**A report to the club of Rome**

The club of Rome built a world model specifically to investigate five major trends of global concern – **accelerating industrialization, rapid population growth, widespread malnutrition, depletion of nonrenewable resources, and a deteriorating environment.**

**The conclusions of the report are:**

1. If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity.

2. It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future. The state of global equilibrium could be designed so that the basic material needs of each person on earth are satisfied and each person has an equal opportunity to realize his individual human potential.

If the world's people decide to strive for this second outcome rather than the first, the sooner they begin working to attain it, the greater will be their chances of success.

All five elements basic to the study reported here--population, food production, and consumption of nonrenewable natural resources--are increasing. The amount of their increase each year follows a pattern that mathematicians call exponential growth.

In this first simple world model, the interest was only in the broad behavior modes of the population-capital system. By behavior modes we mean the tendencies of the variables in the system (population or pollution, for example) to change as time progresses.

**A major purpose in constructing the world model has been to determine which, if any, of these behavior modes will be most characteristic of the world system as it reaches the limits to growth.**

**The underlying assumption were:**

* Only one general populationthat statistically reflects the average characteristics of the global population.
* Only one class of pollutants--the long-lived, globally distributed family of pollutants, such as lead, mercury, asbestos and stable pesticides and radioisotopes.
* One generalized resource that represents the combined reserves of all nonrenewable resources was plotted.
* Nuclear energy will solve the resource problems of the world.
* A reduction in pollution generation from all sources by a factor of four, starting in 1975.
* All levels in the model (population, capital, pollution, etc.) begin with 1900 values.
* The normal yield per hectare of the entire world's land can be further increased by a factor of two.
* Perfect birth control, practiced voluntarily, starting in 1975.
* Social variables-income distribution, attitudes about family size, choices among goods, services, and food-will continue to follow the same patterns they have followed throughout the world in recent history.
* Population and capital growth should be allowed to continue until they reach some "natural" limit.

The behavior mode of the system is that of overshoot and collapse. In this run the collapse occurs because of nonrenewable resource depletion. The industrial capital stock grows to a level that requires an enormous input of resources. The model is biased to allow growth to continue longer than it probably can continue in the real world.

To test the model assumption about available resources, the resource reserves in 1900 was doubled. Now industrialization can reach a higher level since resources are not so quickly depleted. The larger industrial plant releases pollution at such a rate, however, that the environmental pollution absorption mechanisms become saturated. Pollution rises very rapidly, causing an immediate increase in the death rate and a decline in food production**. At the end of the run resources are severely depleted in spite of the doubled amount initially available.**

Only if we make the initial assumption that our present way of doing things will not change, we have ample evidence of mankind's ingenuity and social flexibility. There are, of course, many likely changes in the system, some of which are already taking place. Since the recent history of a large part of human society has been so continuously successful, it is quite natural that many people expect technological breakthrough to go on raising physical ceilings indefinitely.

This entire means we are utilizing a technological policy in every sector of the world model to circumvent in some way the various limits to growth**. The result is still an end to growth before the year 2100 because of three simultaneous crises, overuse of land leads to erosion and food production drops. Resources are severely depleted by a prosperous world. Pollution rises, drops, and then rises again dramatically, causing a further decrease in food production and a sudden rise in the death rate. The application of technological solutions alone has prolonged the period of population and industrial growth, but it has not removed the ultimate limits to that growth.**

The report firmly believes “**faith in technology as the ultimate solution to all problems**”. Perhaps the best summary of the report is the motto of the Sierra Club: "Not blind opposition to progress, but opposition to blind progress".

The report hopes that society will receive each technological advance by establishing the answers to three questions before the technology is widely adopted. The questions are:

* What will be the side-effects, both physical and social, if this development is introduced on a large scale?
* What social changes will be necessary before this development can be implemented properly, and how long will it take to achieve them?
* If the development is fully successful and removes some natural limits to growth, what limit will the growing system meet next? Will society prefer its pressures to the ones this development is designed to remove?

**This report is searching for a model that represents a world system that is:**

**1. Sustainable without sudden and uncontrollable collapse; and**

**2. capable of satisfying the basic material requirements of its entire people.**

By choosing a fairly long time horizon for its existence, and a long average lifetime as a desirable goal, following minimum set of requirements for the state of global equilibrium have been arrived at:

1. The capital plant and the population are constant in size. The birth rate equals the death rate and the capital investment rate equals the depreciation rate.

2. All input and output rates--birth, death, investment, and depreciation--are kept to a minimum.

3. The levels of capital and population and the ratio of the two are set in accordance with the values of the society. They may be deliberately revised and slowly adjusted as the advance of technology creates new options.

An equilibrium defined in this way does not mean stagnation. Within the first two guidelines above, corporations could expand or fail, local populations could increase or decrease income could become more or less evenly distributed. Technological advance would permit the services provided by a constant stock of capital to increase slowly. Within the third guideline, any country could change its average standard of living by altering the balance between its population and its capital. Furthermore, a society could adjust to changing internal or external factors by raising or lowering the population or capital stocks, or both, slowly and in a controlled fashion, with a predetermined goal in mind. The three points above define a dynamic equilibrium, which need not and probably would not "freeze" the world into the population.

The report ends on a note of urgency. The report has repeatedly emphasized the importance of the natural delays in the population-capital system of the world. These delays mean the country's population would continue to grow until the year 2060. During that time the population would grow from 3.5 billion to 10 billion. We cannot say with certainty how much longer mankind can postpone initiating deliberate control of its growth before it will have lost the chance for control. We suspect on the basis of present knowledge of the physical constraints of the planet that the growth phase cannot continue for another one hundred years. Again, because of the delays in the system, if the global society waits until those constraints are unmistakably apparent, it will have waited too long. If there is cause for deep concern, there is also cause for hope.