

Possible Reactions of the Techno-Industrial System to Climate Change

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The techno-industrial system faces a grave danger: climate change.¹ It is dependent on the resources of the biosphere to function. For this reason, the stability of the biospheric functions is crucial for its effective functioning. Climate change means a sudden change in the conditions of the biosphere. According to *The Economist's* October 30th (2021) issue, it is changing the rain patterns, water cycles and will have adverse effects on crop yields. It is increasing the frequency, intensity, and duration of droughts and heatwaves. The great ice sheets of Greenland and Eastern Antarctica are destabilizing and this, in turn, makes it easier for mid-sized hurricanes to intensify into powerful storms causing enormous damage. Sea levels are rising and threatening coastal cities. The biodiversity of the oceans is under stress due to ocean acidification and sudden change in sea temperatures. The tropical zones are becoming virtually unlivable. Massive wildfires burning huge areas are becoming more and more frequent. All these are happening extremely fast and forcing the adaptive capabilities of the techno-industrial system. It should either adapt itself to these new conditions by changing itself (its energy infrastructure, the consumption level of its members, etc.) or try a desperate move in its *fiute en avant* and take on its own hands the governing of the atmosphere.

The Economist's October 30th (2021) issue dedicates a special report to this dilemma, and it investigates some possible answers to this urgent threat. *The Economist* represents the ideological orthodoxy of the techno-industrial system. For this reason, following its arguments and suggestions on this issue might help discern the techno-industrial system's possible reactions to climate change.

As *The Economist* mentions, the use of fossil fuels was the most transformative event after agriculture. It brought a massive growth in population and people's "wealth." But the side-effect of this development, the accumulation of CO₂ in the atmosphere, has a "potentially show-ending role." Thus, world governments should embark on a vast project. They should stabilize the climate. In *The Economist's* words, this project will entail:

The curve-flattening climate stabilization will be the result of deliberate interventions in both the economy and nature on a global scale. And it will be maintained, if it is maintained, by human institutions with the astonishing, and possibly hubristic, mandate of long-term atmospheric management.

The Economist explicitly declares that to ensure the existence of the techno-industrial system, it is necessary now to embark upon a comprehensive transformation not only at the level of economic infrastructure but also on Nature on a global scale. The system should embark upon long-term atmospheric management. In the special report, other, more traditional answers are also evaluated and suggested, but these evaluations are always ending with implicit desperation about the shortcomings of the "traditional" solutions or with a reminder of the fact that it is now too late to rely

¹ Climate change is also a grave danger for wild ecosystems. But in this text, we try to look into the issue from the system's perspective to delineate its possible reactions. The probable solutions that the system will come up with would chiefly represent even more dangers for the wild Nature.

only on these “traditional” remedies. Let’s look at with *The Economist* what are these more “traditional” remedies are.

The most publicized of these “traditional remedies” is that the techno-industrial system should quit its fossil fuel addiction. Things don’t look good in that regard. Despite the global UN Conventions and pledges to decrease fossil fuel consumption, it increases year by year. According to *The Economist*, “in 1992 78% of the world’s primary energy –the stuff used to produce electricity, drive movement and provide heat both for industrial purposes and to warm buildings– came from fossil fuels. By 2019 the total amount of primary energy used had risen by 60%. And the proportion provided by fossil fuels was now 79%.” Therefore, after all the pledges to “stabilize greenhouse gas concentrations in the atmosphere” in Rio de Janeiro in 1992 to Paris in 2015, the absolute consumption of primary energy sourced by fossil fuels increased by 62%!

The Economist tries desperately to appear hopeful about the “new,” “alternative” energy sources: wind and solar. It boasts about the reduced cost of wind turbines and solar panels. But there is no indication that wind and solar are replacing fossil fuels. *The Economist* gives only statistics on their absolute growth. “In 2020, the share of the world’s energy generated by solar panels grew by 21%, which points to a doubling every four years. Wind, which now supplies twice as much energy as solar, is growing more slowly, by 12% a year.” These figures only represent the absolute growth in solar and wind energy production; they are typical considering the ever-expanding energy hunger of the techno-industrial system. They don’t indicate that wind and solar power are replacing fossil fuels. As can be seen in the below graph, energy consumption increases for all the sources in absolute numbers. The trend of the traditional biomass (woodfuels, agricultural by-products, and dung burned for cooking and heating purposes) in the below graph is illuminating. It is the source of energy humans have been using since they discovered the use of fire. But as we can see in the below chart, it hasn’t been replaced by coal or oil after the industrial revolution. It continues to be consumed at its peak level. In energy supply, one source of energy doesn’t replace the other. As far as there is available energy, the techno-industrial system adds one source on top of the other and increases its total energy consumption. This is and will be the case with the solar, wind, and other “alternatives;” they will be added to the total (increasing) energy consumption without replacing the fossil fuels (which still represents the gross majority).

It is clear that fossil fuels will continue to be burned in the foreseeable future, and the absolute consumption of these fuels hasn’t peaked yet. *The Economist* suggests carbon pricing as a remedy. Carbon prices would artificially increase the cost of fossil fuel energy generation and make it more expensive than solar and wind. It is such a pipe-dream. Applying this strategy with the necessary rapidity and brutality to cut back emissions drastically in the required time is virtually impossible without shaking the foundations of the system. It would mean economic collapse, enormous decreases in

living standards, and extreme backlash from the population. Much more timid policies encountered angry backlash in recent times.

Apart from carbon dioxide, there are other greenhouse gases: Methane (from the natural gas industry, rubbish heaps, and livestock), nitrous oxide (mostly from agriculture), and chlorine-bearing industrial gases. Again, there is no hope of a timely solution to these emissions. “Big reductions in agricultural emissions of methane and nitrous oxide emissions will take time,” says *The Economist*. Apparently, the recent propaganda campaign in favor of veganism isn’t producing the expected results.

Another problem is “sulfur-dioxide emissions which are mostly associated with burning coal and heavy oils.” Burning coal and heavy oils produce small airborne particles of sulfate, offsetting greenhouse warming. Therefore, decreasing the consumption of coal would exacerbate in the short term the climate change. The system is on the horns of a dilemma here.

In Paris in 2015, governments made pledges of voluntary reduction in CO₂ emissions, so-called “nationally determined contributions (NDCs).” NDCs are not binding commitments, and there isn’t any regulatory power that would ensure the fulfillment of these pledges. They are castles in the air. But even these pledges wouldn’t be enough to limit global warming to 2° C, let alone to 1.5° C. “[E]ven in Paris, it was clear that the 1.5° C limit could not be met by emission reductions alone. They would have to be supplemented by something else: the withdrawal of CO₂ from the atmosphere by means of ‘negative emissions.’” But again, despite all the noise regarding the need for negative emissions, there isn’t any effective method today to achieve it. “Mechanisms which can provide lots of reliable CO₂ removal remain, at best, embryonic,” sighs *The Economist*. We will come back to this below.

Besides, there is “the Asia problem.” More than half of the global population lives there, and Asian countries constitute a great part of the so-called “developing countries.” They aspire to raise their citizens’ living standards; it can only be done by increasing energy consumption. On top of that, these countries have increasing populations. They have to grow economically in order to absorb the new generations into the economy. Otherwise, they might experience economic crises, massive unemployment, and social instability. *The Economist* says that “two-third of global coal produced there” and “Asia produces most of the world’s cement and steel.” As if this is a vice unique to Asian countries, and the developed countries of Europe and North America extricated themselves from this nasty habit of coal, cement, and steel. But this is far from the truth. If developed countries seem “better” in that regard, the reason is that they mostly shifted their manufacturing sectors to Asia for lower production costs. They have exported the emissions; their economies continue to depend on coal, cement, and steel.

In this special report, we witness inside-the-system debates on capitalism and degrowth. Third-wave leftists,² like Naomi Klein, claim that it is impossible for capitalism to wean itself from fossil fuels. Since capitalism is driven solely by profits, the fossil-fuel industry will insist on putting profits ahead of the threats of climate change. Therefore, to get rid of fossil fuels, it is necessary to get rid of capitalism. As good first-wave leftists, the writers of *The Economist* refute this claim. According to them, to reduce dependence on fossil fuels, new technologies and new investments are necessary. And capitalism has proven itself the most successful economic system to provide both. “All that is needed is to find ways to ensure that growth does not have to be linked to rising CO₂.” *The Economist* uses the below formula to demonstrate the relationship between development, energy, and CO₂ emissions.

$$\text{CO}_2 = \text{population} \times (\text{GDP/capita}) \times (\text{energy/ GDP}) \times (\text{CO}_2/\text{energy})$$

According to this formula, to decrease the CO₂ emissions, one has to cut back either population, GDP per head, energy used per unit of GDP, or carbon emissions from that energy. *The Economist* explains that reducing population using a long-term strategy “is not a course of action that governments can effectively and decently pursue.” We also agree with that. First, it is impossible to implement a long-term population control globally as a concerted international effort. Second, as long as the system needs mass human labor for its functions, population control is detrimental to the economies of individual countries. As we have witnessed in China’s one-child policy, in addition to problems such as destroying the balance of sex ratio in a population, population control increases the dependency ratio enormously. Increased dependency ratio has enormous adverse effects on the economic performance of a country. For these reasons, besides the impossibility of a concerted international effort of population control, individual countries also won’t implement a drastic population control strategy that would be rapid enough to curb the CO₂ emissions in time.

What about GDP per head? It has increased enormously since the Industrial Revolution thanks to the concentrated energies humanity obtained from fossil fuels. As *The Economist* also mentions, if GDP per head continues to increase, the improvements in energy efficiency and carbon intensity would merely keep carbon emissions stable. So is it necessary to decrease GDP, roll back the growth to save the system from climate change? *The Economist* gives several reasons why it would be impossible to implement degrowth consciously according to a strategic plan. These reasons are not wrong in themselves, but they miss the fundamental, underlying causes why it is impossible to implement these kinds of long-term comprehensive plans. But first, let’s look at the reasons *The Economist* gives for the impossibility of such an action:

1. To implement a long-term reversal of growth, everyone else (i.e. the entire human population) should be persuaded to consume less. Anybody who has a modicum

² For a more detailed discussion of the leftism’s development (first, second, and third-wave leftisms) and its role in the system, see Karaçam, “Leftism, Techno-Industrial System, and Wild Nature.”

amount of common sense will know that this is impossible. Therefore, governments should implement a dictatorial policy to ration the consumption of their citizens. However, as *The Economist* puts it, “[a]n overt policy of deliberately slowing, stalling or reversing long-term growth, even if presented as being for the good of the world, is a highly unpromising platform on which to win elections.” From this citation, it sounds like only “democratic” countries would face problems rationing the consumption of their citizens. Authoritarian regimes also need to seek the consent of their populations as long as human labor power is necessary for the functioning of the economy. The consent is primarily produced in today’s modern world (where humans live in a modern zoo separated from their natural habitats) by consumption possibilities (electronic gadgets that isolate people in a virtual world to make them forget their dismal existence, the pursuit of commodities that offers people a pseudo purpose in this purposeless world, etc.) which require growth. In the short term, in which a response should be given to climate change, mass human labor will continue to be necessary for the system’s functioning. Therefore, it would be impossible to play the degrowth card that would affect immensely the living standards of the masses.

2. Decarbonisation can only be realized by massive investment in renewables³; this is especially true for emerging economies. Much of the investment necessary to build the new “renewable” energy infrastructure should come from the developed countries, and without growth, there won’t be any incentive for investment.

3. Decarbonisation process will require accelerated innovation. As an economic system, capitalism has the best record of fostering innovative ideas and implementing them on a broad scale. The system will need capitalism’s that feature. According to *The Economist*, “better ways of storing energy, of heating houses, of cooling houses, of processing crops, of growing crops, of powering large vehicles, of producing plastic and more” will be needed to reduce the CO₂ emissions. These cannot be done in the framework of a “contracting, low-demand, low-investment economy.”

The reasons that *The Economist* gives for the impossibility of planned degrowth misses the most fundamental reasons. First, it is impossible to direct the development of a complex system — especially a system as complex as the global techno-industrial system — by devising a long-term plan and implementing it in real life. Complex systems are composed of numerous components. It is impossible to know the myriad of relations between these components; how they affect each other in self-reinforcing feedback loops. Planned degrowth would require a long-term plan that should be implemented globally. One has to know the consequences of this plan on the global system, and this is impossible. There will always be unforeseen consequences of the actions taken to reach the planned intention. Besides, the aim or the determination of actors

³ As long as you want to keep the techno-industrial system alive.

who undertake this plan can change in time, and even the actors themselves can change or disappear.⁴

The other reason that makes impossible the implementation of long-term degrowth is the existence of the “self-propagating systems.”⁵ A self-propagating system is a system that tends to promote its survival and propagation by either indefinitely increasing its size and/or power⁶, giving rise to new systems that possess some of its own attributes or doing both of these. Nations, corporations, labor unions, churches, political parties, mafia organizations, etc. are all self-propagating systems. The Darwinian selection processes that function in biology (natural selection) are also operative in environments where these systems are present. This selection process favors self-propagating systems that have the most conducive characteristics for self-propagation. As a result, these systems tend to propagate themselves and squeeze out or absorb other self-propagating systems that don’t have these characteristics. They are in constant “competition” with each other. This competition isn’t so much a deliberate antagonism but more of an unconscious process. Self-propagating systems that expand their functions by incorporating more energy and material into their metabolisms will increase their material power; thus, they will absorb or side-step other self-propagating systems. Therefore, implementing a voluntary degrowth strategy would be a sure recipe of disaster for the systems that pursue it. They would relinquish the advantage to the systems that relentlessly seek their aggrandizement and expansion by absorbing each passing day more energy and materials. Systems implementing degrowth would be eliminated, devoured, or side-stepped.

We find the discussion on capitalism and all the noise the third-wave leftists make on it utterly meaningless. First of all, it is not clear what they exactly mean by “capitalism.” But it seems that they imply an economic system designed, created, and managed by some selfish, greedy people (financial speculators, big oil, one percent, etc.) who try to maximize their profits whatever may come. But “capitalism” is not something consciously designed, created, and managed. The things that are generally associated with “capitalism” (financial instruments, modes of property ownership, social classes, economic theories, etc.) have developed during the evolution of complex human societies. They aren’t consciously designed and implemented by anybody for a definite result. They are the result of the Darwinian selection process that is operative on human societies. Those properties that are more conducive for the growth/development of a society end up being selected by this blind selection process. And the phenomenons

⁴ For a more detailed discussion on the impossibility of controlling the development of society, see the first chapter of the *Anti-Tech Revolution: Why and How* by Theodore John Kaczynski (Fitch & Madison, Second Edition, 2020.)

⁵ For a more detailed discussion of the self-propagating systems, see the second chapter of the *Anti-Tech Revolution: Why and How*.

⁶ By “power”, we don’t necessarily mean exercising authority over people or organizations. We mean material capacity: The geographical extent of the functions of a given system, ability to control energy and material flows, and how big these flows are.

that are generally associated with “capitalism” came into being through this process. They developed and spread globally with the advancements in technology and accompanying complexification of human societies. By pointing out as the main culprit to “capitalism” as if it is consciously preferred and deliberately continued by some people, and therefore it can be eliminated and replaced by the decision of some other people, they deflect the attention from the real problem: The existence of a most complex human society that is primarily grounded on material conditions (energy and material resources, the technological infrastructure that makes use of these resources, and the resulting consequences in demography, ecosystems, etc.), not on the property relations, class structure of the society, financial speculation, greedy oil businessmen, etc. Besides, despite their endless rhetoric about alternatives to “capitalism,” it is impossible to hear any alternative from them. Apart from the tried and abandoned command economies of socialist countries, what is the alternative to “capitalism”?

In sum, according to *The Economist*, the techno-industrial system isn’t capable of affecting a change at the first two variables (population and GDP per capita) of the above CO₂ equation. Population control is impossible. It will continue to rise until the middle or the end of the century and will continue to be an increasing factor of CO₂ emissions, let alone a decreasing factor. Implementing a degrowth strategy and decreasing the second factor is also impossible for the techno-industrial system. On the contrary, growth is necessary to face climate change. Since the techno-industrial system can’t shut itself off, to restrain its effects on the earth’s atmosphere and save itself from the abrupt changes that would cause, it should implement a colossal transformation in its energy infrastructure. This transformation will require accelerated technological development and the implementation of these new technologies on a global scale. The only way to realize these are investments and economic growth. “Grid-linked gigawatt world of sky-scraper-topping turbines and solar farms” should spread over the landscape. The technological advancement should find remedies to their intermittency problem (wind turbines and solar panels can’t function at the unsuitable wind and cloudy weather, respectively). But, these “traditional” remedies won’t be enough to limit the effects of climate change to the acceptable levels for the system, at least in the period it is needed. Therefore, something more is necessary.

One option for “something more” is the so-called negative emissions. The following numbers given by *The Economist* demonstrate the necessity of negative emissions for the system: “The cumulative CO₂ emissions budget consistent with a 50–50 chance of meeting the 2° C goal is 3,7trn tonnes. The budget for 1.5° C is just 2,9trn tonnes. With 2,4trn tonnes already emitted, that leaves a decade of emissions at today’s rates for 1.5° C, maybe 25 years for 2° C.” That means there is no place to go. If the system can find a way to suck back some of the CO₂ already emitted, it can gain more time to change or adapt itself to climate change. Several methods are floating in the air for “negative emissions.” But most of them, like direct air capture or increasing the alkalinity of oceans by adding lime to it to increase the dissolution rate of carbon in seawaters as carbonate ions, are science fiction and fantasy right now. They would

create more problems than solutions: They would need massive amounts of energies to implement and have unforeseen adverse effects on ecosystems.

A more plausible method of negative emissions for the system would be biomass energy with carbon capture and storage (BECCS). Plants that capture carbon from the atmosphere through photosynthesis would be burnt in power stations as fuel, and the resulting carbon emissions would be captured and stored. Negative emissions scenarios in the climate models (such as United Nations' IPCC models) rely on this method. But one can easily imagine the enormous dangers that this method would create for wild Nature. As *The Economist* also mentions, "its large-scale deployment requires vast amounts of land be turned over to growing energy crops: in some estimates, an area equivalent to up to 80% of that now used for food crops would be needed." When one considers the ever-increasing energy demands of the techno-industrial system, the area needed to grow the plants that will be burned in power stations would only grow. Large tracts of wild ecosystems such as forests and prairies would be turned into fast-growing, industrial tree plantations. Since this method would have the "green" and "sustainable" image, it would be done with more impunity and even with a claim of restoring "nature." In fact, according to *The Economist*, this has already happened in Chile: "In Chile, government subsidies helped establish 1.3m hectares of tree plantations since 1986—but a rule requiring that this expansion should not happen at the expense of native forests was not enforced. As a result, the program actually reduced the amount of stored carbon by some 50,000 tonnes." But even the large-scale deployment of BECCS doesn't look promising enough to solve the system's climate change problem in time. The area needed for the large-scale deployment is too big. The system needs its agricultural land to feed its enormous population. As the above example from Chile demonstrates, if tree plantations replaced wild forests, the net result would be more carbon in the atmosphere, contrary to the aims of the negative emissions program.

The other possible reaction, and possibly the most dangerous one for the wild Nature, is that the techno-industrial system might attempt to "govern the atmosphere." As we said, *The Economist* represents the orthodoxy of the ideology of the techno-industrial system. In this special report, the chain of argument implicitly points toward the "governing of the atmosphere" as the best (or even the only) possible option to "fix" the climate change in the short time frame that it should be dealt with. Geoengineering is still controversial; there are many uncertainties regarding its consequences, who has the authority to implement it, etc. That is why we don't see (yet?) blatant advocacy of geoengineering in this special report or the media in general. But we see it discussed more and more as a possible option, and a magazine like *The Economist* defends and proposes it as a solution shows us where the trend is going.

There are several proposed methods of geoengineering, but the most popular and the most studied one in the models is solar geoengineering: Spraying reflective particles in the stratosphere so that they reflect sunlight into space and create a cooling effect that balances the greenhouse effect of CO₂ in the atmosphere. According to *The Economist*, geoengineering is cheap, "it seems likely that putting a veil into the atmosphere would

be comparatively cheap,” and it could be undertaken “by a relatively small fleet of purpose-built aircraft.” *The Economist* sees the application of a solar-geoengineering program implemented with global cooperation as the miraculous solution. If only the world as a whole could come together and implement a solar-geoengineering scheme collectively, it would provide “climate benefits to almost everyone and serious problems to almost nobody.” It would give the system breathing time to adjust its energy infrastructure accordingly. And when the CO₂ level was low enough, “the governing of the atmosphere” would be phased out, leaving behind a stable climate.

Of course, this optimistic scenario of “fixing” the climate ignores some crucial and insurmountable obstacles that such a venture would inevitably face. Even if we assume that the whole world could come together and implement a global solar geoengineering scheme, we can be pretty sure that the consequences of such a scheme would be quite different than expected. Earth’s atmosphere is a complex system. We don’t know exactly how it functions, the feedback loops among its components, and the relationships it has with the rest of the biosphere. Our models of atmosphere or climate aren’t the reality itself but an approximation and simplification of it. When such tinkering with the atmosphere begins, there would be inevitably unforeseen consequences. To mitigate the effects of these unforeseen consequences, more tinkering would be necessary. And this process would go on in a self-reinforcing feedback loop until the natural mechanisms that keep the chemistry of the atmosphere and climate in certain limits lose their function. When that happens, the stability of the earth’s atmosphere and climate would be dependent on the artificial governing of the techno-industrial system. In an eventual collapse of the techno-industrial system, the artificial governing of the atmosphere would cease, and its composition might reach a state where it can’t sustain complex living organisms.

On the other hand, mitigating the effects of climate change with the artificial cooling of geoengineering would relieve the pressure of reducing CO₂ emissions. The techno-industrial system is still essentially dependent on fossil fuels for its energy needs. With an artificial method of suppressing the effects of burning fossil fuels, companies and governments would increase their CO₂ emissions with more impunity. That, in turn, would create the necessity of more intense intervention to the atmosphere and so on.

But more probably, solar-geoengineering won’t be implemented as a globally concerted collective endeavor. It is improbable that all the world governments come together in concerted action to implement such a plan. Solar geoengineering would have different effects on different countries. Some will oppose such an endeavor, some will be more reticent, and some will want an immediate implementation. They will have diverse ideas about how to implement it. Since the application of geoengineering is relatively cheap, one or a group of more eager countries might choose to implement it on their own and can do it with their own resources. As we have said, we can’t know the precise consequences of geoengineering beforehand. One possible consequence would be the changing of the water cycles. Countries that implement unilaterally solar-geoengineering would choose to pursue primarily their own benefit; they might cool

part of the planets while disrupting water cycles in other parts producing negative consequences for other countries. That might elicit reprisals in the form of more solar-geoengineering, and the atmosphere's chemistry might be devastated more rapidly with every country tinkering with the atmosphere for its own benefit. But regardless of how it is carried out, "governing the atmosphere" would represent the most comprehensive attack on the autonomy of wild processes.

The techno-industrial system is in a relentless *fuite en avant*. Its functions create disruptions in the processes of the biosphere. But since it still is dependent on wild Nature for its existence, these disruptions also create threats to its effective functioning and survival. To mitigate those effects, it comes up with palliatives in the shape of techno-fixes. But these techno-fixes, in the end, create deeper problems. In its headlong escape from the problems its existence generates, the system keeps getting more complex, bigger, and bulky. Its disruptive effects on biospheric processes get more intense, destructive, and numerous. Climate change and the system's reactions to it is one representation of this process. The techno-industrial system has already littered and continues to litter the environment and the wild ecosystems with the wind turbines and solar panels in its quest of adapting its energy infrastructure to climate change. It created enormous damages with the mining operations necessary to procure the needed metals to produce wind turbines, solar panels, electrical batteries, etc. It plans to turn massive areas into industrially produced tree plantations to feed its never-ending hunger for energy with more "sustainable" methods. But all these aren't enough for its timely adaptation to the new climate that it is creating. Therefore, it is getting ready to attempt the most daring of its endeavors yet: "governing the atmosphere." Apart from its complete destruction, nothing will stop it; its *fuite en avant* will only continue with accelerated speed and devour the remaining autonomous wild processes.

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