# 13 The Great Climacteric, 1798–2048: The Transition to a Just and Sustainable Human Environment

Ian Burton and Robert W. Kates

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## Toward The New Global Equilibrium

Bliss was it in that dawn to be alive,
But to be young was very heaven.
Wordsworth

In almost all the topical areas covered by previous chapters in this book there has been discussion of the "crisis." Certainly the "energy crisis" was a prominent feature of discussions about man, resources, and environment in the 1970s. Gilbert White himself wrote a paper titled "The Meaning of the Environmental Crisis" (see vol. I, selection 19). The notion of crisis has become fashionable.

These so-called crises and no doubt others that we have yet to learn about are not isolated phenomena. They are part of a broader pattern that is more accurately described as a climacteric (Ashby 1978). A crisis is a situation that will pass and that can be overcome by dint of special efforts or short-lived sacrifice or deprivation. A climacteric, in contrast, is "a critical period in human life" and "a period supposed to be specially liable to change in health or fortune" (*Oxford English Dictionary*). The term is normally applied to the individual; but as applied to population, resources, and environment throughout the world it aptly captures the idea of a period that is critical and where serious change for the worse may occur. It is a time of unusual danger.

Ian Burton is professor of geography and former director of the Institute for Environmental Studies, University of Toronto, and vice-chairman of the International Federation of Institutes for Advanced Study. Robert W. Kates is professor of geography and Research Professor at Clark University and holds a MacArthur Prize fellowship. Burton and Kates, who have published widely, are coauthors, with Gilbert F. White, of *The Environment as Hazard* (1978) and coeditors of *Readings in Resources Management and Conservation* (1965).

Viewed from a global and historical perspective, the period of the present climacteric extends from the early days of the industrial revolution to the middle of the twenty-first century, when the world order will proably have reached a more stable and tranquil period if it has not collapsed in the meantime. The world is now in the climax period of this great climacteric. As this fact becomes widely known and accepted, it generates excitement, especially among the young. But, like the French Revolution, with which the romantic poet Wordsworth identified, it can lead to revulsion at a subsequent reign of terror.

The succession of so-called crises certainly brings danger and the fear of repression or, at the worst, global conflict. It is also a period of challenge and an invitation to both intellectual effort and action. Gilbert White's urgings to attempt an understanding of the global issues of our times and to act accordingly within one's own sphere of life are more pressing in the last decades of the present century than at any time during the great climacteric.

The two major variables that frame the ecology of any species are its numbers and its niche. No less in human ecology, it is population size and dynamics in relation to the determinants of the human niche (resources, environment, science, and technology) that constitute the main concerns of researchers, whether they pretend to ethical neutrality or not (Harvey 1974).

Understanding of these fundamental relationships of human ecology always seems to retreat just beyond our grasp. Even forecasting changes in a relatively short time period is notoriously difficult. Whatever happens in science and technology, however, seems unlikely to alter a growing perception that world population growth will level out to some sort of plateau by the middle of the next century or not long thereafter.

No doubt many arguments will continue to be advanced as explanations for this prospect of population stability. But the question that commanded so much attention at the Bucharest population conference in 1974 appears now to have an encouraging answer. The question was, Can effective fertility control policies be established in advance of general economic improvement? In countries culturally receptive, undergoing development, and with strong population control activity, major reductions in fertility have been experienced. Even without economic development, strong policies could lead to reduction in fertility, albeit at a slower rate, particularly in receptive cultures. Thus, if population stability is achieved, it will come more from collective will than by the blind operation of natural forces of



population dynamics. Population will be stabilized because we will it to happen.

The starting point for the recognition of the goal and the growth of the worldwide political will was the publication of Malthus's first *Essay* in 1798. For us this is the symbolic starting point of the period of the climacteric. An even 250 years takes us to 2048, close to the midpoint of the next century.

Optimism over the adequacy of the natural resources base comfortably to sustain human life and society has shifted sharply in the years following the Second World War. As students of Gilbert White, we were both witnesses to, and participants in, the profound changes in thinking that were taking place. In the late 1950s when we began graduate work, the first turning point could be observed away from immediate postwar concerns about the adequacy of the resource base toward a series of professional appraisals and accompanying theory that was redirecting attention to environmental quality rather than resource quantity. Initially, amenity and recreational resources subject to degradation by an expanding urbanized society were a focus of concern; later, attention centered on the quality of an environment subject to pollution and destruction by an industrialized economy.

Writing in 1964, still in the midst of the transition, we found that our mentors and peers ranged between two poles: "In its extreme form, one pole is determinist in its view of nature, Malthusian in its concern with the adequacy of resources, and conservationist in its prescription for policy. The opposite pole is possibilist in its attitude toward nature, optimistic in its view of technological advance and the sufficiency of resources and generally concerned with technical and managerial problems of development" (Burton and Kates 1965, p. 2).

To document these poles, we listed some of the "best-known 'neo-Malthusian' works on the scarcity of resources and growing population written in polemical style": Brown, *The Challenge of Man's Future* (1954); Osborn, *Our Plundered Planet* (1948) and *The Limits of the Earth* (1953); and Vogt, *The Road to Survival* (1948) and *People: Challenge to Survival* (1960). Little known today, they seemed to us in Rosenwald Hall at the University of Chicago as Carson, Commoner, Ehrlich, Hardin, and Meadows would appear to another generation, two decades later.

In contrast, we cited the recent findings of three major studies prepared by Resources for the Future which we had reviewed under the title of "Slaying the Malthusian Dragon" (Burton and Kates 1964). These influential studies (Potter and Christy 1962; Barnett

and Morse 1963; Landsberg, Fischman, and Fisher 1963) concluded that "technology can overcome increasing shortages of natural resources ad infinitum" (Potter and Christy 1962).

More recently we have seen still another shift in the balance of influence between the poles. The question of the adequacy of material resources for developed economies has given way to deep-seated fears for the environment in the industrialized world, for food adequacy in the developing world, and, finally, for the global biosphere and its basic systems of life support. Limits to growth (Meadows 1974) and the steady-state economy (Daly 1973) again became fashionable intellectual concepts.

These shifting tides of optimism and despair may be inherent in human nature or perhaps merely in social scientists (Luten 1980). Tiger (1979) argues that optimism is a distinctly human quality and the key to our survival and evolutionary success. The idea of progress is deeply rooted (Lovejoy and Boas 1935; Van Doren 1967; Nisbet 1980); yet a pessimism that focuses on golden ages past and sees a better time in a simpler, more "natural" world is as old as Hesiod. Thus, our professional oscillations between the neo-Malthusian poles may reflect these deeper currents of human behavior and cognition. But their modern expression must surely begin with Robert Malthus.

## The Principle of Population: Dragon or Dilemma?

Robert Malthus begins with biological verities: hunger and sex and the ability to satisfy the latter with greater ease than the former. The discrepancy would inevitably lead to a more rapid growth in numbers of persons than in the means of subsistence, sex still being linked to reproduction. Numbers increasing geometrically and subsistence arithmetically cannot continue unchecked. "Positive checks" in the form of vice or misery recurrently reduce population, and (in later revisions of the essay) "preventive checks," primarily delayed marriage, slow the growth of population.

It is not obvious what the sources of inspiration were for Malthus. The literature on his life and times has been enriched by two new major studies (Petersen 1979; James, 1979) but these contain no clear-cut answer. Malthus published his *Essay on the Principle of Population* (1798) anonymously, at age thirty-two while serving as curate at a small country chapel in Oakwood. James called the decade preceding 1798 the fallow period in his life. His only previous written work was never published.



He had been born in a remarkable century, in which England and Wales almost doubled in population from 4–5 million to 9–10 million. But, until the first census of 1801, knowledge of the event was lacking, and a major dispute on the "political arithmetic" of Britain raged in intellectual circles, with strong voices expressing belief in the depopulation of Britain at precisely the time its population was doubling.

At Oakwood, a steady stream of baptisms may have heralded this change in numbers, and the realities of hunger were always known, even to the sheltered parsons of the "higher ranks" of society. Adam Smith, the most powerful intellectual influence on Malthus, wrote that

> in some places one-half the children born die before they are four years of age; in many places, before they are seven; and in almost all places before they are nine or ten. . . . Every species of animals naturally multiplies in proportion to the means of their subsistence, and no species can ever multiply beyond it. But in a civilized society it is only among the inferior ranks of people that the scantiness of subsistence can set limits to the further multiplication of the human species and it can do so in no other way than by destroying a great part of the children which their fruitful marriages produce. (Quoted in Petersen 1979, p. 40)

The "provocation" for the *Essay* itself, of course, was the utopian visions of perfection of Condorcet and Godwin, which Malthus felt called upon to refute by the hard arithmetic of the principle of population.

## Malthusian Forecasts

As Petersen (1979) labors to demonstrate, Malthus was an inspired scientific observer. He constantly collected new data, revised his statement of theory in the course of examining them, and allowed for feedback mechanisms that would serve to dampen the tendencies he forecast; a life of vice and misery for the lower classes pressing against the levels of available subsistence. But in the final analysis, in England and Wales, where he eagerly joined the debate on the poor laws, and in Europe, where he both studied and traveled, Malthus was wrong.

Only seventeen years after the *Essay* was first published, a great natural experiment occurred that stressed the subsistence system of both North America and Europe, providing an effective test of Malthusian theory. The test took place in the form of a major diminution of food supplies accompanied by price rises in the wake of widespread crop failure. The great volcanic eruption of Mount Tomboro in Indonesia in 1815 had resulted in a dust cloud and temperature drop. Carried by the prevailing westerlies, the dust led to two successive years of cold, wet growing seasons, beginning with the "year without summer" in 1816. Like all major natural calamities it was further aggravated by a major and painful economic readjustment following the conclusion of the Napoleonic wars. Widespread suffering ensued (as Post 1977 has documented), but unlike earlier famines of the eighteenth century it did not entail significant mortality, except on the outer marches of the Western world—Ireland and Transylvania—whose people were viewed by the powers that were as beyond the pale. Instead, for the first time, massive efforts at relief took place, moving food from the grain bins of Russia and the Baltic states to Britain, France, the Netherlands, and Germany. There was widespread suffering but little death (the great positive check) even under great stress, meriting Post's accurate label (1977), the "last great subsistence crisis of the Western world."

Thus, the ink had scarcely dried when the forecast faltered. It would take another half-century to extend food security to Ireland and Transylvania; and, in the meantime, conditions gave birth to Marxism. And it would take another twenty years in Britain and parts of Europe to reach a steady-state population. Twenty-seven countries currently have a rate of reproduction equal to or below that required to reproduce their population. But the process was underway before 1798 in France and well underway elsewhere even as Malthus wrote and rewrote, argued with Ricardo, and inspired Darwin.

Malthus overestimated the rate of population increase: in 1798 it was thought to be 3 percent; it dropped steadily from that time. He underestimated the resource base; he thought it consisted basically of undifferentiated agricultural land located where the population lived. Later, agricultural land was to become a small part of natural resource requirements, and its productivity was to have major additives in the form of machinery, cultivation techniques, fertilizer, improved seeds, herbicides, and pesticides. The agricultural base would expand to all corners of the world through trade and transport.



Technological progress was grossly underestimated, as well as the ability to undertake corrective or ameliorative action.

## The Dragon's Teeth

Nonetheless, Malthus's theory still is influential, despite all our attempts to slay the Malthusian dragon. Despite repeated refutation, both of its theory and observation, the *Essay on Population* arises anew in fresh guise in each successive generation. A sequence is sketched in figure 13.1. Changes in the numerator (resources) are matched by changes in the denominator (population).

In 1798, the numerator of the Malthusian equation was food and agricultural land, not because Malthus was ignorant of other natural resource needs but because food requirements so dominated other needs (Barnett and Morse 1963). But by the 1850s. food requirements were expanded to include other energy and material resources, marked by the classic volume of Jevons (1906) on coal. Food, how-

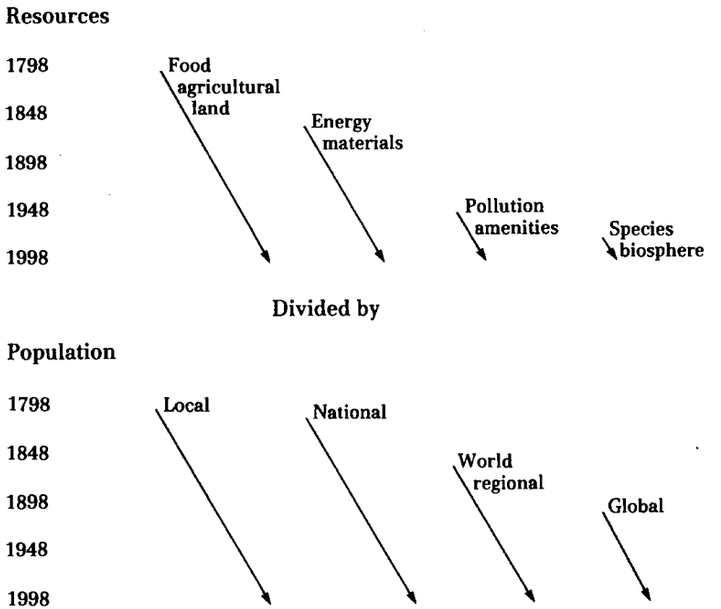



**Figure 13.1** Expanding the Malthusian equation: resources divided by population.

ever, did not disappear from Malthusian concerns; it persisted on a wider scale (along the diagonal of increasing scale shown in figure 13.1). In the United States, the plea of the American Association for the Advancement of Science (1890) for forest conservation marks the nineteenth-century stage in the evolution of neo-Malthusian thought in the United States, which develops through both the first and second conservation movements.

The postwar United States reached a new turning point with the report of the President's Materials Policy Commission (1952), discounting fears as to resource scarcity and laying the groundwork for a new definition of the Malthusian numerator involving amenity resources and the pollution-absorbing capacity of the environment. The Stockholm Conference on the Environment in 1972 enlarged these concerns to a global scale, with a resulting concern with the biosphere and the basic life support system of biogeochemical cycles. The latest extension is the current concern with extinction (Myers 1979; Ehrlich and Ehrlich 1981) and predictions of massive species destruction over the next several decades.

Each of the earlier definitions persists. Concern with food adequacy gets new life in the context of the high population growth rates of the developing world, and concern with the adequacy of energy and material resources is revived by increases in the 1970s in some commodity prices and the recognition of the limitations of oil reserves.

Like the earlier Malthusian predictions, the neo-Malthusian predictions also fail. A classical case is the predictions about coal made by Jevons (1906). An extrapolation from the time Jevon's book was written is shown in figure 13.2 together with the actual course of British coal production. This pattern is analagous to the figure published in the *Global 2000 Report* (Council on Environmental Quality 1980), which comprises an extrapolation of 1950–75 oil production with King Hubbert's projection of U.S. oil production.

Reflecting on the "slain dragon" of the 1950s and 1960s brings to mind the myths of the dragon's teeth, which, when sown, give forth men armed to engage each other in combat at the drop of a stone. The persistence of Malthusian food and population issues along with the continuing redefinition of the resource numerator in the equation arises primarily from the extraordinary character of our times. For within the short span of memory of our grandparents and great-grandparents, humankind has become engaged in one of the three great transitions.



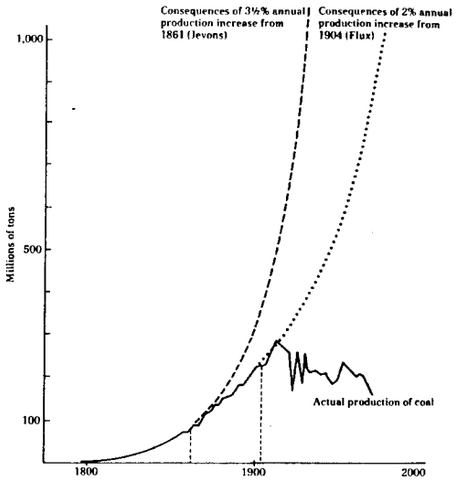



**Figure 13.2** Graphs plotted by Jevons and Flux to illustrate the implications of sustained growth in coal consumption, superimposed on a graph showing actual consumption of coal in Britain (compiled from the frontispiece to Jevons 1906 and incorporating more recent statistics).

## The New Global Equilibrium

In an insightful analysis, Edwin Deevey changed our perception of population problems, Writing in 1960 he noted: "The commonly accepted picture of the growth of the population out of the long past takes the form of the graph [in figure 13.3]. Two things are wrong with this picture. In the first place the basis of the estimates, back of about A.D. 1650, is rarely stated. One suspects that writers have been copying each other's guesses. The second defect is that the scales of the graph have been chosen so as to make the first defect seem unimportant. The missile has left the pad and is heading out of sight" (1960, p. 11).

Deevey collected available estimates of population over a longer period and then compiled figure 13.4 on a logarithmic scale, explaining that:

> The stepwise evolution of population size, entirely concealed with arithmetic scales, is the most noticeable feature of this diagram. For most of the million-year period, the number of hominids, including man, was about what would

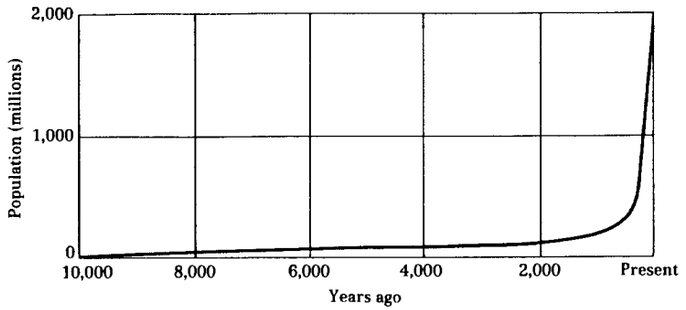



**Figure 13.3** Arithmetic population curve plots the growth of human population from 10,000 years ago to the present. Such a curve suggests that the population figure remained close to the base line for an indefinite period from the remote past to about 500 years ago, and that it has surged abruptly during the last 500 years as a result of the scientific-industrial revolution. (From Deevey 1960.)

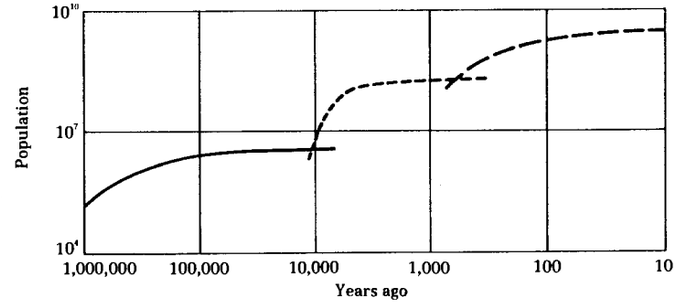



**Figure 13.4** Logarithmic population curve makes it possible to plot, in a small space, the growth of population over a longer period of time and over a wider range (from $10^4$, or 10,000 to $10^{10}$, or 10 billion, persons). Curve, based on assumptions concerning relationship of technology and population as shown in figure 13.2, reveals three population surges reflecting tool making or cultural revolution (solid line), agricultural revolution (short dash) and scientific-industrial revolution (long dash). (From Deevey 1960.)

be expected of any large Pleistocene mammal—scarcer than horses, say, but commoner than elephants. Intellectual superiority was simply a successful adaptation, like longer legs; essential to stay in the running, of course, but making man at best the first among equals. Then the food-gatherers and hunters became plowmen and herdsmen, and the population was boosted by about sixteen times, between 10,000 and 6,000 years ago. The scientific-industrial revolution, beginning some 300 years ago, has spread its effects much



faster, but it has not yet taken the number as far above the earlier baseline. The long-term population equilibrium implied by such baselines suggests something else. Some kind of restraint kept the number fairly stable (1960, p. 13).

Deevey's insight seems further substantiated twenty years later. Significant downturns in population rates have been recorded in many developing countries, giving rise to an optimistic prediction of a steady-state world by the middle of the next century.

## The World in 2048: The Consequences of Stability

If industrial civilization survives to 2048 without major collapse—and we expect that it will—what will be the character of the world? This question is another way of asking what we must do to make our way successfully through the great climacteric.

Five characteristics of that world seem inescapable. First, a major successful effort to reduce the nuclear arms of superpowers and other powers and to limit their proliferation will have been made. We anticipate at least partial success in limiting the share of gross world product spent on armaments. Whether such a shift will come only as a result of a nuclear exchange short of full-scale war is an open question. We are not optimistic that all use of nuclear weapons can be prevented before the world comes to its senses.

Second, the global population will have begun to level off. The rate of increase will have slowed down over large areas of the world to that prevailing in the most stable (in population terms) countries of today.

Third, the wealth of nations must be much more equal than today. A pattern analogous to the distribution of wealth among people in today's more egalitarian states such as Sweden or Britain seems possible and indeed essential. This would mean a very few wealthy states (perhaps fortuitously well endowed with a natural resource in high demand), a small number of very poor states (those to achieve population stability last), and a very large "middle class" of nations.

Fourth, a much greater degree of social discipline and control will exist, especially in those states where it is now lacking. These are of two types—developing countries where the apparatus of state bureaucracy is not yet fully established, and the wealthier industrial nations of today that are attempting to combine a high degree of

social discipline in some areas while preserving a high degree of freedom of choice in others.

To much conventional Western thinking, the more disciplined and bureaucratically controlled society of the future sounds like a society without freedom where the choices of individuals and organizations will be everywhere constrained. This is instead a challenge of the new society of 2048: to find ways of management that ensure the necessary control while preserving the individual sense of freedom and avoiding a fatal overweight of bureaucracy.

Fifth, there will be a new relationship with the environment, in which decisions are guided by a concern for the long-term viability of the biosphere and including a recognized set of "rights" for the natural environment, especially other living organisms.

In our view, these five essential characteristics of the world of 2048 are attainable and will be attained. It is beyond our courage to attempt any description of the pattern of events that might lead to their achievement. (What will probably be crucial is the interaction between nuclear weapons, population, distribution of wealth, the discipline of society, and the biosphere.) Instead, we limit our speculations to the nexus of population change and land resources as expressed in population densities. The actual level of population that the world will have to cope with ranges according to current estimates from 8 billion to 11 billion.

Three independent forecasts of population are in general agreement that the world population will level off, or be seen to be leveling off, by the middle of the next century (figure 13.5). This is perhaps an agreement on assumptions rather than the product of convergence in "scientific forecasting." The forecasts are as follows: 8.1 billion in 2048 (Bogue and Tsui), 9.8 billion in 2090 (World Bank), and 11.0 billion in 2130 (UN). Important consequences of this leveling off are to be seen in the changed distribution of the size of nations and the people-land ratios.

## The Balance of Demographic Power

The Population Reference Bureau estimates for mid-1980 list sixteen countries with a population in excess of 50 million. These are listed in rank order in table 13.1, together with estimated density per square mile. The population densities of these countries exhibit a wide range, from lows of 37 and 40 in Brazil and the Soviet Union to a high of 1,630 in Bangladesh. This ordering of demographic power is



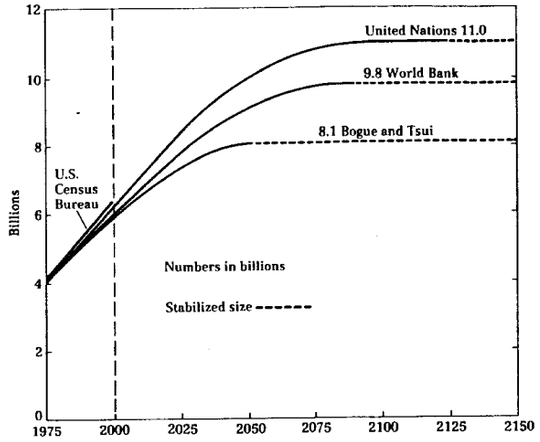



**Figure 13.5** *Population projections.* Sources: U.S. Bureau of the Census, *Illustrative Projections of World Populations to the 21st Century,* Current Population Reports, Special Studies Series, P. 23 no. 79, January 1979. United Nations, *Prospects of Population Methodology and Assumptions,* Population Studies no. 67 (New York 1979). World Bank—K.C. Zachariah and My Thi Vu, *Population Projections, 1975, and Long-Term (Stationary Population)* (World Bank, July 1979), unpublished tables. Donald J. Bogue and Amy Ong Tsui, Community and Family Study Center, University of Chicago, "Zero World Population Growth," *The Public Interest,* Spring 1979, pp. 99–113.

Note: The U.S. Census Bureau has not published projections beyond 2000. The World Bank publishes only one series. The other projections shown are medium series (between high and low variants).

in the course of major change. In table 13.2 we compare population on a continental basis for 1800 and 1980 with the "ultimate" population. This latter figure is based on calculations made by the Population Reference Bureau. The "ultimate size" is that level of population at which growth will have virtually ceased, regardless of the date at which this will be. On the basis of the data in table 13.2 we have drawn figure 13.6.

In Malthus's time there were fewer than a billion people alive, 90 percent of them in Europe and Asia. Today there are well over 4 billion, of whom only 75 percent are found in Europe and Asia; and in the ultimate world of perhaps 10 billion, only 65 percent will be in Europe and Asia. In 1800, 1 in 5 humans were Europeans, 1 in 14 Africans; in the ultimate population the proportions will be reversed.

This ultimate population size leads to some remarkable changes in ranking. Without a doubt the most dramatic is that of Nigeria,

**Table 13.1** Countries with populations of more than 50 million in 1980

| Rank | Country | Total population (millions) | Density per square mile | Rank order for ultimate size |
|---|---|---|---|---|
| 1 | China | 975.0 | 263 | 2 |
| 2 | India | 646.2 | 509 | 1 |
| 3 | Soviet Union | 226.0 | 40 | 4 |
| 4 | United States | 222.5 | 62 | 9 |
| 5 | Indonesia | 144.3 | 196 | 5 |
| 6 | Brazil | 122.0 | 37 | 6 |
| 7 | Japan | 116.8 | 813 | 13 |
| 8 | Bangladesh | 90.6 | 1630 | 8 |
| 9 | Pakistan | 86.5 | 279 | 7 |
| 10 | Nigeria | 77.1 | 216 | 3 |
| 11 | Mexico | 68.2 | 89 | 10 |
| 12 | West Germany | 61.1 | 636 | 30 |
| 13 | Italy | 57.2 | 492 | 29 |
| 14 | United Kingdom | 55.8 | 592 | 32 |
| 15 | France | 53.6 | 254 | 31 |
| 16 | Vietnam | 53.3 | 419 | 11 |

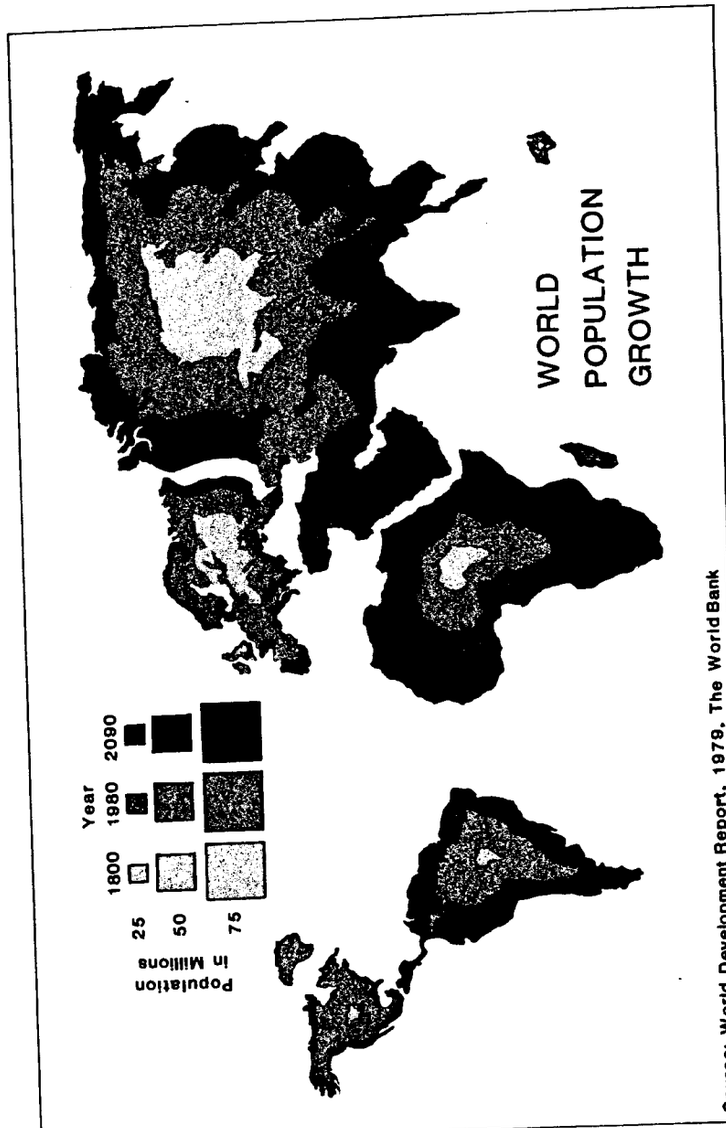
*Source:* Population Reference Bureau (1980).

**Table 13.2** Changing world population (in millions)

| | 1800 | | 1980 | | Ultimate | |
|---|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | Number | Percentage |
| Africa | 70 | 7.8 | 472 | 10.7 | 2,051 | 20.9 |
| America North | 6 | 0.7 | 247 | 5.6 | 296 | 3.0 |
| Middle and South | 18 | 2.0 | 360 | 8.1 | 955 | 9.7 |
| Asia | 625 | 69.3 | 2,663 | 60.3 | 5,743 | 58.4 |
| Europe | 180 | 20.0 | 650 | 14.7 | 750 | 7.6 |
| Oceania | 2 | 00.1 | 23 | 00.5 | 37 | 0.3 |
| Total | 901 | 100.0 | 4,415 | 94.9 | 9,832 | 99.0 |

*Sources:* 1800, C. McEvedy and Richard Jones, *Atlas of World Population History* (Harmondsworth, U.K., 1978); 1980 and Ultimate, Population Reference Bureau, 1980 World Population Data (Soviet Union population distributed between Asia and Europe, 1980: 100/166, ultimate: 170/190).

from a 1980 population of 77 million and a rank of tenth largest nation to an ultimate count of 434 million and a rank of third, well over the population of the Soviet Union, though only a quarter the size of the population of India and China (see table 13.1).




Source: World Development Report, 1979, The World Bank

**Figure 13.6** Changing world population.

The rise of Nigeria to the status of world (population) superpower is part of a trend perceptible throughout much of Africa. As table 13.2 makes clear, the climacteric involves major changes in the world population balance between countries.

## Man-Land Ratios

The comparison of population density is more striking than that of total population. Peak densities occur in a few small city-states and islands. The city-states are typically supported by heavy trading activities and local manufacturing. The cases of two small islands, Malta and Barbados, are interesting because on a very limited land area (122 square miles for Malta, 166 for Barbados) both have managed to obtain a relatively high level of development although both are considered very densely populated and approach their limits of carrying capacity. Clearly this is not necessarily the case if they can achieve the kind of economic development experienced in Singapore, for example.

The most desperate case of people-land ratio is Bangladesh. Even now it has almost double the density of Belgium (1,630 to 840 persons per square mile) while being five times the size of Belgium in area (55,000 to 11,000 square miles). The ultimate density forecast for Bangladesh of over 6,000 p.p.s.m. seems by any of today's standards absolutely unsupportable by any form of agricultural economy. There is no other large country that in terms of people-land ratio anywhere nearly approaches the severity of Bangladesh.

Other world leaders in population size all have much more land per capita. Even though this neglects any consideration of quality of land, an ultimate population density for Nigeria of 1,189 p.p.s.m. is less than that of Taiwan for today. Similarly, even India with a forecast ultimate density of 1,294 p.p.s.m. would be only slightly more densely populated than Taiwan today and less than Bangladesh today. Both these giants of the future, Nigeria and India (judged by population size), will have ultimate population densities less than the density that exists today in Bahrein, Barbados, and Malta.

While a national population total of 1.6 billion (India) or 434 million (Nigeria) appears intolerable by some criteria, there are examples elsewhere, albeit on a smaller scale, of the implied densities managing to survive and to prosper reasonably well.



## Middle-Class Status

What are the constraints likely to be on such countries as India and Nigeria in the next seventy years as they seek to negotiate the great climacteric? For if India and Nigeria can do it, and emerge as middle-class countries by 2048, then there can be little doubt that many other countries will have been able to do likewise.

There appear to be two major routes to middle-class status for such countries. They can accumulate capital wealth by the sale of some fortuitously possessed natural resources that command a high price on international markets. This was the case with petroleum in the 1970s, and Nigeria had an opportunity to accumulate capital to support its needed development program. Much the same possibility opened up for Mexico (ultimate population 203 million; ultimate density 267 p.p.s.m.) and Venezuela (40 million; 114).

It may well be that other countries will be helped by the discovery of a rich resource endowment that can be sold profitably and thus power the development process. Of course, such countries have to face the problem that their resources will not last indefinitely, that even badly needed commodities such as oil cannot indefinitely sustain high prices, and that they can provide only a breathing space in which the necessary industrial infrastructure will be constructed and trained manpower can be built up to earn its livelihood in the world without a rich resource endowment.

But what of the countries that lack such an endowment in the first place? How will they achieve "operation bootstrap"? The economic miracle of Japan shows that it can be done. To go from a virtually feudal society to a leading industrial power in a period of about a hundred years is a spectacular achievement. As recently as the 1930s few in Japan or elsewhere believed that such a thing could be achieved without territorial expansion and the control of additional resources (e.g. Manchuria). Nevertheless, Japan today contemplates a future with an ultimate population of 133 million and an ultimate density of 928 p.p.s.m.—no great increase on today's density of 813 p.p.s.m. and less than South Korea has now.

Japan is not an isolated case. Similar transformations are taking place in South Korea and Taiwan, and the countries of the Association of South-East Asian Nations (ASEAN) promise to follow the same path.

There is a major difference between these two paths, however. The path of resource windfall is likely to become more available as

world demand for natural resources increases. Where these windfalls will occur is not easy to forecast, however, and there is no guarantee that they will fall according to need. Some countries with very small populations happen to have enormous oil reserves. Britain, a country that for many decades thought of itself as resource-poor and had to rely on manufacturing and trade, has now dramatically become resource-rich again with the discovery of North Sea oil.

Although resource windfalls are likely to become more available, they do not add greatly to the total of global wealth. The ability to fuel development through high-export revenues from the sale of natural resource commodities will be more a means of redistributing wealth than increasing the total. Competition for resources therefore promises to become more of a zero-sum game in which there will be winners and losers.

The route of indigenous industrialization (Japan, South Korea, Taiwan, etc.) is likely to become more difficult. However, this development may increase total global wealth if it does not occur simply at the expense of exporting industrial nations.

### Migration

Along with national development, greater individual movement is likely to occur. Major movements of people will take place, reproducing the migrations already taking place within Europe and North America. It is safe to predict massive African outmigration, with Africans occupying the migrant-worker status of Hispanics in North America and southern Europeans in Europe.

Such massive movement, which will persist despite constant efforts to limit immigration and to control so-called guest workers, will bring fresh energy and new culture to the older industrialized societies as well as the old and painful issues of power, exploitation, and racism to most of the wealthy world. If the currently estimated flows of legal and illegal immigrants increase by only a third or a half, one recent projection foresees an absolute majority of Asians, blacks, and Hispanics in the United States by 2048 (Davis 1982).

### A Global Plan?

Any global plan for development should therefore recognize that help to the underdeveloped to industrialize is likely to be beneficial to all. What are the prospects of the adoption of a global development plan by 2048? Is some sort of planning necessary for the great climacteric?



We are convinced that it is. To some extent this is already happening and will continue to do so. We neither propose nor expect to see mandatory planning at the global level. What we do foresee is a gradual emergence of a global consensus that will lead nations voluntarily to adopt policies conducive to a pattern of development that allows all a share in the process. The power and vested self-interest of nation-states is strong and appears likely to remain so. However, the ship of national sovereignty is leaking, and recognition of the interdependence of the global system will produce actions to preserve the stability of the world.

Stability may come about in two ways. First, the growth of shared perceptions of the global predicament will lead nations to policies that coincide with the interests of the whole. Just as world population is being stabilized by a shared consciousness and not by a world population plan, so too the issue of equity will be addressed via enlightened self-interest rather than global planning. We will not be surprised if the system hovers perilously close to the brink of collapse. The requisite steps are not likely to be taken until perceived as an urgent necessity. No doubt the negotiations will be long and difficult, with the outcome seeming constantly in doubt, as demonstrated in the Law of the Sea conference.

One great opportunity probably lies in an international and global agreement on the future of Antarctica. Despite some long-established imperial claims to sovereignty, there is a strong moral case to be made for recognizing Antarctica as part of "the common heritage of mankind" and using the benefits of its potential accordingly.

Beyond enlightened self-interest and the concerted action that occurs as a result of increase in shared perceptions is the second way—response to crisis. In developing ideas on how to make the transition to a more just and sustainable human environment, we see no reason to expect change in the traditional crisis-response pattern of international decision making. A question to be asked about the recent series of "crises" therefore is: To what extent have they helped or hindered in making the transition through the great climacteric? The energy crisis of the 1970s undoubtedly helped to stimulate research and development on alternative energy sources, including wind and solar energy. It also spurred more vigorous steps at energy conservation. It is difficult to view these developments as anything but highly desirable, and we hope that the effort will be maintained as the immediate crisis passes by.

As the energy crisis fades (for the time being) due to the combination of increased supply and lowered demand (both from conservation and the economic crisis), it is the sluggish economies of East and West, North and South that command attention. Their plight will be acute if the current universal downturn ushers in the decades-long decline of a Kondratiev long-wave (Freeman, Clarke, and Soete 1982). Ironically, enlightened self-interest may well call forth new North-South monetary agreements and financial interdependence. With the powerful banking interests in danger of collapse, the ensuing sense of interdependence may lead to a new economic order that shifts the balance of resource exchanges somewhat more in favor of the developing nations of the world.

In other areas a sense of crisis is more difficult to establish. One response of the international community has been to establish specially recognized decades or to develop action plans, as seen, for example, in the United Nations Drinking Water Decade and UNEP Action Plan on Desertification. Where queues at the gas station or other dramatic events are not present to drive the message home, then crises have to be engineered and made dramatically visible in other ways.

This type of thinking has led to a sequence of forecasting or predictive studies including the well-known *Limits to Growth* (Meadows 1974) and, more recently, *Global 2000* (Council on Environmental Quality 1980). Such documents have been useful in alerting governments and people to the possible consequences of inaction. Their essential message is: If you don't act, this will happen. The time seems ripe to change the form of the message. The international community can and should begin to formulate goals of where we wish and expect the world to be at the end of a series of future plan periods, and to develop ways of getting there. The essential message would become: Here are some goals or targets, and this is the action required to accomplish them.

## Epilogue

A concern for future food supplies, resources, and environment in relation to human needs inevitably has a strong materialist flavor. Without in any way diminishing the importance of meeting the basic needs of the human family, and successfully negotiating the great climacteric in material terms, we believe that those goals cannot be achieved without a corresponding growth in the human spirit.



Throughout his life and work, Gilbert White has devoted much energy to enlarging the human spirit. Although his works deal mainly with the material needs of man, his creed has never been a materialistic one. Making the transition through the great climacteric will change human beings and human society. The more stable and tranquil period that we dimly foresee will provide new opportunities for the human species to grow and fulfill its nonmaterial potential. It may well again be bliss in that dawn to be alive, but it will not be paradise on earth.

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