

Energy and resource consumption must decrease – not increase.

By Johan Hansson

Professor of Theoretical Physics, Luleå University of Technology, SE-971 87 Luleå, Sweden

Almost no one mentions the fastest, easiest, and most effective way to solve the crises that today threaten humanity: To *decrease* energy and resource consumption. During the oil crisis in the 1970s, *everyone* was [encouraged to conserve energy](#) – and did. Reduced consumption was also seen during the Covid pandemic. Still, global energy consumption has increased nearly every year for more than half a century and is [continuing to do so](#).

Until the 70s, we lived [within the planetary limits](#). I was there myself and we neither lived in caves, something that critics of (scientifically inevitable) [degrowth](#) claim would happen, nor lacked anything at all. There is no simple correlation between [GDP and quality of life](#).

The Sun is the reason life can exist on Earth. It constantly sends us energy with high order (many energetic visible photons) and Earth radiates the same energy into space, but now with lowered order (even more invisible photons, with lower energy). This net surplus of *order* is what enables disordered dead material to build up living plants and animals (including humans). Let us call this, for life *available*, sunlight "100%".

The problem is that humanity globally today uses close to 200%, [Sweden 400% and the United States 500%](#). We are thus rapidly depleting life reserves that are needed going forward. *If* we had stayed below 100%, as during almost all human history, today's civilization-threatening problems would not exist. Climate change, mass extinctions, plastic pollution, etc., are just accelerating (potentially fatal) *symptoms*, *i.e.* danger signals – or “fevers”, of the *real* underlying causes:

A. Extreme overproduction & overconsumption in the rich western world, since at least 50 years.

B. [Overpopulation](#) – the Earth simply cannot support 8 billion people (or more). Humans already make up over [30 percent of the mass of all mammals, our domesticated animals roughly 60 percent, only less than 5 percent are now wild](#). And each calorie of food is being generated by 10 calories of fossil fuels.

1. Before industrialization, our global impact on nature was so small that economists could neglect it. But today, natural resources & waste sinks can no longer be treated as infinite free goods, which today's economy continues to do as it is *based* on the erroneous assumption (violating fundamental natural laws) that continued growth is possible and desirable. It was only our *one-off* chance-discovery, rapid exploitation, and consumption, of cheap, abundant, and highly energy-dense, fossil fuels that made the *time-limited phase* of exponential economic growth possible.
2. Energy use and economic growth have always gone hand in hand. [This can be described by a simple formula](#), $E \approx (\text{GDP})^{3/4}$, where E is the energy consumption per capita per second (consumed power per person) and [GDP](#) the inflation-adjusted gross domestic product per capita (economic activity per person). There is thus a *direct relationship* between growing

GDP and increasing energy consumption. (Even worse, the increasing *waste production* also has the same relationship to GDP.) The *apparent "decoupling"* of GDP from energy consumption seen in rich countries in recent years (an exponent somewhat lower than $\frac{3}{4}$) has *more than* been eaten up by outsourcing production to developing countries where the exponent has increased to almost 1, $E \approx \text{GDP}$.

3. Nuclear power is not the solution. In a single day, the Sun shines in more energy than could be extracted from all available uranium. If the energy today globally produced by fossil fuels (84%) were to be replaced by nuclear power Earth's mineable uranium would be used up in less than 20 years. Only 1,000s of unusable, but highly radioactive, nuclear power plants would remain. And an unfathomable amount of "eternal" life-threatening nuclear waste; where the containers Sweden has chosen for "permanent" burial in the bedrock have been shown to corrode and break in a few years. Further proof of the dangers: No private insurance companies insure nuclear power plants, it is far too risky. Therefore, they must always be guaranteed by governments – when something goes wrong, taxpayers' foot the bill.
4. The world's enormous, still increasing, fossil energy consumption cannot be "electrified". Only a few percent of the rare metals that would be required exist. In addition, large CO₂ emissions from fossil fuels and cement occur during construction.
5. No geological material is renewable. The Earth has only the iron, uranium, etc..., it had from the very beginning, when the solar system formed. This is evident in concrete terms: Today's ore is both lower grade and more difficult to extract than in the past – the easiest and richest sites were extracted first.
6. Biological material is, on the other hand, being created all the time (photosynthesis), but only at the rate allowed by *the Sun*. And for a long time, humanity has been using *more* than that at an accelerating pace, which means we have increasingly depleted the "reserves". Oil, coal and natural gas are such fossil "solar stores", created over millions of years, and when they are now rapidly being burned up, produce enormous amounts of CO₂, which has resulted in climate emergency.
7. Recycling, in and of itself, is not a solution. Just as animals cannot live on their own waste, neither can a civilization. Granted, metals could be recycled almost indefinitely, but requires energy and 100 % recycling which is not realistic. As a typical example, the average lifespan of a smartphone is less than 20 months and globally almost none are recycled. Plastic is difficult to recycle as there are so many varieties, and most cannot be mixed.

The long-term sustainable global consumption of energy and natural resources can be, at most, half of today's. It is therefore *unsustainable* that politicians and industry *still* relentlessly are pushing for an ever-increasing *consumption* of both energy and raw materials.

Today's growth capitalism does, indeed, require that the economy (GDP) grows at least at the same rate as banks create new credit out of thin air – its sole purpose being short-term egoistic profits, completely ignoring long-term and environmental "side-effects". Therefore, we must change the system. Scientifically knowledgeable economists, like Herman Daly (of World Bank fame) and Tim Jackson, have perfectly realistic alternatives. Transition to an ecologically sustainable non-growth economy is inevitable – if we want to survive.

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

Kenneth Boulding