The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Why Malthus Got His Forecast Wrong

Posted by Gail the Actuary on January 11, 2013 - 5:38am

Most of us have heard that Thomas Malthus made a forecast in 1798 that the world would run short of food. He expected that this would happen because in a world with limited agricultural land, food supply would fail to rise as rapidly as population. In fact, at the time of his writing, he believed that population was already in danger of outstripping food supply. As a result, he expected that a great famine would ensue.

Most of us don't understand why he was wrong. A common misbelief is that the reason he was wrong is that he failed to anticipate improved technology. My analysis suggests that there were really two underlying factors which **enabled the development and widespread use of technology**. These were (1) the beginning of fossil fuel use, which ramped up immediately after his writing, and (2) a ramp up in non-governmental debt after World War II, which enabled the rapid uptake of new technology such the sale of cars and trucks. Without fossil fuels, availability of materials such as metal and glass (needed for most types of technology) would have been severely restricted. Without increased debt, common people would not have been able to afford the new types of high-tech products that businesses were able to produce.

This issue of why Malthus's forecast was wrong is relevant today, as we grapple with the issues of world hunger and of oil consumption that is not growing as rapidly as consumers would like– certainly it is not keeping oil prices down at historic levels.

What Malthus Didn't Anticipate

Malthus was writing immediately before fossil fuel use started to ramp up.

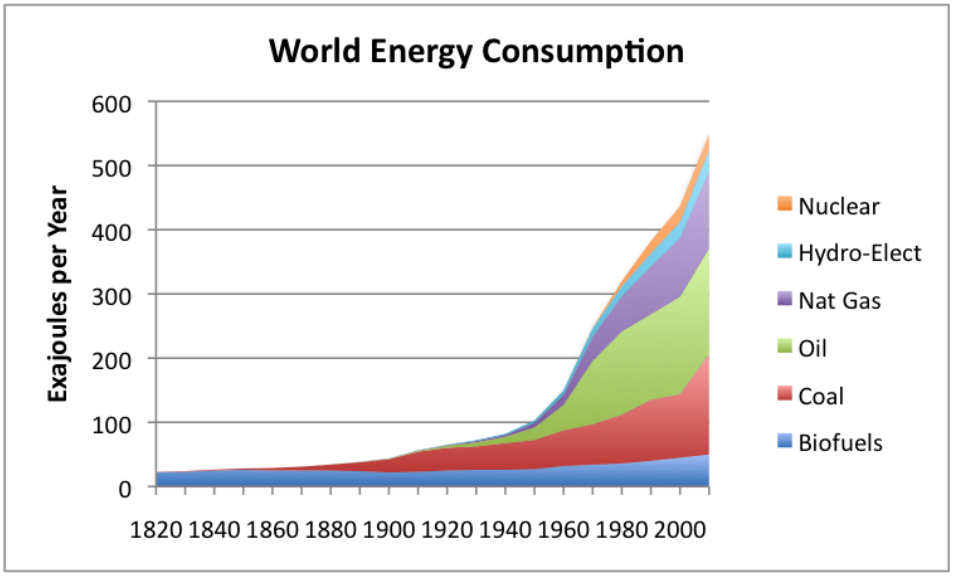

Figure 1. World Energy Consumption by Source, Based on Vaclav Smil estimates from Energy Transitions: History, Requirements and Prospects and together with BP Statistical Data on 1965 and subsequent

The availability of coal allowed more and better metal products (such as metal plows, barbed wire fences, and trains for long distance transport). These and other inventions allowed the number of farmers to decrease at the same time the amount of food produced (per farmer and in total) rose. On a per capita basis, energy consumption rose (Figure 2) allowing farmers and others more efficient ways of growing crops and manufacturing goods.

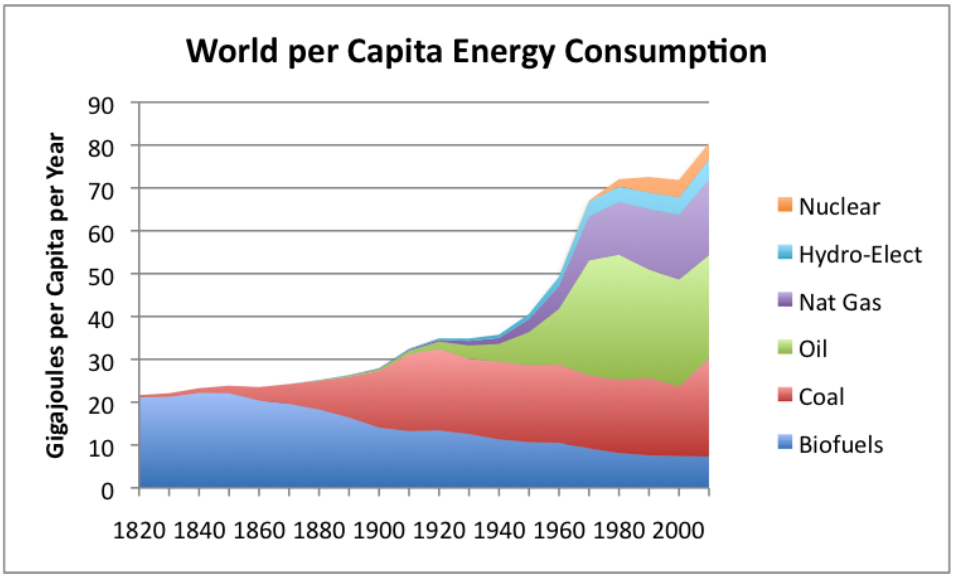

Figure 2. Per capita world energy consumption, calculated by dividing world energy consumption (based on Vaclav Smil estimates from Energy Transitions: History, Requirements and Prospects together with BP Statistical Data for 1965 and subsequent) by population estimates, based on Angus Maddison data.

If it hadn't been for the fossil fuel ramp up, starting first with coal, Malthus might in fact have been right. As it was, population was able to ramp up quickly after the addition of fossil fuels.

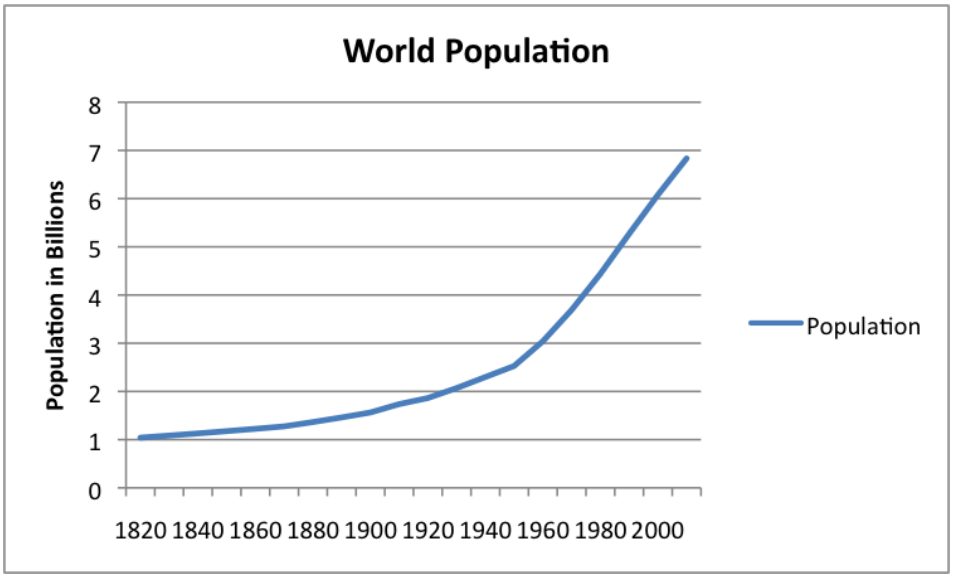

Figure 3. World Population, based on Angus Maddison estimates, interpolated where necessary.

A person can see that there was a particularly steep rise in population, right after World War II,

in the 1950s and 1960s (Figure 3). This is when oil consumption mushroomed (Figure 2, above), and when oil enabled better transport of crops to market, use of tractors and other farm equipment, and medical advances such as antibiotics. The Green Revolution allowed agricultural production to expand greatly during this period. It used fossil fuels (particularly oil and natural gas) to enable the synthetic fertilizers, irrigation, hybrid seed, herbicides and pesticides, allowing increased food production.

It is likely that increased consumer and business debt following World War II (Figure 4) also played a role in the post-World War II ramp up.

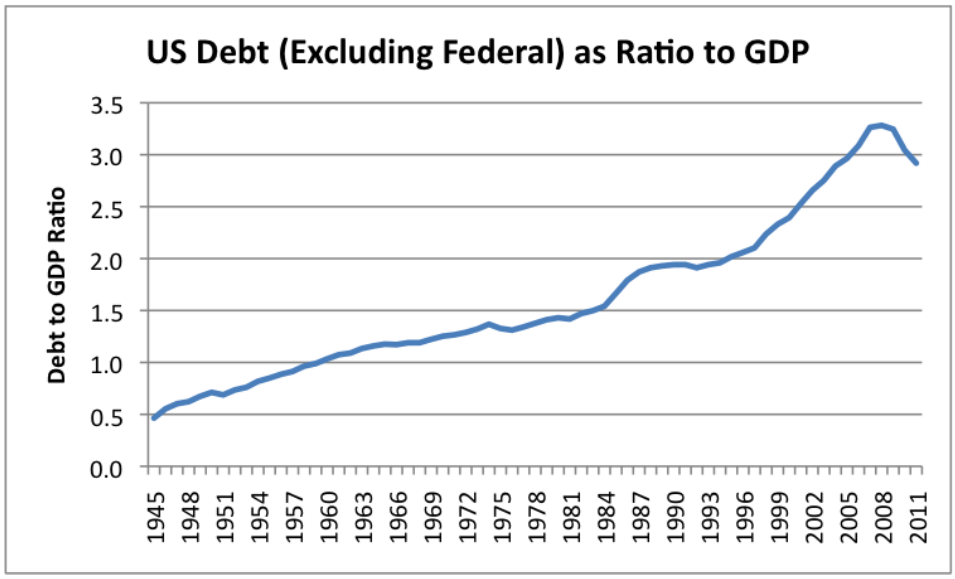

Figure 4. US Debt excluding Federal Debt as Ratio to GDP, based on Z1 Debt data of the Federal Reserve and GDP from the US Bureau of Economic Analysis.

The reason I say that debt likely played a role in this ramp is because at the end of World War II, people were, on average, pretty poor. The United States had recently been through the Depression. Many were soldiers coming back from war, without jobs. Without a ramp up in factory work and related employment, many would be unemployed. A ramp up in debt fixed several problems at once:

- Allowed low-paid workers funds to buy new products, such as cars, that used oil
- Allowed entrepreneurs funds to set up factories
- Allowed pipelines to be built, and other support for ramped up oil extraction
- Provided jobs for many coming home from the war effort

The debt ramp up, and the resulting increase in oil production, raised living standards. Figure 2 shows that the increase in per capita energy consumption was far greater in the 1950 to 1970 period when oil production was ramped up than in the coal ramp-up between 1840 and 1920. The long coal ramp-up period does not appear to have been accompanied by such a big ramp-up in non-governmental debt.

Tentative Conclusion

A tentative conclusion might be that as long as we can keep ramping up availability of energy products and debt, Malthus's views are not very relevant.

Of course, things aren't looking as benign today. World oil production has been close to flat since about 2005 (Figure 5).

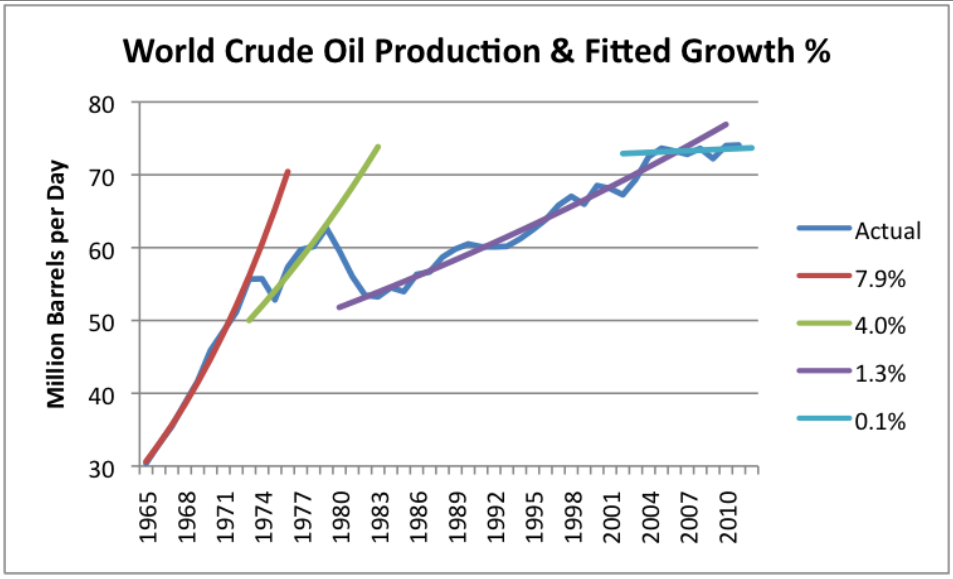

Figure 5. World crude oil production (including condensate) based primarily on US Energy Information Administration data, with trend lines fitted by the author.

The world has been able to increase production of other fuels to compensate so far. Unfortunately, the big increase is in coal (Figures 1 and 2). This mostly relates to growth in the economies of Asian countries, which are large users of coal.

The cost of oil has more than tripled in the last ten years. The higher cost of oil is a problem, because it leads to recession, unemployment, and governmental debt problems in oil-importing countries. See my posts High-Priced Fuel Syndrome, Understanding Our Oil-Related Fiscal Cliff, and The Close Tie Between Energy Consumption, Employment, and Recession.

Continued increase in debt now seems to be running into limits. Federal government debt is in the news every day, and non-government debt seems to be contracting relative to GDP, based on Figure 4.

Looking Ahead

I am not sure that we can conclude that we are headed for catastrophe the day after tomorrow, but the graphs give a person reason to pause to think about the situation.

The reason I write posts is to try to pull together the big picture. If we only look at the latest new item forecasting huge increases in tight oil production or talking about 200 years of natural gas, it is easy to reach the conclusion that all of our problems are past. If we look at the big picture, they clearly are not.

Debt problems are closely related to high oil prices in recent years. Debt problems are today's issue, and they are not being considered in the huge oil and gas forecasts we see everywhere. The new tight oil and the new shale gas resources likely will need to be financed by increasing amounts of debt, so there is a direct connection with debt. There is also an indirect connection, through governmental debt problems, higher taxes, and the likely resulting recession (leading to lower oil prices, perhaps too low to sustain the high cost of extraction).

Also, it is interesting that the supposedly huge increases in US oil supply don't really translate to any discernible bump in world oil supply in Figure 5.

We know that the world is finite, and that in some way, at some point in the future, easily

extractable supplies of many types of resources will run short. We also know that pollution (at least the way humans define pollution) can be expected to become an increasing problem, as an increasing number of humans inhabit the earth, and as we pull increasingly "dilute" resources from the ground.

Based on earth's long-term history, and on the experience of other finite systems, it is clear that at some point, perhaps hundreds or thousands of years from now, the earth will cycle to a new state–a new climate with different dominant species. It may turn out that these new species are plants, rather than animals. The new dominant species will likely ones that can benefit from our waste. Humans would of course like to push this possibility back as long as we can.

At this point, my goal is to pull together a view of the big picture, in a way that other analysts usually miss. The picture may not be pretty, but we at least need to understand what the issues are. Is the shift in the cycle very close at hand? If so, what should our response be?

This article originally appeared on Our Finite World here.