change, progress, achievement, and competition should take place mainly in noneconomic fields.

How can all this be brought about?

Well, during the 20th century everything that has happened was considered impossible 20 years before it happened. And this is true of all human history. What is necessary at first is for intellectuals to demonstrate that these changes in economic attitudes are necessary and desirable. When these ideas take hold, there will be political movements to take them up and change our system from within. No external violent revolution can ever improve anything. What is necessary is a change in attitudes and values.

Without such a change, our chances of survival are dim.

Care for the Elderly: The View Is Troubling

By M. Paul Gallagher

Mr. Gallagher is executive director of Comprehensive Health Planning, Inc., of Metropolitan Chicago. This is excerpted from his statement at a public hearing of the special studies subcommittee of the House Committee on Government Operations.

No one taking a dispassionate view of our times can take much comfort in the programs offered and care extended to our elderly citizens—the mothers, fathers, grandmothers, and grandfathers

debate is over and the campaign literature, promises, and hoopla have been swept from the nation's mind, we see that the elderly remain largely forgotten in the legislation to solve our society's problems. The provisions of Medicare and Medicaid are far too inadequate to meet the needs of the elderly. There are few efforts to include the aged in plans for Health Maintenance Organizations, and insurance companies have made their position clear over the years.

We need a national policy of concern

Study Warns of Perils in World Growth

By ROBERT REINHOLD

Special to The New York Times

CAMBRIDGE, Mass., Feb. 28—A major computer study of world trends has concluded, as many have feared, that mankind probably faces an uncontrollable and disastrous collapse of its society within 100 years unless it moves speedily to establish a "global equilibrium" in which growth of population and industrial output are halted.

Such is the urgency of the situation, the study's sponsors say, that the slowing of growth constitutes the "primary task facing humanity" and will demand international cooperation "on a scale and scope without precedent." They concede such a task will require "a Copernican revolution of the mind."

The study, which is being

sharply challenged by other experts, was an attempt to peer into the future by building a mathematical model of the world system, examining the highly complex interrelations among population, food supply, natural resources, pollution and industrial production.

The conclusions are rekindling an intellectual debate over a question that is at least as old as the early economists, Thomas Malthus and John Stuart Mill:

Will human population ultimately grow so large that the earth's finite resources will be totally consumed and, if so, how near is the day of doom?

The study was conducted at the Massachusetts Institute of Technology under the auspices of the Club of Rome.

In the findings, to be published next month by the Potomac Associates under the title "The Limits to Growth," the M.I.T. group argues that the limits are very near—unless the "will" is generated to begin a "controlled, orderly transition from growth to global equilibrium."

The study would seem to bolster some of the intuitive warnings of environmentalists. In Britain last month, for example, a group of 33 leading scientists issued a "blueprint for survival," calling on the nation to halve its population and heavily tax the use of raw materials and power.

But others, particularly economists, are skeptical.

"It's just utter nonsense,"

Continued on Page 48, Column 1

M.I.T. work first hand, but he expressed doubt about the wisdom of stopping growth.

"It's a simplistic kind of conclusion—you have problems, and you solve them by stopping all sources of change," he said.

Others, like Henry C. Wallich of Yale, say a no-growth economy is hard to imagine, much less achieve, and might serve to lock poor cultures into their poverty.

Malthus Again and Again

"I get some solace from the fact that these scares have happened many times before — this is Malthus again," he said.

Malthus, the 18th-century British economist, theorized somewhat prematurely that population growing at exponential rates that could be graphically represented as a rising curve would soon outstrip available food supply. He did not foresee the Industrial Revolution.

Prof. Dennis L. Meadows, a climatologist who directed the M.I.T. study—which is the first phase of the Club of Rome's "Project on the Predicament of Mankind" — conceded that the model was "imperfect," but said that it was based on much "real world" data and was better than any previous similar attempt.

The report contends that the world "cannot wait for perfect models and total understanding." To this Dr. Meadows added in an interview: "Our view is that we don't have any alternative — it's not as though we can choose to keep growing or not. We are certainly going to stop growing. The question is, do we do it in a way that is most consistent with our goals or do we just let nature take its course."

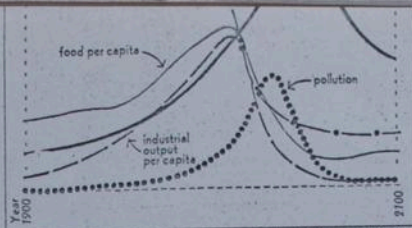
Projection by Computer

Letting nature take its course, the M.I.T. group says, will probably mean a precipitous drop in population before the year 2100, presumably through disease and starvation. The computer indicates that the following would happen:

¶ With growing population, industrial capacity rises, along with its demand for oil, metals and other resources.

¶ As wells and mines are exhausted, prices go up, leaving less money for reinvestment in future growth.

¶ Finally, when investment falls below depreciation of manufacturing facilities, the in-



The New York Times/Feb. 27, 1972

M.I.T. group used a computer global model to project trends in five key growth factors to year 2100. This computer "run" shows rapidly diminishing resources even as slowing growth, assuming no major change in physical, economic, or social relationships. The time lags in decline of population and pollution are attributed to natural delays in the system. Rise in population is finally halted by an increase in death rate.

dustrial base collapses, along with services and agriculture.

¶ Later population plunges from lack of food and medical services.

All this grows out of an adaptation of a sophisticated method of coming to grips with complexity called "systems analysis." In it, a complex system is broken into components and the relationships between them reduced to mathematical equations to give an approximation, or model, of reality.

Then a computer is used to manipulate the elements to simulate how the system will change with time. It can show how a given policy change might affect all other factors.

If human behaviour is considered a system, then birth and death rates, food output, industrial production, pollution and use of natural resources are all part of a great interlocking web in which a change in any one factor will have some impact on the others.

Interrelations Studied

For example, industrial output influences food production, which in turn affects human mortality. This ultimately controls population level, which returns to affect industrial output, completing what is known as an "automatic feedback loop."

Drawing on the work of Prof. Jay W. Forrester of M.I.T., who has pioneered in computer simulation, the M.I.T. team built dozens of loops that they believe describe the interactions in the world system.

They then attempted to assign equations to each of the 100 or so "causal links" between the variables in the loops, taking into account such

things as psychological factors in fertility and the biological effects of pollutants.

Critics say this is perhaps the weakest part of the study because the equations are based in large part on opinion rather than proved fact, unavailable in most cases. Dr. Meadows counters that the numbers are good because the model fits the actual trends from 1900 to 1970.

The model was used to test the impact of various alternative future policies designed to ward off the world collapse envisioned if no action is taken.

For example, it is often argued that continuing technological advances, such as nuclear power, will keep pushing back the limits of economic and population growth.

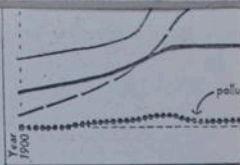
To test this argument, the M.I.T. team assumed that resources were doubled and that recycling reduced demand for them to one-fourth. The computer run found little benefit in this since pollution became overwhelming and caused collapse.

Assumption Tested

Adding pollution control to the assumptions was no better: food production dropped. Even assuming "unlimited" resources, pollution control, better agricultural productivity and effective birth control, the world system eventually grinds to a halt with rise in pollution, falling food output and falling population.

"Our attempts to use even the most optimistic estimates of the benefits of technology," the report said, "did not in any case postpone the collapse beyond the year 2100."

Skeptics argue that there is



This computer "run" projects on assumption that "technology with other growth-regulating policies would include resource control devices, increased life capital, methods to restore en-

no way to imagine what kind of spectacular new technologies are over the horizon.

"If we were building and making cars the way we did in 30 years ago we would have run out of steel before now I imagine, but you get substitution of materials," said Robert M. Solow, an M.I.T. economist not connected with the Club of Rome project. "It is true we'll run out of oil eventually, but it's premature to say therefore we will run out of energy," he added.

At any rate, the M.I.T. group went on to test the impact of other approaches, such as stabilizing population and industrial capacity.

Zero population growth alone did very little, since industrial output continued to grow, it was found. If both population and industrial growth are stabilized by 1985, then world stability is achieved for a time, but sooner or later resource shortages develop, the study said.

System Suggested

Ultimately, by testing different variations, the team came up with a system that they believe capable of satisfying the basic material requirements of mankind yet sustainable without sudden collapse. They said such a world would require the following:

¶ Stabilization of population and industrial capacity.

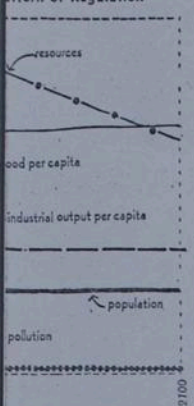
¶ Sharp reduction in pollution and in resource consumption per unit of industrial output.

¶ Introduction of efficient technological methods — recycling of resources, pollution control, restoration of eroded land and prolonged use of capital.

¶ Shift in emphasis away from factory-produced goods toward food and nonmaterial

Population and Industrial Output

Pattern of Regulation



The New York Times/Feb. 27, 1972

its relatively stable future policy policies" are combined mechanisms. Study says resources recycling, pollution lifetimes of all forms of eroded and infertile soil.

services, such as education and health.

The report is vague about how all this is to be achieved in a world in which leaders often disagree even over the shape of a conference table.

Even so, critics are not sanguine about what kind of a world it would be. Dr. Meadows agrees it would not be a Utopia, but nevertheless does not foresee stagnation.

"A society released from struggling with the many problems caused by growth may have more energy and ingenuity available for solving other problems," he says, citing such pursuits as education, arts music and religion.

Many economists doubt that Doubts on No-Growth World
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a no-growth world is possible. Given human motivations and diversity, they say, there will always be instability.

"The only way to make it stable is to assume that people will become very routine-minded, with no independent thought and very little freedom, each generation doing exactly what the last did," says Dr. Wallich. "I can't say I'm enamored with that vision."

"Can you expect billions of Asians and Africans to live forever at roughly their standard of living while we go on forever at ours?" asked Dr. Solow.

Dr. Wallach terms no-growth "an upper income baby," adding "they've got enough money, and now they want a world fit for them to travel in and look at the poor."

The M.I.T. team agrees there is no assurance that "humanity's moral resources would be sufficient to solve the problem of income distribution." But, they contend "there is even less assurance that such social problems will be solved in present state of growth, which is strain-

ing both the moral and physical resources of the world's people."

The report ends hopefully, stating that man has what is physically needed to create a lasting society.

"The two missing ingredients are a realistic long-term goal that can guide mankind to the equilibrium society and the human will to achieve that goal," it observes.

Collaborating with Dr. Meadows in writing "The Limits to Growth," were his wife, Donella, a biophysicist; Jorgen Randers, a physicist, and William W. Behrens 3d, an engineer. They were part of a 17-member international team working with more than \$200,000 in grants from the Volkswagen Foundation in Germany.

The major conclusions of the study have been circulating among experts for a few months. The full details are to appear in next month's publication and in future technical documents. This Thursday, a symposium on the study will be held at the Smithsonian Institution in Washington.

PLAYBOY IS TESTING EUROPEAN 'MARKET'

PARIS (AP)—Chastely, almost on its bare tiptoes, Playboy magazine is moving into Europe.

Test issues in the French, German and Italian language don't use full frontal nudity.

"Why look for trouble right off?" said Patrick de Teller of the French edition.

"We're going to have some meetings with the censors on this by and by. We think they'll come around."

The test issue has a translated collection from "The Best of Playboy." If it sells, monthly editions are scheduled to start appearing in the three languages.

Mr. Le Teller says the magazines will count on the American original for about 70 percent of editorial materials, in-

cluding stories, articles and cartoons. The remainder will be locally produced.

Playboy will receive royalties and maintain an American adviser in Paris, Munich and Milan.

The test issues have a center spread of the old Marilyn Monroe calendar picture.

Bow-and-Arrow Hunters Bag Only 4 Deer in Season

HALIFAX, Nova Scotia (Canadian Press)—Archers bagged only four deer in the Chignecto game sanctuary in northern Nova Scotia in 1971.

The largest specimen dropped during the two-week season was a 190-pound, 15-point buck.

The Chignecto sanctuary is the only area in the province where bow-and-arrow hunters are permitted to hunt deer during a specified period.

Club of Rome a Worldwide Organization

In April, 1968, a group of scientists and intellectuals alarmed at what they considered ominous trends in the world, met in one of the most venerable scientific institutes, the Accademia Nazionale dei Lincei in Rome, or National Academy of Linceus.

They decided to get together in search of ways to avert a breakdown of society.

the Massachusetts Institute of Technology.

Since then the Club of Rome has grown in numbers and in prestige. It includes several score scientists, economists, educators, businessmen and specialists in systems analysis. There are members from Japan and North and South America.

A central role in the club's development has been played

M.I.T., in using computer simulations to analyze the problems of a whole city, the club turned to him for help in developing computer models for the whole world.

While its early work was supported by a grant from the Giovanni Agnelli Foundation in Italy, the more-recent support project, has come largely from the Volkswagen Foundation.

M.I.T. Study Warns of Perils in Growth of Population

Continued From Page 1, Col. 7

remarked one leading economist, who asked that he not be identified. He added that he felt there was little evidence that the M.I.T. computer model represented reality or that it was based on scientific data that could be tested.

Another economist, Simon S. Kuznets of Harvard, a Nobel Prize-winning authority on the economic growth of nations, said he had not examined the M.I.T. work first hand, but he expressed doubt about the wisdom of stopping growth.

"It's a simplistic kind of conclusion—you have problems, and you solve them by stopping all sources of change," he said.

Others, like Henry C. Wallich of Yale, say a no-growth economy is hard to imagine, much less achieve, and might serve to lock poor cultures into their poverty.

Malthus Again and Again

"I get some solace from the fact that these scares have happened many times before — this is Malthus again," he said.

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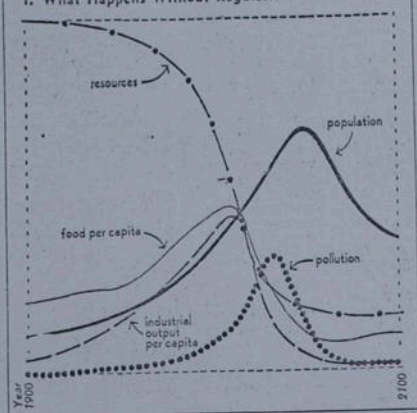
The report contends that the world "cannot wait for perfect models and total understanding." To this Dr. Meadows added in an interview: "Our view is that we don't have any alternative — it's not as though we can choose to keep growing or not. We are certainly going to stop growing." The question is, do we do it in a way that is most consistent with our goals or do we just let nature take its course."

Projection by Computer

Letting the computer do the M.I.T. projections probably mean a precipitous drop in

Two Projections in 'Limits to Growth' Study

I. What Happens Without Regulation



The New York Times/Feb. 27, 1972

M.I.T. group used a computer global model to project trends in five key growth factors to year 2100. This computer "run" shows rapidly diminishing resources even under slowing growth, assuming no major change in physical, economic, or social relationships. The time lags in decline of population and pollution are attributed to natural delays in the system. Rise in population is finally halted by an increase in death rate.

Industrial base collapses, along with services and agriculture.

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For example, industrial output influences food production, which in turn affects human mortality. This in turn affects population level, which re-

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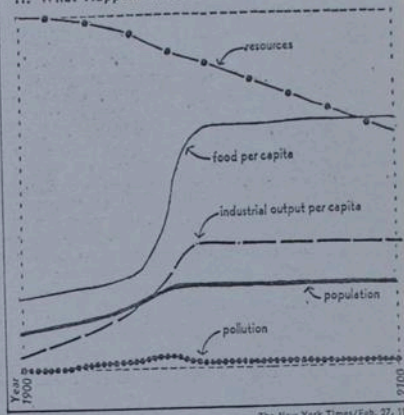
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For example, it is often argued that continuing technological advances, such as nuclear power, will keep pushing back the limits of economic and population growth.

To test this argument, the M.I.T. team assumed that resources were doubled and that recycling reduced demand for them to one-fourth. The computer run found little benefit in this since pollution became overwhelming and caused collapse.

Assumption Tested: The assumptions was no better; food production dropped. Even

II. What Happens in One Pattern of Regulation



The New York Times/Feb. 27, 1972

This computer "run" projects relatively stable future on assumption that "technology policies" are combined with other growth-regulating mechanisms. Study says policies would include resources recycling, pollution control devices, increased lifetimes of all forms capital, methods to restore eroded and infertile soil

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System Suggested

Ultimately, by testing different variations, the team came up with a system that they believe capable of satisfying the basic material requirements of mankind yet sustainable. They said a world would require the following:

services, such as education and health.

The report is vague as to how all this is to be achieved in a world in which leaders often disagree even over the shape of a conference table.

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Many economists doubt Doubts on No-Growth View Many economists doubt

Club of Rome

In April, 1968, a group of scientists and intellectuals alarmed at what they considered ominous trends in the world, met in one of the venerable scientific institutions of the Accademia Nazionale in Rome, or the Academy of Lincei.

They decided to work in search of ways to avert a breakdown of the world that they felt was intrin-

WORLD MODEL FORECASTS COLLAPSE

That the earth and its resources are finite is common knowledge. Also widely accepted is that the world's population will double every 33 years if it continues growing at the present rate. There must be some natural limit to the number of people the earth can support, and a generally unstated hope is that population will level out when that limit is reached in the distant future.

However, an international team at Massachusetts Institute of Technology, directed by Dr. Dennis L. Meadows, has completed a study that foresees a far grimmer future. The team's computer-based world model predicts that if current physical, economic, and social relationships continue unchanged, nonrenewable natural resources will be exhausted, followed eventually by a soaring death rate and a rapid drop in world population. Although the timing of the collapse is uncertain, Dr. Meadows and his colleagues expect it to come by the end of the 21st century.

The MIT team has gone on to use the world model to look for changes that might prevent collapse. All technological innovations, such as unlimited nuclear power, prove to be futile. An equilibrium state can be achieved, however, but only if

population growth is halted and industrial growth is abandoned as a worldwide goal.

The results of the study will be published this week in a book entitled "The Limits to Growth." The study was funded by the Volkswagen Foundation and conducted for the Club of Rome's "project on the predicament of mankind." The Club of Rome, founded in 1968, is an informal organization of some 70 industrialists and academicians from 25 countries. Dr. Meadows, assistant professor of management at MIT's Sloan School of Management, presented the report's results at a conference held in Washington, D.C., last week. The conference was sponsored by the Club of Rome, the Smithsonian Institution, the Woodrow Wilson International Center for Scholars, and Potomac Associates, sponsor of the book.

The MIT group based its world model on the method of system dynamics developed at MIT by Dr. Jay W. Forrester. The model includes relationships for changes among five physical quantities—population, industrial output, food, nonrenewable resources, and pollution. Positive and negative feedback loops are a key feature of the model. Population and industrial growth are driven by the positive feedback loops of birth rate and capital investment, respectively. The model also includes delays in time. A change in the birth rate, for example, has a delayed effect on the size of the world's population. A rise in the level of pollution lags behind an increase in industrial activity.

The delay factors are crucial for the behavior of the world model, the study finds. In the computer calculation for the system with unchanged relationships, the collapse in population is due at least in part

to the continued increase in population after the disappearance of nonrenewable resources forces a cut in industrial output.

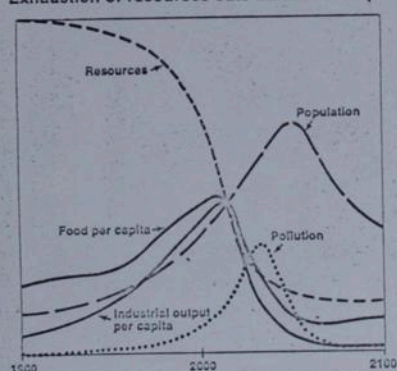
The exponential nature of most changes is also a crucial factor in the results of the study. The soaring increase in world population is generally known to be exponential, but so are increases in pollution, gross national product per capita, and consumption of nonrenewable resources. When changes are exponential, absolute amounts can change rapidly. In one calculation, for example, all arable land for food production will be used up by the year 2000 if productivity per acre and food per capita remain unchanged. If productivity is doubled, all land will be in use only 30 years later. The need for arable land depends on the growth of population, and 30 years—half a lifetime—is almost certainly too short a time to bring population growth to a halt.

The MIT team used the model to test the effects of various changes—chiefly technological improvements—that might permit growth to continue. But even in the most optimistic system—use of all resources with 75% recycling, nuclear power, reduction of pollution to 25% of the 1970 value, doubled food yield, and worldwide birth control—exhaustion of natural resources and rising pollution would force a drop of population before the end of the 21st century.

Dr. Meadows readily points out that the model is only a first attempt, with many approximations, assumptions, and gaps in data. But he is confident that the calculated modes of behavior—delayed reactions and subsequent collapses—are correct. Any errors in time in the world model are a matter of only decades, not centuries, Dr. Meadows asserts.

The MIT group went on to investigate changes that could give an equilibrium population level instead of a decline after growth is halted. Dr. Meadows and his colleagues find that several combinations of changes would produce equilibrium, but delays in instituting the changes would produce fewer possible solutions as more natural resources disappear prior to achieving this equilibrium.

Exhaustion of resources cuts industrial output



Note: The variables are plotted on different vertical scales but are combined on the same graph to emphasize modes of behavior. The variables and their units are: population (total number), industrial output per capita (dollar equivalent per person per year), food per capita (kilo-calories per person per year), nonrenewable resources (fraction of 1900 reserves remaining). Source: "The Limits to Growth," Universe Books, New York, 1972.

article By RICHARD M. KOFF WITH THE CAREFUL DISREGARD of their respective governments, two dozen eminent men were gathered last June in one of the great old *grande luxe* Swiss hotels. They strode familiarly down wide, carpeted halls—an Italian industrialist, a Belgian banker, two university presidents, a professor at MIT, the director of a major Swiss research institute, a Japanese nuclear physicist, a science advisor to an international economics organization, several economists whose pessimism, if quoted in the press, could cause a stock-market crash.

They moved purposefully toward a conference room. They did not drift, though side conversations delayed several members of the executive committee. Their one common characteristic was a certain firmness about the lips and jaw indicating an intention to get things done. They were activists in the most responsible meaning of the term. Each had been invited to join the group, called the Club of Rome, by its founder, Aurelio Peccei, himself a member of the management committee of Fiat, vice-president of Olivetti and managing director of Italconsult. Each served quietly, without compensation nor even paid expenses, as a full-fledged member.

They represented the best analytical minds of the world, with considerable influence to make funds available if a promising approach could be found to stop the suicidal roller coaster man now rides. Their concern during the two days in Bern was formidably titled A Project on the Predicament of Mankind. The predicament is simply stated: World population is growing by 70,000,000 people every year. This is the fastest growth in man's history, and the rate is still accelerating. We will number four billion in 1975 and, if current trends continue, we can expect to reach eight billion well before the year 2000. This population is making more and more demands on its environment. We are taking fresh water out of the ground roughly twice as fast as natural processes replace it. The demand for electric power in the U. S. is doubling every ten years, and most power comes from the heavily polluting combustion of coal. We are building 10,000,000 cars a year—twice as many as we made only 17 years ago, and cars burn gasoline, grind rubber tires to dust, wear asbestos brakes into an acrid powder.

Until 1970, these figures were considered proud evidence of progress. After all, it was reasoned, if power demands, automobile production and water consumption are increasing even faster than population, then the standard of living of each individual must be improving; and for the advanced countries, this is certainly true. Edward C. Banfield, professor of urban government at Harvard, wrote a few years ago: "The plain fact is that the overwhelming majority of city dwellers live more comfortably and more conveniently than ever before. They have more and better housing, more and better schools, more and better transportation, and so on. By any conceivable measure of material welfare, the present generation of urban Americans is, on the whole, better off than

an
end
to all
this

*we have handed
our heirs an
ecological time bomb
that birth control
alone cannot defuse*

Playboy July, 1971

A Careful Look at Growth as Suicide

By DAVID C. ANDERSON

"Limits to Growth" is a recently published environmental study currently attracting such passionate attention. Its major conclusion, certainly, would seem to warrant the heavy response: A rapid halt to population and economic growth is the only way to forestall the collapse of human society within a century's time.

The study (Universe Books, 205 pages, \$5.95 hardcover, \$2.75 paperback) was sponsored by Potomac Associates, a nonprofit Washington research firm, and conducted by a group of analysts headed by Professor Dennis L. Meadows of the Massachusetts Institute of Technology. The book is also part of a project undertaken by the Club of Rome, an international group of businessmen, scientists and others, and financed by the Volkswagen Foundation.

The club betrays a certain smugness. "The majority of the world's people are concerned with matters that affect only family or friends over a short period of time," the study says beneath a graph purporting to reflect the range of human perspectives. "Others look farther ahead in time or over a larger area—a city or nation. Only a very few people have a global perspective that extends far into the future."

And many readers seem willing to grant their claim to special vision. New York Times columnist Anthony Lewis, for example, wrote of the study:

"Merely to state such problems is to make one thing evident: The complete irrelevance of most of today's political concerns to the most important problem facing the world in the long run. And not very long at that. There are men in government who understand that. . . . But the leaders they advise are too busy trying to win this year's election to be interrupted with such disturbing thoughts."

Cautious Appraisal Needed

Perhaps the study merits its claim to special insight, or perhaps it doesn't. The weight of its implication, though, requires that it be appraised in a more cautious light than many now seem prepared to give it, especially since Potomac Associates has chosen to give "Limits to Growth" something of a hype. Advance proofs were sent to selected journalists, and the book was introduced with a day-long symposium and press conference at the Smithsonian Institution.

"Limits to Growth" actually does not differ in any substantial way from a book called "World Dynamics" by management expert Jay Forrester (Wright-Allen Press). "World Dynamics" was published last year and discussed at length on this page for the moral and social problems it implied. Mr. Forrester, it turns out, is an associate of Mr. Meadows and is also known to the Club of Rome. In an interview Mr. Meadows acknowledged that "Limits to Growth" is something of a rewrite. Job and explained that two installments of the study scheduled for publication later this year will advance the project more substantially.

In any event, the Forrester-Meadows research amounts to this:

Various trends affect life on earth: population growth, pollution generation, depletion of natural resources, food production and industrial output. Each of these may be expressed in mathematical terms, as may the relationships between them. A computer may be used to calculate and predict the behavior of the trends as they relate to each other.

refuting "Limits to Growth" but showing that non-catastrophic futures are as plausible.

Mr. Weiner acknowledges the standard responses of other skeptics: The world model as explained in "Limits to Growth" does not seem to account well for the economic fact that as resources become scarce their price goes up and people are motivated to find substitutes or to do without.

Nor does it properly reflect the continuing trend of technological innovation. Though the study does try to adjust some of its figures for new discoveries, Mr. Weiner contends, it does not account for the conceivably tremendous impact of technology, a factor that may be hard to guess at with any accuracy at all, but which should not therefore be ignored.

More important, though, are two other ideas. First, some economic growth need not waste resources or generate a lot of pollution. For example, increases in computer capacity or communications capacity might result in dramatic increases in economic growth with only negligible pollution or resource drain.

Second, human beings are capable of making value judgments that alter their behavior. This human factor is hard to quantify and is bound to be ignored by a computer study. But it has crucial relevance to the problem.

For it means that though the computer can only prescribe an absolute halt to growth as a remedy to the catastrophe it foresees, another approach is possible: selective growth that permits human survival and the continued functioning of economic life as it now is known, but leads eventually to less waste and pollution and perhaps ultimately to an equilibrium state.

Such an equilibrium state, though, Mr. Weiner believes and the Hudson Institute hopes to demonstrate, could involve much higher levels of affluence, population and technology than the world knows at present, much higher than would remain if humanity somehow made some drastic attempt to halt growth now.

Is a shift to such selective growth feasible? Mr. Weiner suggests it may already be under way. "We've never done business as usual for very long," he says. "Growth has never proceeded in simple-minded exponential fashion. And it's no help at all to say we have to stop growing. What we have to do is to ask how much of our growth is worthwhile to our happiness. It's already becoming clear that much of it hasn't been worth it." To be concrete, one may cite as evidence of the trend the rapid emergence of the environment as a major issue and the plunging U. S. birth rate.

To be fair, of course, one must await the actual scenarios and mathematics of the Hudson Institute before judging if their contentions are as plausible as those of the Forrester-Meadows group. But in the meantime, at least, one may reflect on the subtler point implied by Mr. Weiner's particular form of skepticism.

Growth may be suicidal, but the human race, collectively, is not, however foolishly and destructively it may behave at times. And there is a certain snobbishness to the idea that only certain visionaries, computer equipped or not, can understand what threatens us and so presumably, can claim a right to dictate remedies.

For one thing, the future is apparent in the present to a certain extent; one doesn't have to be a visionary to watch the garbage piling up in the streets, to see the waste of energy and industrial technology can waste our environment, abuse kinds of electronic technology

likelihood is great that a significant enough number of men will understand. For this reason the Times' Mr. Lewis rather crucially distorts the situation when he writes that most of today's political problems are irrelevant to the long-range danger.

For the man who is worried about winning the election this year or next year or the year after that will more and more have to worry about winning the votes of men who are more and more worried about the garbage piling up in the street, or the increasing scarcity of basic resources, or whatever.

Could such a homely wisdom actually be proof against the apocalypse? Many will remain unpersuaded, for it's true that the human awareness necessary to prove Mr. Meadows' computer wrong and Mr. Weiner right would necessarily result in some great and strange adjustments in our thought and our behavior.

But that only reflects the final, most easily overlooked point: The strange, these days, may be much more normal and predictable than the familiar.

Let those who doubt remember the first round of postwar apocalypticism, which had to do with nuclear diplomacy. The stockpiling of thermonuclear weapons, the advances in delivery systems, the widening divergence of national ideologies—all of these, we were told, made of the earth a hideously dangerous place; civilization-destroying war seemed not only possible but inevitable one day, by design, accident or the combination of both.

For surely men could not see the danger or change to reduce it. Politicians were too shortsighted; arms manufacturers too greedy; people in general too concerned with everyday affairs to worry about the huge and horribly complicated problems, the drift toward holocaust.

In the End

But in the end the strange won out. Though its costs were terrible enough, Vietnam was acknowledged as a mistake and a fiasco before it could escalate into the apocalypse. The staggering price of preparedness forced the Americans and the Russians to come together in Vienna in serious pursuit of arms limitations; President Nixon made his improbable trip to China in an effort to reduce the hideous danger over the long term.

It is true that visionaries of one sort or another called for these changes long before they occurred, but it is equally important that they were forced, in the end, by millions of people who began to feel that Vietnam was wrong, preparedness expensive and detente desirable, and often for personally compelling reasons.

A once hawkish President Nixon did not de-escalate the Vietnam war and seek arms limitation and detente because of the words of visionaries he had once passionately debated, but because of the votes of Americans worried about their draftable sons and rising taxes, and markedly unenthusiastic about superpower diplomacy. And though the visionaries may still talk, their case for nuclear apocalypse is no longer so persuasive.

Such a look to the earlier apocalypticism is not conclusive of all that much, perhaps, but it does leave one with a comforting hint: there seems to be a human tendency to ultimate common sense when the big issues of security and survival come into play; such a reality, if it is true, would make it possible real enough to trust for a while yet, and real enough, perhaps, to make all the differences

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