

# **The Geographer's Viewpoint**



# Population, Resources, and Environment: "Beyond the Exponentials" Revisited

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## **Abstract**

More than half a century ago, Trewartha (1953) argued that population was a pivotal element in geography and that its neglect would affect the future development of the discipline. Subsequently, geographers paid more attention to population than they had previously, perhaps, but still not enough. My purpose is to revisit Zelinsky's article, "Beyond the Exponentials: The Role of Geography in the Great Transition"; to update what has happened since it was published, at least with respect to basic population changes; to raise some questions about neo-classical economics and the growth syndrome; and to encourage geographers, once again, to engage population issues as an integral element of geographic studies, especially those focused on resource use and environmental degradation.

Nearly four decades ago, Zelinsky (1970, 498), in a seminal article titled "Beyond the Exponentials: The Role of Geography in the Great Transition," wrote that "Mankind is propelling itself into a state of acute frustration or even a crisis of survival as stresses upon society and the fragile terrestrial ecosystem multiply at an exponential rate." He added (1970, 499) that "Our growing power to sense and revel in the infinite complexity and glory of the worlds of mind and matter and to chart brilliant near-utopias of grace, compassion, and creativity is matched only by our growing capacity for beastliness, for concocting new horrors for a bedeviled species and a battered planet." Zelinsky urged geographers to tackle tough questions about population, resources, and the environment.

Now, nearly forty years later, most of those questions have gotten tougher and new ones have been added. Geographers need to confront them head on, connecting the dots for people between what we are witnessing in the changing cultural landscape and how growing human numbers are often responsible for those changes. Too many geographers have been seduced, as have many others, by the promise of growth and abundance sketched out for us by

modern neoclassical economists, who receive further critical attention below. Cohen (1995, 368) warned us more than a decade ago that “The human population of the Earth now travels in the zone where a substantial fraction of scholars have estimated upper limits on human population size... the possibility must be considered seriously that the number of people on the Earth has reached, or will reach within half a century, the maximum number the Earth can support in modes of life that we and our children and their children will choose to want.” Speth (2008, x) illustrated how much worse environmental problems have become since 1970 and what confronts us as we look ahead:

How serious is the threat to the environment? Here is one measure of the problem: all we have to do to destroy the planet’s climate and biota and leave a ruined world to our children and grandchildren is to keep doing exactly what we are doing today, with no growth in the human population or the world economy.

Just continue to release greenhouse gases at current rates, just continue to impoverish ecosystems and release toxic chemicals at current rates, and the world in the latter part of this century won’t be fit to live in.

Some perspective on how far we’ve come demographically since 1970 is both essential and instructive. According to the Bureau of the Census, in 1970 the Golden State had a population of around 19.7 million; the United States a population of about 205 million; and the world a population of approximately 3.7 billion. Zelinsky worried that population growth, economic growth, and resource depletion would worsen in the decades ahead, and he was right. Since 1970 the population of California has nearly doubled, to about 38 million; the population of the United States has increased by more than 100 million, to close to 307 million; and the world population has grown to almost 6.8 billion—an additional 3 billion people on Earth since Zelinsky’s article appeared. As Friedman (2008, 65) wrote, “But now we understand that the effect of rising population depends on how much people consume and produce, and as the world gets flat, more and more people are going to be consuming and producing more and more.” Friedman is correct, but Zelinsky told us that in 1970. Few landscapes have been more altered by population growth, affluence, and technology than California’s (Dilsaver, Wyckoff, and Preston 2000), but even there population growth continues.

Here is another perspective. If we take 200,000 years ago as the beginning point for *Homo sapiens*, we can compress it into one 24-hour day to better comprehend how rapidly population growth has changed in recent centuries, compared to earlier times. For about 190,000 years, modern humans were hunters and gatherers; our numbers grew slowly and erratically. On our 24-hour clock, if we take midnight as our start and end points, the Agricultural Revolution did not begin until around 10:48 p.m. (10,000 years ago). Our numbers reached 1 billion around 11:58:43 p.m. (1 minute and 17 seconds before midnight). Suddenly, in the last 77 seconds of our day, our numbers increased by an unprecedented 5.8 billion. During the twentieth century alone, 43 seconds out of our day, Earth's human population nearly quadrupled, from 1.6 to 6.1 billion. Though the rate of population growth has slowed since 1970, annual additions are larger now than they were then because the base population has increased by so much.

Demeny and McNicoll (2006, 1) noted that numerous economic and social changes occurred during the period 1950–2000 and that “[L]inked to them in many different and significant ways was a huge expansion of the size of the world’s population—unprecedented in pace and magnitude—generated by improving health and longevity, especially in the world’s poorer regions.” A different interpretation of that unprecedented growth, one that raises different questions about what really “generated” it and where we might be headed, is possible and deserves consideration.

Though we might argue about what sent our slow, unsteady growth in human numbers into a rapid and sustained upward spiral, our discovery and exploitation of fossil fuels—first coal, then oil, and finally natural gas—allowed us to increase the productivity of labor on a scale that had never before been imaginable. That, in turn, allowed us to increase food production more rapidly than ever before. Zabel (2009, 2) argued that “Cheap and abundant fossil fuels have been a necessary precondition for the past century’s population growth.” Evidence of that is considered next.

The first oil well was drilled in Pennsylvania in 1859, around 11:58:55 p.m. (1 minute and 5 seconds before midnight). In the last 65 seconds of our 24-hour day, humans managed to consume perhaps half of all of the oil that we will ever pump from the ground. Even if we cannot “prove” that the growth in oil production “caused” the incredible growth in our numbers during the last century or

two, the correlation between oil production and expansion of our numbers is undeniable. As Wright (2009, viii) noted, “[F]ossil fuels are feeding us. ... A two-century carbon binge has allowed mankind to fill its planet way beyond the natural carrying capacity for feckless, reckless, self-indulgent apes. If we run out of carbon or fail to find good substitutes, we are back to dung and muscle power. Billions will die.”

Wright may be wrong, but he could also be right. Wallach (2005, 269) noted that “Fears of resource shortages have circulated for longer than anyone can remember, and they have always proven alarmist.” However, that does not preclude such shortages from occurring in the future, especially with oil, which is crucial to modern economies and to sustaining the production and distribution of food. As Peters (2009, 12) pointed out, “After 1970, trends in population growth and oil production in the United States diverged, and the implications of that divergence cannot be over-stated. ... Americans have had nearly four decades to adjust to these diverging trends but have remained in denial, as have most of our leaders.” Denial has been a common feature of the decades since 1970.

Population growth continues. “Climate change responsible for 300,000 deaths a year” was a typical headline generated by the release on May 29 of a new report from the Global Humanitarian Forum (2009), *Climate Change: The Anatomy of a Silent Crisis*. According to the report’s Executive Summary (2009, 1), “The findings...indicate that every year climate change leaves over 300,000 people dead, 325 million people seriously affected, and economic losses of US\$125 billion. ... These figures represent averages based on projected trends over many years and carry a significant margin of error. The real numbers could be lower or higher.”

That headline sounds frightening, but it needs to be viewed within a demographic context. The world’s population in 2009 was close to 6.8 billion. According to the U. S. Census Bureau, we can expect about 55.7 million people to die this year, so in purely demographic terms 300,000 deaths amount to just over half of one percent of all deaths. Furthermore, there are about 15,465 births per hour worldwide, so again in a purely demographic sense those 300,000 deaths can be replaced in less than 20 hours.

Paradoxically, the very fossil fuels that have allowed us to feed the vast increase in world population over the last century or two may

also be starting to increase mortality rates, even if only slightly so far. Currently we add about 80 million people to the planet each year, and we know that population growth exacerbates most environmental problems, including global warming (Speth 2008, Diamond 2005, and Friedman 2008).

Pimentel (2001), Hopfenberg (2003), and others have established in a series of articles that human population growth is a function of food supply, yet we continue to expand food supplies to accommodate future growth—even if that growth threatens the planet’s socioeconomic systems, ecosystems, biodiversity, oceans, and atmosphere. Continued expansion of food supplies has come at considerable cost both to people and to Earth. As Pollan (2008, 121) commented, “Clearly the achievements of industrial agriculture have come at a cost: It can produce a great many more calories per acre, but each of those calories may supply less nutrition than it formerly did. ... A diet based on quantity rather than quality has ushered a new creature onto the world stage: the human being who manages to be both overfed and undernourished, two characteristics seldom found in the same body in the long natural history of our species.” According to Heller and Keoleian (2000), it takes seven to ten calories of input, mainly from fossil fuels, to produce one calorie of edible food in the United States. Looking at the American landscape, Babbitt (2005, 100) observed that “[I]ndustrial agriculture has been extended too far, and the price has been too high for the land and waters to bear.” In many places, agricultural landscapes are no longer what Tuan (1993, 143) had in mind when he wrote that “In common with the vast majority of humankind, Americans love the small intimate world that is their home, and, immediately beyond it, a rich agricultural land.”

According to Pimentel (2001), humans already use more than half the planet’s entire biomass, leaving less and less for other species. From there, as Hopfenberg (2009, 2) noted, “It is not a far logical leap to determine that, if human population and resource use continues to grow and we continue to kill off our neighbors in the biological community, one of the many species facing extinction will be the human. Thus, the impact of civilized humanity on the rest of the biological community can be seen as lethal to the point of destroying our own ecological support.” It is a reminder that, as Bush (2000, 28) noted, “If there is one lesson that the geological record offers, it is that all species will ultimately go extinct, some just do it sooner

than others.” With the expansion of human numbers has come a steady increase in the background rate of extinction.

But even among environmentalists, population has been dropped from most discussions because it is controversial; it has been snared in the web of political correctness. As Speth (2008, 78) somewhat ironically pointed out, “By any objective standard, U.S. population growth is a legitimate and serious environmental issue. But the subject is hardly on the environmental agenda, and the country has not learned how to discuss the problem even in progressive circles.” Cobb (2007, 1) put it this way, “Even if some politicians, policymakers and reporters in wealthy countries can see beyond the daily mirage of plenty to the overpopulation problem, they do not want to touch it.”

Population, consumption, and greenhouse gas emissions will continue to grow until we either face up to the fact that there are limits on our finite Earth or we are confronted by a catastrophe large enough to turn us from our current course. If Chinese, Indian, and other nations in the poorer world had consumption levels that rose to current Western levels, it would be like Earth’s population suddenly increasing to 72 billion, according to Diamond (2008, 2), who then wrote:

Some optimists claim that we could support a world with nine billion people. But I haven’t met anyone crazy enough to claim that we could support 72 billion. Yet we often promise developing countries that if they will only adopt good policies—for example, institute honest government and a free-market economy—they, too, will be able to enjoy a first-world lifestyle. This promise is impossible, a cruel hoax: we are having difficulty supporting a first-world lifestyle even now for only one billion people.

Even before that, Athanasiou (1996, 299) argued that “In a world torn between affluence and poverty, the crackpot realists tell the poor, who must live from day to day, that all will be well in the long run. Amidst deepening ecological crisis, they rush to embrace small, cosmetic adaptations.” Today, as the perils of global warming become ever more apparent, it is clear that the poorest nations, and the poorest within nations, will pay the highest price.

Let’s return to modern neoclassical economics. In one widely used economics textbook, Mankiw (2007, 566-7) wrote about population growth as follows:

Economists and other social scientists have long debated how population growth affects a society. The most direct effect is on the size of the labor force: A large population means more workers to produce goods and services. At the same time, it means more people to consume those goods and services. Beyond these obvious effects, population growth interacts with the other factors of production in ways that are less obvious and more open to debate.

Mankiw (2007, 570) also pointed out that “Some economists have suggested that world population growth has been an engine of technological progress and economic prosperity.” Speaking for most neoclassical economists, Harford (2008, 232) concluded that “The more of us there are in the world, living our logical lives, the better our chances of seeing out the next million years.”

The absurdity of Harford’s statement must be recognized and challenged. Geographers know Earth is finite, as do ecologists and most other scientists, so we should respond forcefully to the ideology of growth that is a foundation for neoclassical economists, to what many call “growthmania,” Zelinsky called the “growth syndrome,” and which is altering life on Earth at every scale from local to global. Economists do not deserve all the blame, of course. As Berry (1999, 89) noted, “Western civilization, dominated by a cultural arrogance, could not accept the fact that the human, as every species, is bound by limits in relation to the other members of the Earth community.” Greer (2008, 23) would add to that his observation that “Our culture’s mythology of progress envisions the goal of civilization as a utopian state in which poverty, illness, death, and every other aspect of the human predicament has been converted into problems and solved by technology.” We don’t want to hear about limits, either to what we can achieve with technology or to how many of us can comfortably inhabit the planet.

Zelinsky (1970, 498) wrote that “The reader is asked to consider what I have come to regard as the most timely and momentous item on the agenda of the human geographer: the study of the implications of a continuing growth in human numbers in the advanced countries, acceleration in their production and consumption of commodities, the misapplication of old and new technologies, and of the feasible responses to the resultant difficulties.” Geographers have not risen to Zelinsky’s challenge in sufficient numbers, and we have seldom made our voices heard above those of economists and others who

are heavily invested in the status quo. The president still has no Council of Geographic Advisors.

Nowhere is acceptance of the twin towers of economic growth and increased consumption more apparent than in the United States, where “growing the economy” is on the lips of politicians, economists, and business leaders, even as we wrestle today with the leftovers of a fiscal meltdown created by banking and shadow banking systems run amok. As Bacevich (2008, 16) noted, “For the majority of contemporary Americans, the essence of life, liberty, and the pursuit of happiness centers on a relentless personal quest to acquire, to consume, to indulge, and to shed whatever constraints might interfere with those endeavors.” Yet evidence that modern economics has let most people down is abundant. As Berry (1999, 68) observed, “Presently we experience on a world scale an enormous glut in many basic products, along with unmatched deprivation in the vast numbers of peoples gathered in the shantytowns of the world.”

More than two decades ago, Abbey (1988, 21) wrote that “[W]e can see that the religion of endless growth—like any religion based on blind faith rather than reason—is a kind of mania, a form of lunacy, indeed a disease,” adding that “Growth for the sake of growth is the ideology of the cancer cell.” Speth (2008, 47) commented that “Promoting growth—achieving ever-greater economic wealth and prosperity—may be the most widely shared and robust cause in the world today.”

Some have questioned the nature of neoclassical economics, and the chorus of skeptics is growing louder, especially with the current worldwide economic downturn and the failure of markets to cope with increasing greenhouse gas emissions. Abbey (1988, 66) expressed his concern as follows: “Economics, no matter how econometric it pretends to be, resembles meteorology more than mathematics. A cloudy science of swirling vapors, signifying nothing.” Along that same line, Taleb (2007, 155) wrote that “Economics is the most insular of fields; it is the one that quotes least from outside itself!” Daly (1996, 73), an ecological economist and a voice of reason among modern economists, noted that “Devotion to growthmania dies hard.” Speth (2008, 124) argued that “In the end, what has to be modified is the open-ended commitment to aggregate economic growth—growth that is consuming environmental and social capital, both in short supply.” Ehrenreich (2008, 94–6)

wrote that “The economists’ odd fixation on growth as a measure of economic well-being puts them in a parallel universe of their own...the mantra of growth has deceived us for far too long.” I think Zelinsky would agree.

Since Zelinsky’s “tract” was published, new resource and environmental problems have emerged and intensified, while earlier ones have festered; few, if any, have been resolved. Whether in California, the United States, or the world, no problem that I can think of will be more easily solved with additional millions of people, despite what economists have suggested and may even believe. As the carbon dioxide content of Earth’s atmosphere has increased from 270 parts per million in preindustrial times to nearly 390 parts per million today, global warming has emerged as an issue that was recognized by virtually no one in 1970. Another recent concern is with future oil production, which a growing number of petroleum geologists and others argue may be at or near its peak (Simmons 2005, Greer 2008). Though disagreements exist about both of these issues, continued population growth is sure to exacerbate them.

Should concerns about peak oil production prove to be true, implications for growthmania are considerable. As McKibbin (2007, 63) noted, “Cheap and abundant fossil fuel [mainly oil] has shaped the farming system we’ve come to think of as normal; it’s the main reason you can go to the store and get anything you want at any time and for not much money.” Zabel (2009, 17) pointed out that “If population growth were related to oil production [as he and others have argued] and oil production is beginning to decline, *Oil Population* will also decline—in other words, its growth curve may change from a slowing logistic curve, to a declining parabolic curve—and therefore a large component of global population will decline more quickly than most people anticipate.”

Nearly forty years ago, Zelinsky (1970, 535) urged geographers to “[T]hink as hard and furiously as possible about what should be done...[and] agree to make haste wisely in a rationally controlled frenzy.” Our response has been timid and underwhelming. Amidst pressures from political correctness and the promises of neoclassical economists, geographers need to stand up and encourage a deeper interest in population growth on a finite planet and its effect on many of the major issues of our time. We ignore the implications of population growth at our peril. Zelinsky (1970, 501) worried that “The problem that shakes our confidence in the perpetuation and

enrichment of civilized human existence or even our biological survival is that of growth: the rate, volume, and kinds of growth, and whether they can be controlled in intelligent, purposeful fashion." Continued population growth is unsustainable. As Brown (2004, xvi) argued, "If we cannot stabilize population and if we cannot stabilize climate, there is not an ecosystem on earth we can save."

Finally, I urge you to consider these words from eminent ecologist Garrett Hardin (1975, 10):

Don't speak to me of shortage. My world is vast  
And has more than enough—for no more than enough.  
There is a shortage of nothing, save will and wisdom;  
But there is a longage of people.

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