30 November 2018

An Economist Comments on the Impending World Collapse

Recently received a serious letter and several documents/news stories from an acquaintance who was concerned about recent reports that human civilization was facing total destruction in the near future as a result of population growth, resource exhaustion, and environmental collapse. Below is my response. I have deleted all references to the acquittance's name, profession, etc.

Appreciate your sending these studies and news stories concerning important - if not existential - issues. You have given me a lot to think about! As a result, I have spent a substantial amount of time over the last several months reading online and in the library to prepare this answer. I hope that you find my comments of interest.

There is a common theme among the documents that you sent to me. If current trends in population use, energy use, environmental degradation, etc. continue then the world will experience a disaster within the next couple of decades.[1] As you probably know, in the field of economics, there is a long history of the use of extrapolation of current trends to predict future outcomes. The most famous was, of course, is the 1798 essay of Thomas Robert Malthus.[2] In this essay, Malthus explored the implications of a world where the quantity of available food increases gradually while, at the high fertility rates of his time, the population increases rapidly. In its most straight forward form, food supplies grow arithmetically – 2, 3, 4, 5, etc. – while population grows geometrically – 2, 4, 8, 16, etc. The implications are grim. Most of the world's population will live their lives on the edge of starvation. Any improvement in food supplies as a result of a good harvest, etc. will be temporary. More food means more children will live and the resulting growth in population will exhaust the extra food until everyone is once again on the edge of starvation. In the Malthusian world, charity is a form of cruelty. Give a starving family food and you simply allow them to continue to breed so that more people will be hungry in the future.

The Malthusian analysis has had a substantial impact on thinkers of his day as well as the current environmental movement. As an example of the former, Charles Darwin credited Malthus with providing a key inspiration for his theory of the "survival of the fittest". More recently, the Zero Population Growth (ZPG) movement has proposed reducing world fertility rates to below 2.1 children per woman. As you noted, at rates at or below 2.1, the world population will eventually stop growing. The difficulty is if some/many people refuse to voluntarily reduce their family size. As you note in bullet 6 of your paper entitled: "Thoughts on the Coming Destruction": "There are three and only three ways that population growth can cease: a) war, disease, starvation, and other horrors; b) voluntary population control; and c) coercive population control." Malthus would have agreed with your analysis. Some ZPG advocates propose

[1] A point of logic. You state: "No responsible scientist" disagrees the statement that humanity faces disaster. This appears to be a version of the: "No true Scotsman fallacy" in that if I quote a scientist that disagrees then you will respond that he or she is not a "responsible scientist". I'm sure that was not your intent, but you might think about rewording your statement that there can be no credible alternative views. For example, I recommend Ronald Bailey (2015) *The End of Doom* as providing a well-documented alternative view of the challenges that you discuss.

[2] Thomas R. Malthus (1798) *Population: The First Essay*

involuntarily sterilization or abortion for those families that fail to voluntarily reduce fertility. The best-known examples are China's "one child" policy and India's involuntary sterilization scandal. Of course, this approach raises ethical issues that are discussed below.

You reference the UN's medium estimate of population growth. However, over the last three decades, the UN's lower estimate has been more accurate. This is because fertility has declined more rapidly than expected over the last quarter century. As can be seen in the table, the fertility rate for the world's 2016 population of about 7.5 billion persons was only about 2.4 children per woman. In the economic development field, the consensus view is that the major driver of reduced fertility is female education. Higher education for women tends to increase the opportunity cost of child bearing and rearing. As you note, religious beliefs also play a role. In fact, the Goldman Hypothesis states that fertility falls when women both become educated and lose their religion.

Total Fertility Rates	1990	2016
World	3.3	2.4
East Asia and Pacific	2.5	1.8
Europe and Central Asia	2.0	1.8
Latin America and Carib	3.2	2.1
Middle East and N. Africa	4.9	2.8
N. America	2.1	1.8
S. Asia	4.3	2.5
Sub Saharan Africa	6.3	4.8

Source: World Bank (2018) *World Development Indicators*

According to the demographer Sanjay, if current downward trends in fertility continue then the world will reach a maximum population of between 8.5 - 9 billion in about 2050 and then begin to decline.[3]

But will the almost 9 billion people in 2050 be starving in a Malthusian world? The experience of the recent past is optimistic. Over the last quarter century, as the world's population increased by almost 2 billion persons; the percentage of the world's population that was in poverty actually declined and average caloric intact increased.[4] And as per capita income increased there seemed to be progress towards a cleaner environment at least for democratic free-market countries.

Personally, I am surprised that there was not a world-wide celebration in the mid-1990s when, for the first time in human history, the world income distribution ceased to be a pyramid. For ten thousand years, there were large number of persons at the bottom of the income pyramid who lived lives of near starvation. Above them were a smaller warrior/merchant/skilled labor group and, at the top of the pyramid, the few elites. But in the mid-1990s, the income pyramid evolved into a five-sided figure as there were fewer people in absolute poverty than in the next higher

[3] Sanjeev Sanjay (2013) "Predictions of a Rogue Demographer" *The Wide Angle.*
[4] World Bank (2018) *World Development Indicators*

income group! This evolution was primarily because of the sharp drop in absolute poverty in China and India as they adopted more market friendly policies.

How did the world escape the Malthusian trap that population growth leads to declining living standards? And was this escape a one-time fluke? It appears that the escape had two elements: shortages lead to price increases that motivate the search for alternative sources of supply and technological progress. With respect to the effects of price increases, it is important to distinguish between "reserves" and "resources". Reserves have been precisely documented *and* can be commercially recoverable using existing technology. The last part of this definition is critical. Resources are either unknown or not commercially viable using existing technology. The total amount of reserves plus resources of oil, gas, rare, metals, rock phosphate, etc. are by definition fixed – no more oil is being made – but the total known volume is just an estimate. As an example, it is estimated that at current rates of usage, natural gas reserves - recoverable using existing technology - will last 120 years. However, if the technology could be developed to tap all known resources of natural gas as well then, the supplies will more than double to over 250 years.[5]

Increases in the price of a scarce resource therefore have two effects. First, there are known resources that were not commercially recoverable at a lower price but are commercially viable at a higher price. In other words, at higher prices, resources are converted to reserves. Second, a higher price motivates exploration for additional resources.

An example of the first effect is the reaction to the higher oil prices in the 1970s that followed the formation of OPEC. Within a few years, world oil prices – adjusting for inflation - rose sharply from a few dollars a barrel to over $100 per barrel (Brent Blend) in 1979. The world economy reeled, and you may remember that there were a flood of editorials stating that the US and other oil importing nations must accept a future of either pay a large chunk of their national incomes to OPEC until the end of time or be prepared to "freeze in the dark". Some actually proposed military action to capture oil fields by force.

However, such radical and foolish options were not necessary. Higher prices led both to the exploitation of formerly unprofitable reservoirs as well as to a worldwide search for oil. There was increased drilling in the North Sea, Gulf of Mexico, and even the mountains of Colombia. In addition, there was a surprising increase in energy efficiency in factories and homes. As a result, oil prices – again adjusted by inflation - began to fall in 1981 until they reached $30 per barrel in 1988. The process of oil price increases leading to a search for alternative sources was repeated more recently. High oil prices in 2008-2013 made the initial oil/gas fracking efforts in the USA very profitable. The result has been the USA is now the world's largest oil producer and yesterday's oil price was only $58.22 per barrel compared to $110 in 2013.

One sees a similar pattern with the other resource shortages that have been announced. Within the last decade, a variety of commentators – many connected to international organizations or governments – have worried about looming shortages of phosphorus, potassium, lithium, the rare earth neodymium, and other resources. However, in each case rising prices or the expectation of higher prices has led to a successful search of alternative sources of resources or substitutes. In

[5] International Energy Agency (2011) *World Energy Outlook*

summary, the key element that is often missed is that available supply of any natural resource is, in part, a function of price. If the world price of oil is $15 per barrel, relevant oil reserves will be small since only Saudi Arabia and Iraq will pump oil since all other producers will lose money. But if oil is $100 per barrel, then the world was and will be awash in oil.

Technological progress is the second reason that the oft predicted impending resource and environmental disasters never quite seem to arrive. Examples are not hard to find. Norman Borlaug may have saved more lives than anyone else in history. There are an estimated 100 – 250 million persons in India, Mexico, Pakistan, and the Philippines that are alive today that would have probably died without his work. Borlaug's was responsible for two far reaching agricultural initiatives. First, he bred new varieties of crops that were more disease resistant, more productive, or more able to deal with environmental issues such as damaging wind or salt poisoning. His second initiative was more controversial. Borlaug insisted that governments in poor developing countries pay their farmers world prices for their crops. Many governments had previously required their farmers to sell grain at below market prices in order to provide cheap food for the more politically important urban population. The impact of these two initiatives was almost miraculous. Agricultural production rose leading to healthier populations and as the requirement for massive food imports decreased, developing nations experienced improved trade balances and greater food security. Borlaug earned the title of "father of the green revolution" and won the Nobel Peace prize for his work on agriculture in developing countries.

Less well known is George P. Mitchell. Mitchell in the late 1990s used a variety of techniques old and new to produce natural gas by horizonal drilling and fracking. This allowed the exploitation of natural gas deposits that had been identified decades before but, until Mitchell, could not be profitably accessed. The sharp increase in gas and associated petroleum liquid reserves as a result of these initiatives is rapidly turning the USA from a large energy importer to an energy exporter. In the process, it destroyed the "peak oil" story of energy production. Previous to the fracking revolution, it was widely believed that US energy production had peaked in the mid-1980s and that oil/gas fields in the USA would gradually be exhausted leading to lower and lower levels of energy production. Instead, US 2018 oil/gas production now exceeds the "peak" of the mid-1980s.

Will increased population, economic growth, and energy use lead to accelerated environmental degradation? The answer depends both on whether a clean environment is a "normal good" and whether a country's political-economic-social system pays attention to people's preferences. If the clean environment is what economists can a "normal good" then as incomes rise people want more of it. This appears to be accurate. If my family's income is $1,000 a year, then I really don't care about the environment – the only thing that is important is feeding my family. However, if my family income is $60,000, then achieving a clean environment becomes an important goal. If a clean environment is a normal good then one would expect high-income nations to have cleaner water, air, and soil then low-income countries. In fact, this pattern is generally true. And as per capita incomes are increasing in most nations of the world – including those in sub-Saharan Africa – one would expect greater concern about the environment and cleaner water, air, and soil.

However, if a government refuses to listen to the desire of its people for a better environment then this natural process can be blocked. Democratic market economies tend to do a better job of developing and enforcing environmental regulations than undemocratic command economies. One reason is the existence of a hierarchy. In most democratic market economies, it is accepted that the government through the democratic process sets the rules and market participants are expected to follow them. A business in America can appeal an EPA decision but if it loses the appeal then it must obey or face financial or other sanctions. However, in command economy, the hierarchy of authority is different. The minister of heavy industry and the minister of the environment are often bureaucratic equals. As a result, environmental rules and their enforcement are the subject of negotiation and political maneuvering. If the minister of heavy industry is more powerful in the bureaucracy, then he or she can safely ignore the decisions of the minister of the environment. Therefore, one would expect that there would be more pollution of air, water, and soil in countries with weak democratic processes and command/socialist economies. This seems to be true. Eight of the nine most polluted cities in the world are in such countries.

Where does this leave the USA? As a reasonably democratic, reasonably market-oriented country; one would expect substantial progress towards a clean environment. Since the Clean Air Act of 1970 was passed, the US economy has grown a great deal and now has more people, higher average incomes, uses more energy, and drives more miles in more vehicles. And yet, there has been a substantial decline in atmospheric lead, sulfur dioxide, nitrogen oxide, carbon monoxide, ozone and particulate matter. The air we breathe is much cleaner[6] and similar stories can be told about the quality of soil and water. As a symbol of the progress, Ohio's Cuyahoga River no longer catches fire!

How about carbon dioxide (CO2) which is the most important long-lasting greenhouse gas contributing to global warming? When President Trump withdrew from the Paris Greenhouse Gas Agreement, there was fear that this would lead to a sharp rise in CO2 produced in the USA. To the consternation of the environmental movement, something that they didn't expect occurred. In 2017, US production of CO2 *decreased* by over 40 million tons – the largest decrease in the world. During the same period, the European Union and most of the other signatories of the Paris Agreement actually experienced increases in CO2 emissions. The two worst offenders were India, which experienced over a 90 million ton increase, and China, almost 120 million tons.[7]

Your own writings as well as several of the very interesting articles that you sent to me are predicting imminent disaster if people or governments do not act immediately and aggressively. Such arguments from Global Footprint Network, The Club of Rome, and others would be more credible if they explained why previous predictions of disaster did not occur. A few examples of erroneous predictions:

[6] In fact, in 2018, the World Health Organization stated that the USA has cleaner air than Germany, Italy, Switzerland, the UK, Japan, Austria, and France. The only rich country with cleaner air is Canada.
[7] International Energy Agency (2018) *Global Energy and CO2 Status Report, 2017*

1968 Paul Ehrlich *The Population Bomb:* United Kingdom has about a 50% chance of surviving until the year 2000. I was in London last month and the UK is still there and there were no food riots in the streets.

1970 Harvard Biologist George Wald: Unless immediate action taken, civilization will end in 15-30 years. Civilization is still here.

1970 Paul Ehrlich: 100-200 million people will die of starvation by 1980. 200 thousand will die from smog in New York City and Los Angeles. There was starvation during this era but the primary causes were political oppression and conflict not regional food shortages. The mass smog deaths in NYC and LA did not occur.

1970 Earth Day Organizer Denis Hayes: It is already too late to avoid mass starvation. Mass starvation has not occurred yet but, since Hayes was smart enough not to predict a date for this starvation to begin, he can't be said to be wrong.

1970 *Life Magazine*: By 1980, city dwellers will have to wear gas masks. By 1985, sunlight will be cut in half by air pollution. Didn't happen.

1972 Club of Rome *Limits of Growth*: out of control population growth would mean world would run out of food, minerals, forests, water, and energy in the foreseeable future. Forty-six years later and these adverse events have not yet happened.

1974 OPEC: Future oil prices will be $100 - $200 a barrel. If these predictions are adjusted for inflation then current oil prices should be over $300. On November 29, 2018; the price of Brent Blend oil was $58.22 a barrel.

1980 President Carter *Global 2000 Report:* Life on earth getting worse in every way. Did not happen. Life expectancies generally increased, caloric increase up, and poverty down.

1980 Environmental pessimist Paul Ehrlich bet environmental optimist Julian Simon that basic metals would face severe shortages and therefore higher prices. In 1990, Ehlich admitted that he had lost and paid Simon $576.07.

1992 Union of Concerned Scientists *World Scientists' Warning to Humanity: "*No more than one or a few decades remain before the chance to avert the threats we now confront will be lost and the prospects humanity immeasurably diminished." It is now 26 years later and the UCS is still sending out exhortations even though according to their 1992 analysis, the opportunity to avert disaster has probably passed.

2000 United Nations: There will be 50 million environmental refugees by 2010. Didn't happen.

And there have been many more recent predictions of population, energy, environment, etc. disaster but it is too early to tell whether they will turn out to be true or not.

In view of the many failed predictions over the last fifty years, why should we have confidence in new predictions of doom? If the previous predictions were based on the wrong data or flawed analysis, then let us discuss the mistakes, so we can learn to do a better job on new predictions. But rather than concede previous errors, organizations such as Union of Concerned Scientists and the Club of Rome simply push out the date of doom. It is beginning to sound like cults that predicted the rapture at midnight on December 31, 2000. And when midnight came without the event, they claim that they really meant December 31, 2010; or was it 2020, etc.

Final Comments

Overall, I find your analysis to be interesting but incomplete. You assume the truth of something – that the world is already past the point of no return - that is not obviously known to be true. And disparage anyone who disagrees!

Also, you seem to ignore history that contradicts your thesis that current trends must lead to destruction. For example, your first bullet states that resources are limited. This statement is both true and, as discussed above, irrelevant. Since the Industrial Revolution began over 250 years ago there have been numerous resource constraints that threatened to bring the progress of civilization to a halt. And yet the only resource not subject to diminishing returns – human creativity – continually came up with new ways to relax the binding constraint. I think that it is arrogant to assume that the current generation is less creative than previous ones. This argument might seem to depend on hope or magic to rescue humanity from its errors. But I think that it reveals an important truth. I accept it is crucial that we think carefully about such important topics. And develop a plan to deal with problems as they arise. However, the future is always unknown and will always surprise us. To quote a great General, a good US President, and a minor Philosopher, Ike Eisenhower: "Plans are worthless, but planning is everything."

On a personal note, I deeply disagree with your statement that justice and morality must take second place to the saving of civilization. Equally offensive is where you seem to compare having more than one child as equivalent to murder. Since you are an educated man, I assume that these remarks don't represent your honest opinion but rather you used these remarks as a rhetorical device to spark serious interest in an important topic. However, as a retired US Marine, I'm not sure that a civilization without morality and justice is worth saving. In the last hundred years, the USA has fought hot and cold wars against several nations that sent hundreds of millions to die horribly in camps because they believed their survival was more important that morality and justice.

Once again, thanks for the opportunity to read your writings on the environment!

Best,

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