

# GMO

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VIEWPOINTS

## EXECUTIVE SUMMARY

As a species, we must make the jump to full sustainability. Decarbonizing our economy will be spectacularly resource intensive, and all key commodities required are finite in supply. Russia's desperate attack on Ukraine makes everything more unpredictable but for one certainty – this war will increase the pressure on raw materials in the short term. It serves as a reminder more broadly that we will have to innovate around the bottlenecks, shortages, price spikes, and climate damage that are almost certainly coming our way so that we might survive to tell the tale.

# PUTIN'S INVASION REMINDS US THAT WE LIVE IN A FINITE WORLD

## *In Which Resource Prices Tend to Rise*

*Jeremy Grantham* | April 2022

### *Introduction*

Spaceship Earth, together with its local galaxies, is speeding through our part of the universe at over 600 miles per second. The good news is that no Klingon battle cruisers have yet appeared. The bad news is that there are no space stations that we can stop at for repairs and supplies. We have only the limited resources that we carry with us. Some of these can be recycled, but many, including metals and fossil fuels, once used cannot be reconstituted and often become damaging waste. Our natural habitat on Spaceship Earth is incredibly complex but almost perfectly suited to our species. It is, though, extremely sensitive to misuse and has been easily and substantially damaged. Our spaceship, like every spaceship, has a limited carrying capacity for not only resources but also the people using them. A challenge to our particular spaceship is that on our bridge there is no commander and there are no rules. Our species, as it learned to survive over millennia, has adopted a style of "get what you need now by any means possible!" There has been no incentive to worry about the distant future, and so we don't. Our current attitude has been described by Kenneth Boulding as "cowboy economics," driven by the spirit of the limitless frontier, where we shoot (or drill) first and ask about consequences later. Regrettably this natural response must change, and change fast, for finally after a few hundred thousand years we are approaching our limits to physical growth. Perhaps we are already into our last doubling in resource use, having doubled many, many times before. We must now make the jump to full sustainability, or Spaceship Earth as a haven for our species will come to a sticky end.

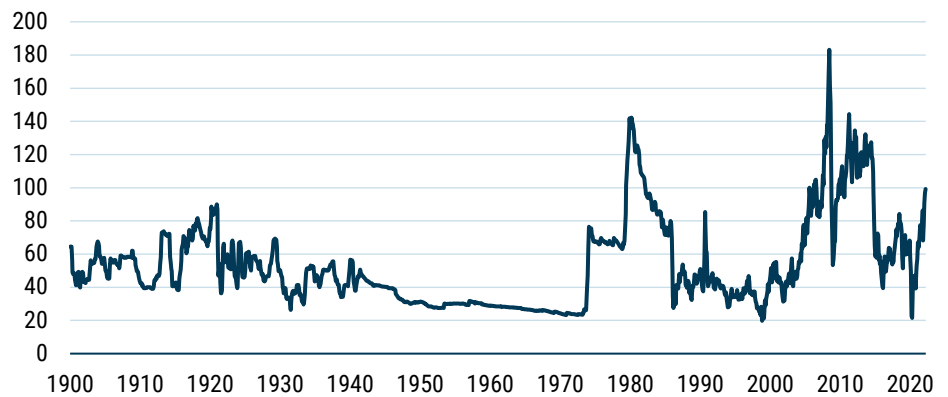
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"Anyone who believes that exponential growth can go on forever in a finite world is either a madman or an economist." - Kenneth Boulding

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The simple fact, often ignored, is that all key commodities required by the modern economy are finite in supply, and the cheapest and best have gone first. There is still plenty of oil in the Earth's crust, but the best resources have gone: where simple gushers once were common, we now ingeniously torture the solid rock – euphemistically known as shale – or drill miles below the deep seabed offshore Brazil. As a result, the real price trend of oil has reached 3 or 4 times its 1965 level in spite of incredible innovation by the energy industry. This is shown in Exhibit 1. Oil was the first important commodity paradigm shift, breaking out of a long flat trend back in the early 1970s, with its price trend rising as the prices of other commodities continued to fall. In this sense it was the canary in the mine for other commodities, whose prices also began to rise about 30 years later.

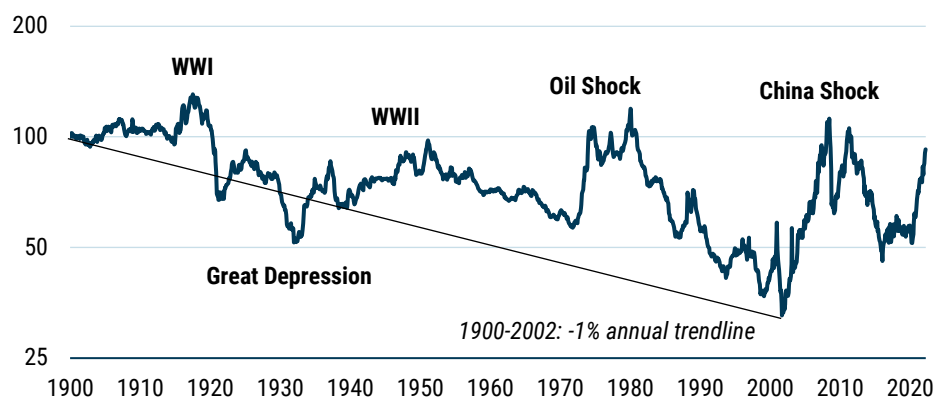
## EXHIBIT 1: REAL PRICE OF WTI CRUDE OIL, IN 2022 \$



As of 3/31/2022 | Source: Global Financial Data, GMO

This is shown in Exhibit 2, GMO's graph of 36 important commodities equally weighted. This shows the original 100-year decline interrupted in only three exceptional circumstances. But after the year 2000, the trend changed and prices began to rise under the pressure of unrelenting growth in China, whose global share of important commodities, like iron ore, cement, and coal, rose to 50% by 2013 from around 5% in 1980, by far the most impressive leap in history.

## EXHIBIT 2: GMO COMMODITY INDEX



As of 3/31/2022 | Source: Global Financial Data, GMO

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*But many of the most important industrial metals are extremely scarce, and the best deposits have already been consumed.*

Thankfully, many vital resources are fully recycled by nature: think of water evaporating from the most polluted sludge and falling as pure rain, often exactly where we need it. Even a few of our finite resources are fortunately not at all rare. For instance, iron and aluminium are abundant enough to supply civilization for millennia to come (although their particularly energy-intensive production must urgently be decarbonized). But many of the most important industrial metals are extremely scarce, and the best deposits have already been consumed. The average ore grade of active copper mines, for example, is estimated to have fallen from about 2.5% 100 years ago to about 0.5% today. Nickel, lithium, cobalt, and copper are all essential to the modern

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*I believe the long demand surge of global development will drive repeated commodity boom cycles for many decades to come.*

economy – and particularly critical for decarbonizing industry – but each makes up only 0.002% to 0.006% of the Earth's crust, compared to iron at 5% and aluminium at 8%.

Meanwhile, the population of the developing world is still growing rapidly, and these countries will want to emulate China. Everyone wants to be richer, and richer has historically meant multiples of resource intensity, with energy in particular being closely tied to the growth rate. Consequently, I believe the long demand surge of global development will drive repeated commodity boom cycles for many decades to come.

And now, as we are faced with the urgent, even existential need to decarbonize the economy, we should realize a major and unexpected irony: large-scale deployment of windmills, solar farms, and transmission lines will be spectacularly resource intensive. It is for precisely those metals which are most constrained that the coming demand expansion will be the most unprecedented. The electric vehicle (EV) industry, for example, is likely to consume 15 times the current annual global lithium supply by 2050! And the energy situation is just as bad and even more underappreciated. Nearly all of the investment to generate 30 or 40 years of power from a wind or solar farm is up front – whether measured in money, resources, or energy. Even basic measures like insulating homes require real investment first with their payoff later. Perhaps the last great irony of the fossil fuel era will be that going off fossil fuels in the long run will require using one more spurt of fossil fuels in the short run. The quicker we convert our power grid, the worse the energy squeeze will be, and we cannot risk moving slowly. Only afterwards will fossil fuel prices decline – led by oil, which will be hit by the rapid rise of EVs, and followed later by gas and coal, which will at first be needed to meet the spike in electricity demand from these EVs (and other electrification) and whose prices will likely top out several years after oil.

Suddenly we have been confronted by Russia's desperate attack on Ukraine. We know nothing about the length and severity of this war and even less about its consequences, which could range from a positive reset to international relations if we're very lucky to the use of nuclear weapons (we pray not) if we're very unlucky. This attack takes an already sensitive world, dealing with interest rates and inflation rising and with extremely high asset prices beginning to wobble, and makes everything even more unpredictable.

A rare certainty though – already being seen – is that this war will increase the pressure on raw materials. We notice fuel the most, but food may be the most dangerous to global stability. The invasion has caused the price of wheat, corn, vegetable oil, and fertilizer to rise rapidly from a level that was already at a record, according to the UN FAO's Food Price Index. And whenever commodity prices rise, incomes are squeezed while costs rise, destabilizing economies and even political systems. Ukraine and Russia together make up over a quarter of global wheat exports, and the harvesting of Ukraine's wheat in two months is obviously at extreme risk. Egypt, which is particularly dependent on wheat, imports over half its wheat from the two countries. It is worth remembering that the chant going into Tahrir Square in the Arab Spring was “Bread, Freedom, Dignity.”

Russia also has a large share of the world's export of both potassium (potash) and phosphorus (phosphate), without which inputs the productivity of most modern agriculture rapidly falls below commercial viability. This coming growing season will definitely be affected by shortages and higher prices of fertilizers, particularly in Africa, which is least able to afford it and is by far the most dependent on fertilizer supplies from Russia in particular.



### **Jeremy Grantham**

Mr. Grantham co-founded GMO in 1977 and is a member of GMO's Asset Allocation team, serving as the

firm's long-term investment strategist. He is a member of the GMO Board of Directors and has also served on the investment boards of several non-profit organizations. Prior to GMO's founding, Mr. Grantham was co-founder of Batterymarch Financial Management in 1969 where he recommended commercial indexing in 1971, one of several claims to being first. He began his investment career as an economist with Royal Dutch Shell. Mr. Grantham earned his undergraduate degree from the University of Sheffield (U.K.) and an M.B.A. from Harvard Business School. He is a member of the Academy of Arts and Sciences, holds a CBE from the UK and is a recipient of the Carnegie Medal for Philanthropy.

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In the West, historically, major spikes in the price of oil like today's have always preceded or triggered recession. A recession would likely interrupt the rise in commodity prices temporarily, but in the longer term it seems nearly certain that the trend in resource prices will continue to rise.

And why would they not? Although we live on a finite planet, we have been attempting for the last 250 years to do the impossible: to generate perpetual compound growth. Had the Egypt of the Pharaohs grown its assets by 1% a year – a derisory growth rate to us – they would over the 3000 years of their civilization have compounded by 9.2 trillion times! (Check it!)

Most ancient civilizations were brought down by overuse of their resources, such as soil, water, and forests. Our current civilization – the first to be more or less global – also suffers from overuse of those resources once again, but we add new shortages of metals and energy. We also add a scale of damage from this overuse – waste, pollution, toxicity, and the destruction of so many natural assets – that earlier civilization could never have imagined.

But all is not hopeless, for there is an alternative to our past destructive growth in physical assets. We need to develop a much-increased emphasis on the quality of life, including enhanced protection for what is left of our natural systems, and an emphasis on the quality of our products as opposed to the quantity. Quality goods will emphasize long life, repairability, and recyclability by design. With this shift in emphasis, together with a new level of innovation, we might make it to real sustainability.

Our species, so far, has shown itself reluctant to address very long-term issues, such as climate damage and sustainability, and maybe it always will be reluctant. But we are also a remarkably inventive species, and this may be our saving grace. If we can innovate around the bottlenecks, shortages, price spikes, and climate damage that are almost certainly coming our way, we might survive to tell the tale.

Decarbonizing the global economy at the same time as we have to become rapidly more protective of our limited resources will not be easy. It will take the best period of energy and creativity we have ever had. At best, to replace our destructive reliance on fossil fuels, we might have breakthroughs in one or more of commercial fusion, modular fission, deep geothermal energy, or very much cheaper energy storage – any one of which might save our bacon. On a smaller scale we will surely have new biologically derived substitutes for many traditional materials and a thousand new innovations of all kinds in agriculture and industrial efficiency.

To succeed, we must put an increasing value on new ideas and new research in these fields. The U.S. does much of this very well in its VC business and its great research universities (to the envy of the world). The U.S. may have slipped in some commercial areas, but in these it really is exceptional, the biggest and the best. But the collective scale is still far too small, for corporate and government R&D has for several decades shrunk rather than grown. Our best shot for long-term sustainability – even prosperity – is for government, business, and individuals to all get behind these exceptional strengths of the U.S.: research, innovation, commercialization, and our society's unusual willingness to take risk (also an American characteristic widely admired). Our collective survival as a reasonably stable and livable global society may depend on U.S. leadership in all these areas. As we enter the new age of environmental damage, scarcity, and physical limits, we will need all the innovation and ingenuity we can muster.