Don’t expect the world economy to resume its prior growth pattern after COVID-19

Most people seem to think that the world economy is going through a temporary disruption, caused by a novel coronavirus. As soon as COVID-19 goes away, they expect the economy will be back to normal. I think that this assessment is overly optimistic. The way I see the situation, the world economy was already having severe growth problems, caused indirectly by resource problems, even before COVID-19 hit.

In a growing world economy, a person might expect that workers would be getting richer, so that they could afford an increasing quantity of goods and services. What we really see is something very different. The number of new automobiles sold was falling in many major countries long before COVID-19 hit, even as population was generally rising. Clearly, something was seriously wrong.

As I see the situation, the world has a resource problem. Resources of many kinds, including fresh water, energy products, and minerals of many kinds were becoming more difficult (and expensive) to extract, even before 2020. Substitution might have worked if the problem were only one or two resources, but not with several major resources. Cutting back was the only answer.

Thus, the shutdowns for COVID-19 came at a convenient time, allowing economies that were already doing poorly to shut down. Needless to say, there was no world leader who was willing to explain this hidden issue to the world population. Instead, world leaders used standardized code words such as “we need to move to renewables” or “we need to reduce carbon use by 2050 to prevent climate change.” Unfortunately, the ability to move to alternatives...
in this time frame is simply an illusion, allowing world leaders to avoid mentioning the serious resource issues that the world economy is really facing.

I expect that within a few months, a new crisis of some sort (perhaps financial) will come along, further reducing resource use. This will happen, whether or not the problem of the novel coronavirus is solved. In this post, I will try to explain the situation.

[1] The world’s economy is a self-organizing system, powered by the laws of physics. It requires a mix of resources, including energy resources, to operate.

The laws of physics require that energy be “dissipated” whenever activities we associate with generating GDP take place. For example, if a person is to drive a truck, he/she will need to eat food for his/her own personal energy. This food is “dissipated” by digestion. If the truck is to transport goods, it will need to burn some type of fuel, such as diesel. This fuel is dissipated by burning. If a computer is to operate, it will need to dissipate electricity. If a room (or a liquid) is to be heated or cooled, some sort of energy dissipation will be required.

The world economy grows in a very orderly manner. It gradually adds population, as more babies are born than people die. All of these people need food and fresh water; they also need some type of housing and clothing to protect them from the elements. Ideally, they need some type of transportation in addition to walking. Businesses are formed to enable access to goods and services that fill these needs. Governments are also formed to provide services used by all and to regulate the system. A financial system is formed to facilitate transactions, among other things.

The world economy cannot slow down and quickly restart. This is especially the case for an economy that had already started slowing, even before the 2020 pandemic. If not enough resources of the right kinds were available to enable true economic growth before the pandemic, it is hard to see how the situation would be very much improved a year later.

One key to understanding how a self-organizing economy works is to understand that the economy is multi-sided. Businesses need to make an adequate profit, to continue in operation. Workers need to earn an adequate wage to raise a family. Customers need affordable prices. Shortages of inexpensive-to-extract resources can lead to many different problems: lack of profitability for producers, or too much wage disparity among workers, or too high prices for customers. Resource shortages can also lead to people with inadequate wages wanting to migrate. They can also lead to empty shelves in stores.

[2] Depleted coal mines near population centers in China have adversely affected the Chinese economy more than it tells the outside world.

China joined the World Trade Organization (WTO) in December 2001. The Kyoto Protocol mandated that 37 industrialized nations cut their greenhouse gas emissions. More than 100 developing countries, including China and India, were exempt from the treaty. This combination of events allowed China to greatly ramp up its economy, building many new roads, factories and housing units from concrete, with little competition from the 37 industrialized economies.

China had very large coal resources, which it ramped up (Figure 2). Of course, this greatly increased world coal consumption, an effect precisely the opposite of the stated purpose of the Kyoto Protocol—to reduce world CO2
emissions.

The problem that China ran into about 2013 was that its coal mines, especially those near population centers, began depleting. The cost of extraction started rising because the thickest coal seams, closest to the surface, were badly depleted. In theory, there was still a great deal more coal available from those mines if the price would rise sufficiently high. Coal from new mines that were more distant from population centers might also be used if the price would rise high enough to include overland transport costs.

Coal prices didn’t rise to match the higher cost of production. If they had risen, they would have raised the cost of many goods manufactured for export, making these industries less profitable. Because coal prices stayed too low for coal producers, over 70% of China’s coal companies were reported to be unprofitable by the first half of 2014.

China closed unprofitable mines and added new mines at more distant locations. China’s coal production has struggled in recent years. A constant problem has been keeping coal prices high enough to cover the rising cost of extraction and delivery to population centers. There are recent indications that coal supply is inadequate: Parts of China experienced rolling blackouts in the winter of 2020-2021, and warnings have been given to expect possible electricity shortages this summer. China has been accepting few coal imports, largely because it wants to keep its local prices sufficiently high that its own coal producers can be profitable.

China uses coal in many ways, including generating electricity, making steel, and manufacturing cement, which is the most important ingredient in concrete. Concrete is used in producing roads, bridges and buildings of all types, including high rise buildings used in many places in China.

Figure 3 shows that China’s cement production fell at a time similar to that at which coal production “flattened out.” This would not be surprising if a shortage of coal led China to cut back on its use of cement in order to save coal for electricity production.
China, like other countries, has been seeing its population rise. Figure 4 shows coal and cement amounts for China on a per capita basis. This approach shows that, viewed on a per person basis, both coal consumption and concrete production have been falling since about 2013-2014. In fact, coal consumption began to fall slightly before cement production, suggesting that the fall in coal consumption is the cause of the fall in cement production.

[3] A decrease in new home building in the United States after 2008, as well as the recent difficulty in ramping construction back up again, are further evidence that the world is reaching resource limits of some kind.
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Figure 5. New US privately owned single-family housing units divided by US population, multiplied by a constant. This gives a measure of per capita growth in new single-family housing units. Chart prepared by the St. Louis Federal Reserve.

Figure 5, above, shows that the number of new single-family housing units, relative to population, dropped dramatically after late 2005, early 2006. (This was when US Federal Reserve target interest rates rose, leading to higher borrowing costs for both builders and purchasers.) New home building plunged before and during the Great Recession. Building of new units has not ramped up very much, since then.

Even in 2020 and early 2021, the number of new units being started is very low by historical standards. It certainly wouldn’t be surprising if a lack of resources is part of what is depressing new home production. It may also be causing the spurt in resource prices (for example, lumber and copper) when new-home production does try to ramp up.

[4] World oil production seems to be falling for the same reason that China’s coal production stopped growing: Prices are too low for producers because of depletion issues. Oil producers cannot make an adequate profit, so they are reducing production.

World crude oil production was at its highest level ever in 2018. It has fallen ever since.
Figure 7 shows that oil production has been falling in many parts of the world in recent years.

The shining star of crude oil production, at least until recently, has been the United States with its shale oil production.

Unfortunately, with low prices, US shale oil is unprofitable. Shale production fell in 2020, and indications for the year 2021 are down as well.

Worldwide, the oil industry seems to require a price of $120 per barrel or more to make investment in new production profitable, and current prices are far below this. Part of this high price is required to provide adequate tax revenue for oil exporting countries that are dependent on this revenue.

Figure 9 shows that on a per capita basis, combined oil and coal consumption reached its highest level in 2007 and dipped during the Great Recession. It reached somewhat of a plateau in the 2011 to 2013 period, but started slipping in 2014 and had fallen ever since. Those who follow oil prices closely will notice that combined oil and coal consumption per capita tends to be high when oil prices are high relative to other goods; consumption tends to be low when oil prices are low. The lower per capita oil and coal consumption since 2007 would be expected to hold back the production of “goods” of many kinds, including houses, automobiles, roads and electrical transmission lines.

The “All Other” category is really not a stand-alone category. It depends on oil and coal for its pipelines and electrical transmission, among other things. Without concrete bases, it would be difficult to have wind turbines. Solar panels without steel supports wouldn’t work well either. In theory, if a huge amount of transition were done, perhaps steel and concrete could be produced in reasonable quantities with only the “All Other” types of energy, but someone would need to figure out precisely how this could be accomplished, including the timeframe required.

[6] Inadequate fresh water supplies are a problem in many parts of the world.

The standard approach to getting fresh water has been to tap underground aquifers and tap them at rates far greater than they are refreshed. In some places, this leads to saltwater intrusion; in others, it leads to a falling water table. Some examples of areas with water problems include California, Saudi Arabia, India, China, and Cuba.

There are ways to work around these problems:
- Digging deeper wells
- Piping fresh water from a distance, nearly always uphill
- Desalination

Implementing any of these workarounds for water shortages takes energy of different kinds, mostly coal (to make steel) and oil (for transporting goods and extracting metal ores). These workarounds make the cost of fresh water higher. Higher water costs are especially a problem for agriculture and for poor families, struggling with budgets that cover little more than the price of food and water.

If fixes for the fresh water supply problem cannot be found, irrigation will need to be cut back. Such a change would likely lead to a fall in world food supply.

[7] **We are probably kidding ourselves if we think that production of semiconductor chips can be ramped up significantly in the future.**

China is now a major producer for rare earth minerals, and it is practically the only processor of rare earth minerals. Semiconductor chips are created using rare earth minerals, water and huge amounts of heat in an exceptionally clean environment. The leading producer of chips is Taiwan, using raw materials from China. There is a long lead time required for building new factories. My concern arises because of the resource issues China and the rest of the world is facing.

We use semiconductor chips in many things, including computers, cell phones, automobiles and “smart” appliances. Without a ramp up in semiconductor chip production, many high-tech dreams for the future will likely remain only dreams.

[8] **With a falling supply of coal and oil per capita and inadequate fresh water in many parts of the world, we have already reached the point where some types of “optional” activities need to be cut back.**

An early optional activity that was cut back on was recycling. Oil prices fell in 2014, making the recycling of many types of goods, especially plastics, non-economic because the resale value of recycled products dropped with oil prices. China cut back greatly on its recycling efforts, effective January 1, 2018. Other countries have followed suit. China’s cutbacks on recycling allowed it to save its coal supplies (which were no longer growing, see Figures 2 and 4) for other activities that had the possibility of being more profitable.

In early 2020, cutbacks associated with the pandemic gave the world economy some “breathing room” with respect to resource shortages. Cutbacks in travel left more oil for other uses. Oil prices could drop back. This was especially helpful to countries that are big importers of oil, such as those in Figure 10, below. It is not surprising that some of the countries with the biggest oil import problems have been the most enthusiastic about travel cutbacks related to COVID-19.
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The world economy has a very serious resource problem. There seem to be three different approaches to hiding the problem, none of which will really solve the problem.

The serious problem that the world economy is encountering is the fact that the supply of both coal and oil are running short, especially when viewed on a per capita basis. The world is also very short of fresh water. China is affected as much, or more than, other countries by these problems. As a result, China’s future growth prospects are likely quite low, even though few are expecting this change. Without a continued strong forward “pull” from China, the world economy may be headed for “collapse,” a condition which has affected many civilizations in the past.

There seem to be three different approaches to doing something about the world’s resource limits problem, without mentioning the nature of the real underlying problem:

[a] Develop a “fear of future climate change” story by creating models that assume we have huge amounts of fossil fuels that can be burned in the future, even though the evidence is very much the opposite: We are “running out” of coal and oil right now, but in a different way than economists have theorized (low price, rather than high price). At the same time, argue that a transition to renewables (particularly intermittent wind and solar) is possible in the next 30 years. The fact that essential minerals for such a change, including copper and lithium, are themselves in short supply relative to the incredibly large quantities required, is overlooked. No one stops to calculate the true cost, measured in energy products and other materials, required by such a transition, either.

[b] Create a “fear of the coronavirus” story, and use it to keep people inside and away from traveling as much as possible. Emphasize the possibility of mutations. If people cut back on traveling, it saves oil. If they cut back on eating out and large celebrations such as weddings, it reduces food wastage. If a pandemic takes place, politicians can use it as an excuse to mitigate problems of many kinds:

- Reduce the need for imported oil, by keeping citizens at home
- Keep factories closed, without disclosing that the factories could not really operate at full capacity because of inadequate orders or missing raw materials
- Use shutdowns to keep order in areas disrupted by uprisings related to low wages
- Hide the problem of many failing stores and businesses behind a new “temporary” problem
- Give the politician a new sense of control with new rules related to the epidemic

It is disturbing that back in 2010, the Rockefeller Foundation was looking at using pandemics to control people when the foundation was examining possible workarounds for too large a population relative to resources.

[c] **Hide the existing resource problem with more debt, to the extent possible.** In fact, having a circulating coronavirus has assisted in this effort because everyone can see the need for more debt on a temporary basis, “until this problem goes away.” Of course, the resource problem is not going away, which means the world is likely headed for serious financial problems when the economy tries to ramp up again. See my post, *Headed for a Collapsing Debt Bubble.*

[10] **My expectation is that the world economy will try to bounce back from this pandemic, but it won’t really be able to bounce back.**

There really aren’t enough resources of any kind to pull the world economy much farther forward. A day of reckoning seems to be coming, probably in the next few months. The financial system looks like it is the weakest link. If the world economy dramatically slows, borrowers will not be able to repay debt with interest. There may be rapid shifts in currency relativities, disrupting derivatives markets. International trade will become less and less possible, perhaps taking place only among a few trusted partners.

We seem to be headed for a rapidly changing world economy, and unfortunately not for the better.

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**About Gail Tverberg**

My name is Gail Tverberg. I am an actuary interested in finite world issues - oil depletion, natural gas depletion, water shortages, and climate change. Oil limits look very different from what most expect, with high prices leading to recession, and low prices leading to financial problems for oil producers and for oil exporting countries. We are really dealing with a physics problem that affects many parts of the economy at once, including wages and the financial system. I try to look at the overall problem.  

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