On Human Population, Global Nuclear War and the Survival of Planet Earth

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I. Introduction and Summary

This article discusses the likelihood of global nuclear war and how it relates to the human population problem. The thesis of the article is that the likelihood of global nuclear war is increasing dramatically because of human population growth.

Section II summarizes the current state of the world, and Section III assesses what will happen if present trends continue (in the absence of global nuclear war). Section IV examines the capabilities and limitations of global nuclear war with respect to stopping the human destruction of the biosphere. Section V discusses the likelihood of global nuclear war, and Section VI addresses approaches for coping with this situation. Section VII discusses the issue of an "optimal" human population size for Earth's biosphere and for mankind.

This article synopsizes the book, Can America Survive? (Reference 1), an on-line version of which is available at the Internet web site http://www.foundationwebsite.org/. That book contains detailed discussion of the concepts discussed here, and an extensive bibliography. The primary data source for the points made in this article is the World Bank's World Development Indicators CD-ROM. Other data sources are cited in Can America Survive?

II. The State of the World

The state of the world is disastrous. The planet is currently experiencing the greatest mass extinction of species since the time of the dinosaurs, 65 million years ago, and it is being caused solely by mankind's massive numbers and industrial activity. Most of the species extinction is being caused by rampant destruction of forests and wildlife habitat. In other cases, species are being deliberately singled out for destruction, as in the case of rhinoceros horn (for Yemeni dagger handles), or tigers (for Chinese medicine), or whales (for Japanese whale-meat shops).

Industrial gasses are poisoning the atmosphere to such an extent that the ozone layer that protects all biological life from extreme radiation is being destroyed. These gasses are contributing to global warming. Signs of global warming are dramatic and ubiquitous; see the web site http://www.climatehotmap.org for a description of the global-warming picture. Mankind's large numbers and industrial activity are causing such great changes to the atmosphere that it is conceivable that all life on the planet's surface could be extinguished in a relatively short time.

Apart from the possibility that present human numbers and activity risk catastrophic destruction of the planet's biosphere, the human species is at the very least causing a tremendous change in the planet's biodiversity. Of the estimated 5-30 million species on the planet's surface, an estimated 30,000 are being exterminated every year. With each passing year, the world becomes a less and less varied and interesting place to be.

For details on the current state of the world, refer to the annual Worldwatch Institute publication, State of the World, or the World Resources Institute's annual publication, World Resources.

In summary, mankind's large numbers and industrial activity are causing the extinction of large numbers of other species, and could lead quickly to the biological death of the planet. This destruction began with the advent of modern technology several centuries ago, and accelerated tremendously with the advent of the petroleum age. The human population continues to grow by about 1.3 - 1.4 percent a year, and economic activity (industrial production) is increasing by about three percent per year. Ecologically diverse forests are being destroyed at the rate of 16 million hectares per year. The pace of the destruction is relentless.

III. Current Trends, and What Will Happen if They Continue

World human population is exploding. Last year it passed the six billion mark, and it increases by about 80 million every year. In many regions of the world, the human population is increasing at horrific rates, and it will continue to do so because birth rates are very high – much higher than the "replacement" level of just over two children per woman in her lifetime. Birth rates are dropping in many regions, but very slowly, and rarely to replacement levels. Current estimates by the United Nations and the World Bank are that the world population will continue to increase for decades, even if human birth rates were to drop rapidly to replacement levels everywhere. Under the most optimistic assumptions about fertility declines, the human population will increase to perhaps nine billion people. If birth rates do not drop to replacement level, the population will continue to soar.

History offers no cause for optimism that the human population explosion will spare any portion of the world. Underdeveloped nations continue to grow in population until they simply run out of natural resources and cause total destruction of their forests and wildlife. Most developed industrial nations continue to grow in population at about one-half of one percent per year. They strive for maximum economic growth, regardless of consequences to the local environment or the planet's ecological well-being.

The world's forests are where many plant and animal species survive, and it is the destruction of forests that is causing much of the ongoing species extinction. About 94 percent of the forest that existed just sixty years ago has been destroyed. In the past 20 years, forests have disappeared in 25 countries. At these rates, most of Earth's forest cover will soon be gone. As human population continues to increase, the demand for wood products and land will increase, so that the destruction of the shrinking forests will accelerate.

From the point of view of destruction of Earth's natural resources, the US population is the most destructive nation on Earth, since its industrial activity is the largest. Its population is large and its industrial production per person is one of the highest in the world. Its per capita commercial energy consumption is one of the highest in the world. Although birth rates for the US white population fell to replacement level years ago, US

population growth continues to soar by about three million (one percent) a year, due in large part to immigration. For each new resident added to the country, about an acre of land is taken permanently out of wildlife habitat or agricultural production. The US has no plans to reduce its per capita energy consumption, or reduce its industrial production per capita, or reduce its population. Its policy, quite the contrary, is to increase both the population and the per capita industrial production as fast as possible, regardless of the consequences to the planet's biosphere. Every year, it strives to increase its population size, expand industrial production, and push the standard of living ever higher, imposing an ever-greater burden on the planet's biosphere and driving more species to extinction.

All nations of the Earth strive for increased economic and industrial activity. Perhaps the simplest readily available measure of industrial activity is the amount of commercial energy consumed, which is usually measured in terms of kilograms of oil equivalent (kgoe) per capita per annum. Over the past few decades, the commercial energy consumption of the planet has increased at an average rate of about three percent a year, somewhat less in recent years. Note that this is about the same as the rate of increase of economic activity as measured by the standard measure, gross domestic product (GDP). Without energy, there is no industrial activity. See web site http://www.dieoff.com for much information on the relationship of energy availability to economic production.

At the present time, about one-sixth of the planet's population has a high level of industrial production, and the rest of the population is striving to achieve high levels also. What this means is that, in the absence of war or other phenomena to reduce industrial capacity and activity, the level of industrial production will continue to increase even if the human population tapers off. The annual GDP per capita of the richest nations is on the order of about $25,000 (GNP per capita, purchasing-power-parity (PPP), current international $), whereas for poor countries it is about $2,000 per year. The world average is about $6,000. At a growth rate (in industrial production) of three percent a year, it would take the rest of the world about fifty years to catch up to where the developed countries are today. This means that even if the human population were to level off by 2050, global industrial production would continue to increase throughout this period, even if the developed nations "stood still" and the poorer nations just tried to catch up. Given the commitment of all nations to the increased standards of living associated with increased industrial production, global industrial production is bound to continue to soar as poor countries strive to become rich, even if population levels off. Under the current world order, industrial production will continue to soar to higher and higher levels, and the massive destruction of the environment that is caused by industrial activity will intensify.

In summary, even under the wildest assumptions about decreasing fertility rates, human population levels will continue to rise, and industrial activity will soar exponentially, for generations to come. The destruction to the biosphere will continue unabated. The planet's biosphere and biodiversity – already reeling from mankind's assault – are doomed.

Unless radical change happens.

IV. The Effects of Global Nuclear War

What can change things? What can halt the rapid destruction of the world's forests, atmosphere, oceans, and species by human overpopulation and global industrialization? Well, any of a number of things. A large asteroid might hit the planet, as is believed to have occurred 65 million years ago when the dinosaurs disappeared. The atmosphere becomes so filled with dust that sunlight is blocked out for days or weeks. Many of the planet's plant and animal species are destroyed. Food is gone and large animals perish. Massive volcanic activity could accomplish the same end. The problem with both of these eventualities is that they accomplish the same result as mankind's current overpopulation and global industrialization – the destruction of the biosphere and mass extinction.

As long as fossil fuels hold out, it does not appear that famine will halt the human population explosion. The world can easily feed nine billion, just by converting all forests to cropland and eliminating meat from the human diet (i.e., use cereal grains for human consumption, rather than for animal feed). The world can continue to feed billions of people, however, only as long as fossil fuels hold out. The world's petroleum and natural gas reserves will be exhausted by 2050 (coal will last somewhat longer), and solar energy can support only about 200-500 million people. When fossil fuels are gone, the human population will indeed drop, but by the time that that happens, mass extinction of the biosphere's species will have taken place.

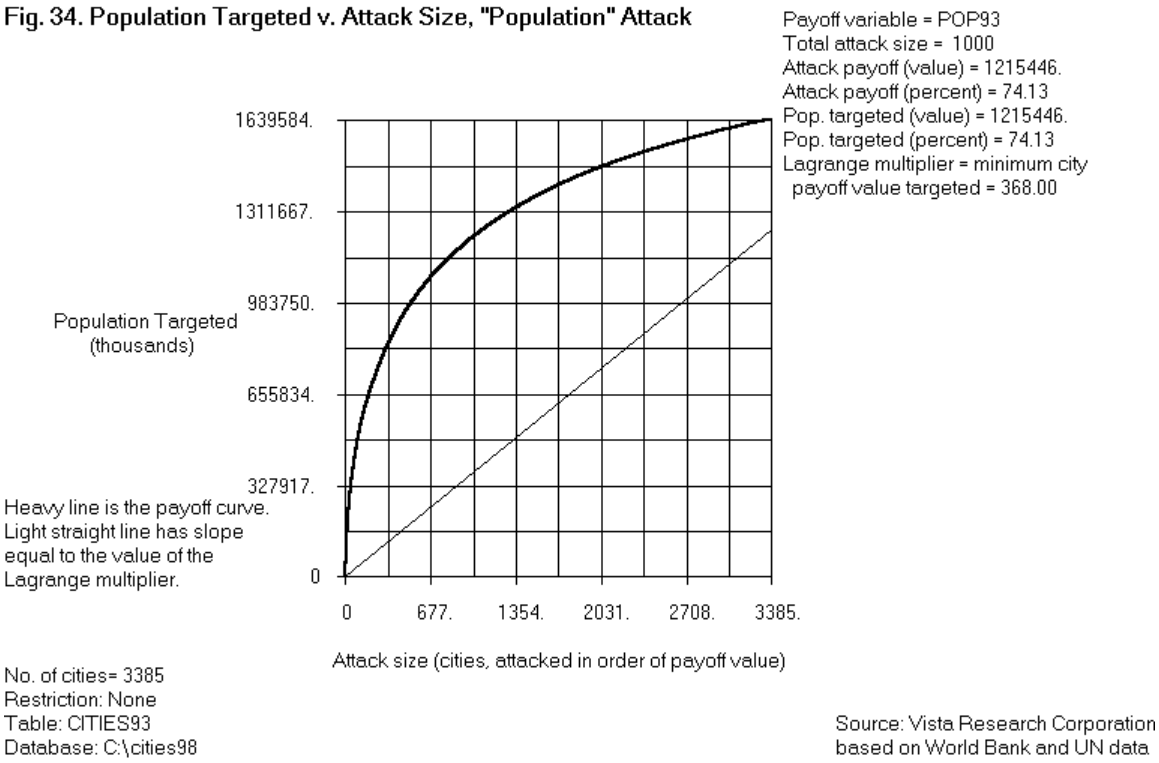
Disease could wipe out mankind. It is clear that HIV/AIDS will not accomplish this – it is not even having a significant impact on slowing the population explosion in Africa, where prevalence rates reach over thirty percent. But a real killer plague could certainly wipe out mankind.

And war. Not small wars, such as the scores of small conflicts that continue year after year. Not even big wars, such as the First and Second World Wars. But a really big war, involving thousands of nuclear weapons. That can make a real difference. It can bring an immediate halt to industrial activity at a level that is destroying the planet. It can reduce human numbers to the point where they no longer have a significant impact on the planet's ecology.

Reference 1 contains an assessment of the impact of a moderate-sized global nuclear war on human population and industrial activity. It analyzes several different types of nuclear attack, each of which is optimal with respect to a different objective. One attack is designed to maximize the total population destroyed; another maximizes destruction to industrial capacity. A third attack is oriented to reducing population in countries that still have a substantial amount of biodiversity. A fourth attack is a "combination" attack that is oriented toward achieving all three objectives (reduction in population, reduction in industrial capacity, and reduction of population in high-biodiversity countries).

Figure 1 (Figure 34 of Reference 1) shows the "damage curve" for a nuclear attack designed to maximize population destroyed. The damage curve shows what proportion of the world's city population (of cities of 100,000 or more) is destroyed as a function of the number of weapons (nuclear bombs) deployed. The figure shows that a relatively modest number of weapons can destroy a very large proportion of the planet's city population.

Figure 1. Graph Showing that a Medium-Scale Global Nuclear War Can Destroy a Large Proportion of the World's City Population (from Reference 1)



For example, Figure 1 shows that an attack involving 1,000 nuclear bombs can destroy about three-quarters of Earth's total city population. An attack of 1,000 weapons is of modest size. One thousand nuclear bombs could be produced, for example, with just the amount of plutonium that the nuclear powers have lost track of. At the present time, the US possesses about 12,000 nuclear weapons, and Russia possesses 22,500 nuclear weapons, of which about 7,000 (on each side) are classified as "strategic." Either of these stockpiles is sufficient to destroy all 3,385 cities of population 100,000 or more. Under the START II arms treaty, the number of strategic nuclear weapons will be halved, to about 3,500 deployable warheads each for the US and Russia, by the end of 2007 -- still enough to target every city of population 100,000 or more in the world. (See Internet web sites http://www.cdi.org or http://www.nrdc.org for data on nuclear arsenals.)

Figures 2 and 3 illustrate several population scenarios, corresponding to different attack sizes and post-attack population policies. These figures graphically illustrate that current human population levels, enabled by industrial agriculture and massive consumption of fossil fuels, are vastly greater than sustainable levels (i.e., the levels that can be supported by non-industrial agriculture). (For discussion of the methodology used to construct the figures, refer to Reference 1.)

Figure 2. World Population Scenarios

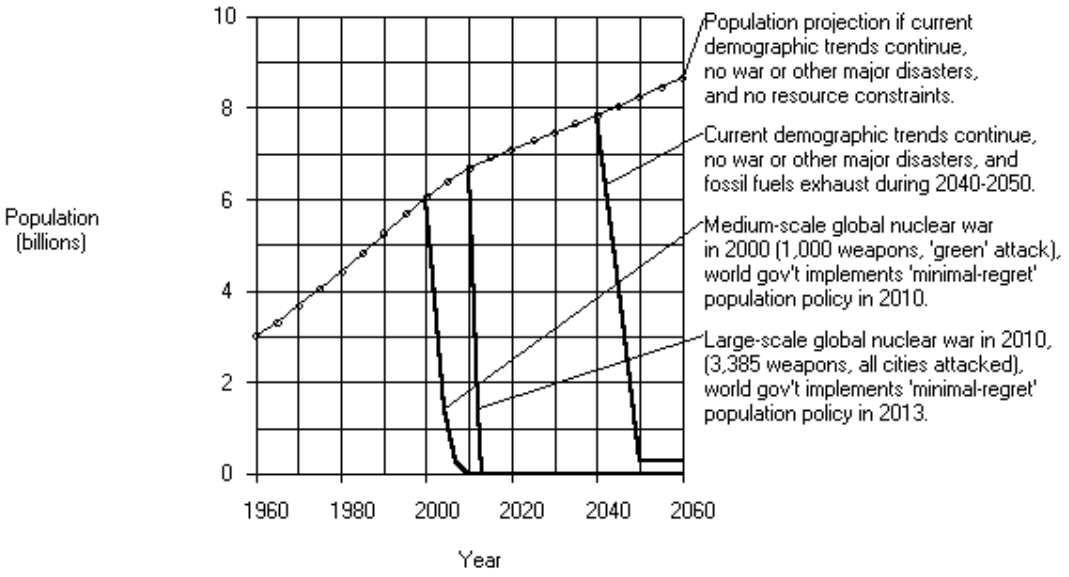
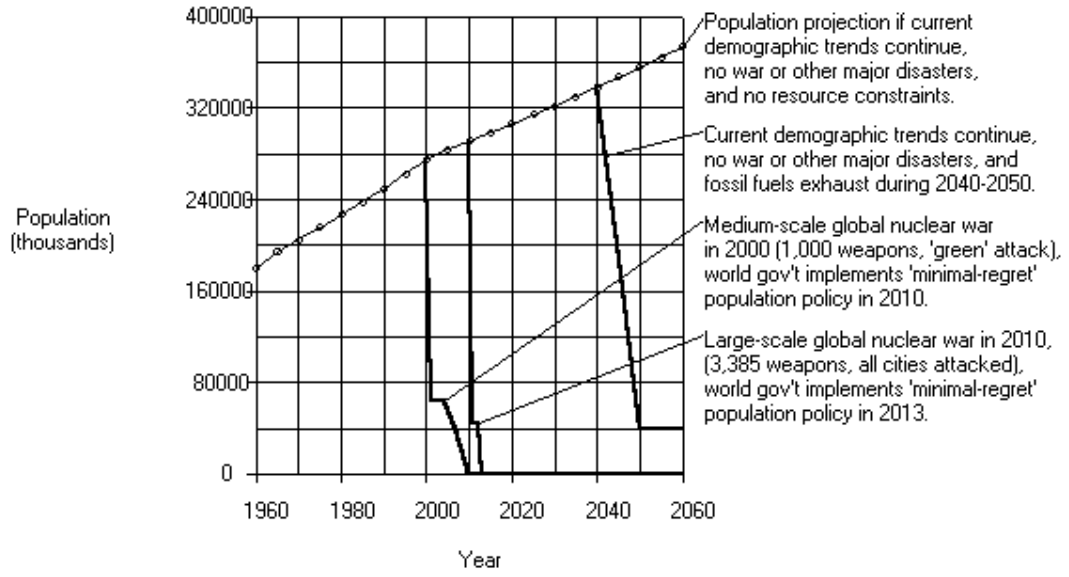


Table: WorldScenarios
Database: C:\Program Files\DevStudio\VB\pop98\WorldScenarios.mdb

Source: Vista Research Corporation based on World Bank and UN data

Figure 3. Country Population Scenarios

Country: UNITED STATES OF AMERICA



Country: UNITED STATES OF AMERICA
Table: CountryScenarios
Database: C:\Program Files\DevStudio\VB\pop98\CountryScenarios.mdb

Source: Vista Research Corporation based on World Bank and UN data

V. The Likelihood of Global Nuclear War

It would appear that global nuclear war is inevitable, for several reasons. A major factor is the “politics of envy” – the desire for the “have-nots” of the world to destroy what the “haves” have. The gap between the industrialized “west” and the rest of the world is widening, and the hatred and envy are growing as the poorer nations realize that they will never catch up. With the proliferation of plutonium from nuclear reactors, terrorists and rogue nations will soon have the capability to produce thousands of suitcase-sized nuclear bombs, and deliver them to any cities in the world. No missiles or airplanes are required.

Another reason why global nuclear war appears inevitable is the fact that nuclear war “dominates” all other proposed solutions as a means of stopping the ongoing species extinction. No other alternative for planetary management accomplishes this. As long as this situation holds, it is just a matter of time until the global-nuclear-war solution is implemented, since continuing on the present course leads to a “dead” planet.

It would appear that global nuclear war will happen very soon, for two main reasons. First, human poverty and misery are increasing at an incredible rate. There are now three billion more desperately poor people on the planet than there were just forty years ago. Despite decades of industrial development, the number of wretchedly poor people continues to soar. The pressure for war mounts as the population explodes. Second, war is motivated by resource scarcity -- the desire of one group to acquire the land, water, energy, or other resources possessed by another. With the passage of time, however, less and less benefit accrues to the winner. With each passing year, the planet's biodiversity decreases, another two percent of the planet's remaining petroleum reserves are consumed, and the risk of biospheric extinction (e.g., from a greenhouse effect) increases.

Once gone, these resources -- the very reasons for waging war -- are gone forever. Extinct species will never return, and the planet's fossil fuel reserves, once exhausted, are gone forever. In the past 50 years, human industrial activity has consumed about half the world's reserves of petroleum and has led to the extinction of perhaps one million species. In another 50 years, human industrial activity will consume all of the remaining petroleum reserves and destroy millions of species more. For those tempted to wage war, the time to strike is now -- in fifty years there will be nothing left to win.

With each passing year, 30,000 more species are exterminated by mankind's epidemic numbers and industrial activity (pollution, habitat loss). Many large-animal species are in danger of extinction, becoming so small in number that they are effectively extinct. Each passing year sees a rise in the number of species made extinct, never to roam the Earth again. If global war happens this year, no more species will be made extinct from the habitat destruction and pollution of an exploding industrial human population. If global war happens next year, another 30,000 species are lost -- forever. If global war happens in ten years, another 300,000 species are extinct. Delay simply leads to the loss of more species and increases the likelihood of a “hothouse” destruction of the biosphere. If a global nuclear war happens now, the production of greenhouse gases stops.

The point mentioned above about the depletion of the plant's fossil-fuel reserves warrants additional comment. A factor motivating a global nuclear war sooner rather than later is the desire to preserve the planet's remaining fossil fuels. The world's total original fossil fuel reserves have been about half used up. At current consumption rates, the remaining petroleum and natural gas will be used up within fifty years, and coal somewhat later. A similar situation holds for nuclear fuel (unless used in fast-breeder reactors, which produce plutonium, which may be used to make nuclear bombs). If global nuclear war occurs this year, and a single industrialized nation of five million takes control of the planet, it can be sustained on the solar energy flux. It would also have available, however, sufficient fossil fuel to last for thousands of years. This energy surplus could dramatically help the transition of mankind to the post-fossil-fuel era. Consuming all of the planet's remaining fossil fuel in the mindless, hedonistic orgy of consumption that is currently in progress is a tragic waste.

In summary, global war is increasingly likely because the misery and overcrowding caused by the large human population is rapidly increasing, and the benefits to be derived from war (i.e., a planet with full biodiversity and substantial remaining fossil fuel reserves, or a planet that is still biologically alive, in any condition) are rapidly decreasing. The conditions are ripe for global nuclear war, now. Motive, means, and opportunity are all in abundant supply.

VI. Planning for the Post-War Era

So, for a number of reasons, it would appear that the odds of global nuclear war are increasing, and that they increase more as the human population grows and the biosphere is destroyed by large human numbers and industrial activity. What can be done to address this problem? Well, there are basically two approaches. First, mankind could attempt to reduce the likelihood of nuclear war. But if, as argued here, the likelihood of nuclear war is increasing because of human overcrowding, misery, and industrial activity, then that likelihood cannot be reduced unless these problems are resolved. The problem that arises is that no efforts to reduce human population numbers and industrial activity have succeeded. Indeed, all nations are pressing for more industrial activity, not less. In the face of this commitment, it is rather futile to hope for a voluntary, immediate reduction in human numbers or industrial activity.

A second approach to the problem is to recognize, or accept, that the likelihood of global nuclear war is great, and that the factors contributing to it are growing in strength, and to prepare for the post-war era. Whereas the first approach has proved hopeless, this approach appears feasible. What can be done?

First, countermeasures should be taken to reduce the destruction that will result to the biosphere by war, and facilitate the postwar recovery of the biosphere. This can be done through planning and analysis, and the distribution of information that will help. Steps that can be taken including efforts to preserve the planet's remaining biodiversity, and to prepare for a reduced world population after the war.

The following are examples of what can be done.

First, develop approaches for planetary management. Make preparations such that if global nuclear war occurs, it will be possible to establish a small global population that will live in harmony with the rest of the biosphere. These preparations should include the development of social, political, military, and religious structures to bring about and sustain long-term stabilization of the biosphere.

Second, assemble a collection of all of the world's knowledge. Replicate the collection and store it in various hidden locations around the world, to minimize the chance of its extinction.

Third, take steps to preserve the planet's biodiversity, such as storing seeds in many secret locations and establishing ecologically viable safe zones (large reserves) of sufficient size to ensure the survival of the world's disappearing larger species.

Note that, with the exception of elements of the third item, the preceding measures can be implemented by a small, independent (but well-funded) organization. They are not measures that require massive funding, the consensus of nations, or a massive global mobilization. They can be accomplished by a small, well-organized group, committed to saving the planet. Unlike so many previous proposals of ways to "save the planet," they are quite feasible, they can be implemented quickly, and they do not require agreement or support from any nation or international organization. Furthermore, they are not contingent on the occurrence of a host of other improbable events or conditions (such as waiting fifty years for a worldwide demographic transition and economic development to occur, after which time it is too late -- the world is destroyed).

VII. Optimal Human Population Size and Composition

Over the years, a fair amount of effort has been invested in trying to determine an "optimal" human population size for Earth. Relatively little effort has gone into determining an optimal population composition. Reference 1 proposes a global population consisting of a single-nation industrial population of five million people and a primitive (hunter-gatherer) population of five million, distributed over the globe. Very briefly, the rationale for these numbers and composition is as follows.

First, some facts. For millions of years, Earth supported a hunter-gatherer population estimated to be about five million in size. When agriculture was developed, the planet was able to support 300 million to 500 million people. Careful analysis (Reference 5) shows that 500 million people is about all that can be supported by solar energy – today's population of six billion was achieved because of the use of fossil fuels, which will soon be depleted (oil and natural gas within 50 years, coal somewhat later). People in advanced industrial nations consume about 2,500 – 8,000 kgoe per capita per annum of commercial energy. People in poor nations consume as little as one-hundredth of that amount.

In Reference 1, the "optimal" human population is defined as the smallest population that can be maintained for a long period of time. The objective is to reduce the planetary impact of mankind to the lowest level possible, while at the same time keep the human numbers sufficiently high to reduce the likelihood of extinction to a low level. The approach in Reference 1 is to split the population into two parts – a single industrially

advanced nation of five million and a hunter-gatherer population of five million, spread over the Earth. The purpose of the industrial nation is to keep the hunter-gatherer population in check. The purpose of the hunter-gatherer population is to reduce the chance of human extinction from a cataclysmic event (by having the population geographically dispersed).

The purpose of having but a single industrial nation is the realization, from history, that having more than a single nation leads to competition, with all nations striving to maximize their population size and industrial activity (limited only by resource constraints). And that is exactly what has caused the current human overpopulation problem. If, after the war, more than one nation survives, the age-old process of national competition will result in the reestablishment of a global industrial civilization, which has proved nonviable.

The rationale for a size of five million for the industrial population is that the planet can support at most 500 million people on solar energy at a very low-energy level of living, and that high-technology (industrial) man utilizes about 100 times as much energy as low-technology (hunter-gatherer) man. In order to live within the daily solar energy budget, the following formula applies:

size of hunter-gatherer population + 100 (size of industrial population) = 500 million.

Historically, the planet had little stress with a hunter-gatherer population of five million, so let us set the size of the hunter-gatherer population equal to that number. In this case, the preceding formula becomes:

5 million + 100 (size of industrial population) = 500 million

or

size of industrial population = 4.95 million, say five million.

The global population that consists of five million industrialized human beings and five million hunter-gatherers is referred to in Reference 1 as a “minimal regret” population, since it was motivated by the desire to determine a population strategy that minimizes the “regret” that mankind and the planet’s biodiversity are destroyed.

VIII. Summary

This article has briefly summarized the human population problem, the concomitant environmental problem, and prospects for the future. A detailed analysis is presented in Reference 1, which also explores the ethical and religious aspects of global nuclear war. If you have suggestions about what to do to enhance the chance of survival of mankind and the biosphere, please send them to the Internet web site http://www.foundationwebsite.org . See also the Internet web site http://www.churchofnature.com for a religious approach to solving the problem.

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