

# Renewable Energy Will Impoverish Humanity

From THE DAILY SCEPTIC

by John Constable

*This is the eighth in a series of 13 articles challenging climate change orthodoxy commissioned by Professor Gwythian Prins. We will be publishing the articles at a rate of one a week (read the first article [here](#), the second [here](#), the third [here](#), the fourth [here](#), the fifth [here](#), the sixth [here](#) and the seventh [here](#)). The hope is that they can be collected into a book for Sixth Formers and university students.*

The modern world and the rich, free lives it brought are both dying in Britain. Energy consumption has fallen by about 30% since 2005 and electricity consumption by about 23%, both due to climate policy costs, and particularly that of renewable energy, subsidies to which amount to £25 billion a year, 40% of the total cost of electricity supply. Insofar as we are maintaining our standard of living, we do so by borrowing and importing the goods of fossil- and nuclear-fuelled Asia. That borrowing cannot continue indefinitely, and an abrupt reversal in distressed circumstances is all but certain, with the consequence that wind and solar are not only a threat to British prosperity, but to any realistic hope of reducing emissions.

To get out of this mess we must remind ourselves of the relationship between *fuel quality* and *wealth*, and act in accordance with those realities.

Stand anywhere in the world and starting from your skin look out and around you. Even in the remotest wildlands the environment will have been modified to suit your interests. Layers of intricate textile shield you against weather. In your backpack you have a container with pure water, clean and concentrated food, and in your pocket an electronic device that can send and receive signals as part of a worldwide network. The hills may be bathed in brilliant sunshine and clear air but also in manmade electromagnetic fields permitting you to establish your location, to summon help, to interrogate databases to identify any unusual flower or bird, to call your friends to let them know of your discovery or distribute photographs.

And this is human life at the simpler end of the spectrum. At the extreme of complexity, in an urban area, you will probably be within a fabricated structure with temperature and humidity regulation, controllable lighting, running water hot and cold, and a system to safely carry away your wastes. Controllable heat is available at whim to prepare food, and a low temperature food storage cabinet inhibits the growth of bacteria and moulds. The pantry will contain many other foods in airtight, pathogen proof membranes offering convenient, low risk nourishment. To an astonishing degree this whole space is free of hostile organisms and substances. And none of this will seem remarkable to you.

Around you there is an interconnected pattern of smooth roads with swift vehicles carrying family to visit, or goods to your door, or taking produce and things to shops not because you ordered them but just in case you might happen to want them.

And beyond that there is a spider's web of things and services available or in preparation. Here, a theatre rehearsing a drama that you may choose to attend in a month, there a hospital training the surgeon whose lifesaving attentions you may require quite unexpectedly next year. Guided by computer analysis, factories in places over the horizon are anticipating a demand that you have yet to express, and power stations are planning to generate electricity precisely when you tend to turn on your kettle and make tea. Overhead pass sophisticated and safe aircraft that are nevertheless so cheap to run that they can import fresh vegetables from another continent and passengers who have no more urgent purpose for visiting the other side of the world than that they want to have a look at Uluru before they die.

And operating all this is an information system distributed over human minds and computers, a bio-electronic network mediated by cables, satellites and written and spoken communication between several billion human beings.

This is an improbable state of physics. In the jargon of science, it is distant from thermodynamic equilibrium and of low entropy, meaning that such a situation is vanishingly unlikely to come about by chance. And we have been in this fortunate position for a large part of human history and even prehistory. Our situation is comparatively extreme, but a hunter-gatherer band of a few dozen individuals is also in an improbable state. They may lack engines, but they can carry fire from place to place. They have only a few tools, yet these are exquisitely well-designed; and though illiterate they possess a detailed orally transmitted knowledge of territory, weather, animals and plants, enabling their families to prosper. Such human populations may seem to us simple, primitive even, but they too are impressively distant from equilibrium, and in an important sense they are rich, for wealth is an improbable state of the physics in relation to a human desire.

And, from that definition it follows that wealth is the result of changes to the world. To make such changes we must overcome one or more of the forces of nature, namely *gravity*, the *electromagnetic force*, or the *strong* or the *weak nuclear forces*. In physics this is called *work*, with the capacity to do *work* termed *energy*.

Energy is therefore by definition an indispensable requirement for the creation of wealth. Suggestions that economic growth can be decoupled from the consumption of energy are simply illogical in the technical sense and cannot be taken seriously. The creation and maintenance of wealth is proportional to energy consumption. Improvements are certainly possible in the efficiency of conversion, but, as W. S. Jevons pointed out in 1865 with his famous 'paradox', this increases the potential for wealth creation, and since there is no limit to our desires, energy consumption will always rise not fall. No candid person will ever say, for example, that child mortality is low enough. Energy, like cash, is never left on the table.

We derive energy from fuels, which are bits of physics that have the property of doing work. In this general sense all physical states are fuels, from the dried leaf that blew into my study through an open skylight, to the breeze that brought the leaf to me, as well as the solar radiation that allowed me to see it drifting down onto my desk.

But fuels vary greatly in their potential to cause change and in their ease of use. Generally, the more accessible the energy the less useful the fuel. The energy state of the leaf is of a moderate level and easily reached through combustion. The wind energy is ubiquitous and available at a temperature that does not threaten organic tissue, but is of a low quality, close to random heat, and almost incapable of work. Consequently, living organisms use winds only adventitiously, for seed dispersal say, not for fundamental metabolic energy. The fuel quality is simply too low, the entropy too high, to support life.

Solar radiation is better, and outside the earth's atmosphere is of high quality. But on the surface of the earth, and as seen by a point receptor, a leaf say or a solar photovoltaic cell, it is degraded, being subject to a continuously varying angle of incidence, total occlusion at night, Rayleigh scattering, clouds and shadows. Plants do derive their metabolic energy from sunlight, but almost their entire structure is devoted to overcoming the disadvantages of the fuel. Those parts of plants which are not its reproductive organs are devoted to energy collection and storage. There is little or no sensory equipment, and they lack nervous systems capable of integrating information to support rapid movement.

By comparison even with the solar flux, fossil fuels have an elevated energy state. The reasons for this are curious. While we often say that coal is fossilised sunshine this is only part of the story. Plants are certainly superior fuels to the radiation which produced them, but if coal were just the sunshine collected by plants it would be no better than timber, which it demonstrably is. The reason for this difference is that the dead plant material was subjected to hundreds of millions of years of gravitational compression, increasing its energy density (and reducing its entropy), but also raising its temperature and resulting in chemical transformations driving its molecules into higher energy states. Bizarre though it may sound, coal's energy can in part be described as ancient gravity. This makes fossil fuels exceptional pieces of physics and there is nothing to compete with them as fuels other than sub-atomic structures.

But fossil fuels, and nuclear fuels too, are difficult to use, requiring sophisticated conversion devices to resist high temperatures and pressures. Bootstrapping this took time. Indeed, human history can be read as the progressive adoption of better but more demanding fuels. Our hunter gatherers, for example, live in an improbable state because fire enables effective tool manufacture and extends the range of usable foods. But such a society is still fuelled by organic materials and thus limited. Contemporary populations, even those we call poor, inhabit a world many orders of magnitude more unlikely in its close correspondence to human wishes.

To achieve this, we certainly use a great *quantity* of energy, but the difference between the hunter gatherer and ourselves is not explained only in terms of quantity, but also and critically by the *quality* of our fuels. Coal, oil, and gas are more difficult to employ, but when converted they deliver energy not only plentifully from a relatively small volume, but at a remarkable rate of joules per second, enabling the achievement of very high temperatures.

The high energy return on the energy invested in the collection and conversion of fossil fuels thus delivers a large surplus for other purposes, a fact which has consequences for the

structure of society. The economies of the past were based on low return fuels, and, like plants, they were almost entirely devoted to energy collection and storage. Societies that adopted high return fuels had a greater surplus, and the high temperatures possible meant that many transformations previously so difficult as to be rarely or never produced, such as airflight, became commonplace. That is the story of Europe and then the entire world from the later medieval period to the present, and it first became evident in Britain, which by 1700 was 50% driven by the competent physics of coal. By 1850 our energy consumption had increased tenfold, and over 90% of that consumption was of coal.

The changes in British society during that period were staggering. Household wealth, houses and chattels combined, quadrupled in the first 50 years of the 19th century, growing faster even than population which itself grew fourfold from the 1700s to the 1800s. And employment was much more diverse in character. In 1600 about 80% of the male population worked in the primary sector, mostly agriculture. By the early and middle 19th century the workforce was some four times larger, and those in the secondary and tertiary sectors, manufacturing, dealing and services, comprised about 70% of the workforce. And this large and variously busy population could travel. In the 1840s British railways were already carrying 20 million passengers a year; but by the 1880s this had risen to nearly 800 million. It was a different *kind* of world. A child born in the 1600s would almost certainly work on or around a farm and rarely leave it, while someone born in the 1800s could increasingly go where they wished and do as they wished. To an unprecedented degree the mass of the people had become free.

Forcing the use of physically inferior fuels, such as wind and solar, will reverse this process. Renewable energy is intrinsically costly, requiring extensive resources to correct its entropic defects, and these resources, from wind turbines to batteries, are currently all derived from fossil wealth. A wholly or predominantly wind and solar fuelled economy will not be able to sustain those corrective technologies and at the same time provide a generous margin for other uses. So the system will shrink, energy consumption itself will fall and the human niche will narrow. General health will decline, rates of mortality will rise, household wealth will fall, travel will be restricted, and there will be little work outside the energy sector.

Our whole societal structure will move back towards the pre-coal past, when the energy sector and its owners were socio-politically dominant. Such a society will be internally miserable and externally vulnerable to enemies who have not neglected thermodynamic realities. Could any sane person want such a future for their descendants?

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