Is Capitalism saving the planet?

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The election of Trump, the elevation of climate deniers to head major US agencies and the record-breaking Hurricane Harvey, as well as other extreme weather events, have injected a sense of urgency into many activists on climate change. Records in temperature rises, heat waves, storm intensities, droughts etc are broken with alarming regularity. 16 of the 17 warmest years on record have been since the year 2000. Past predictions that seemed alarmist turn out to be too timid in forecasting the scale and intensity of the climate change. While the Paris treaty talked about limiting the temperature increase to 2 degrees, we have zoomed past a one degree rise already and are heading full throttle to 1.5. The need to build a mass movement that can challenge the fossil fuel industry and their elite backers is absolutely central. It seems then a strange time for a bout of optimism about the ability of capitalism and technological changes to rescue us. Such optimism is based on an unfounded belief that capitalism and markets are the solution, rather than the cause, of the unfolding climate catastrophe.

Statistics in recent reports are being heralded as marking a historic turning point[1]. These reports suggest that global CO_2 emissions are peaking and that capitalism is decoupling economic growth from a reliance on CO_2 and fossil fuels. Similar stories about breakthroughs in the technology of electric cars[2] and carbon storage have set off many breathless news articles heralding the dawn of a clean and carbon-free capitalism that is going to save the planet.

Unfortunately, this is not what is happening. More CO_2 and other Greenhouse Gases (GHGs) are being released into the atmosphere than ever and the world is still staring straight into a climate catastrophe. The proliferation of stories eulogising capitalism's innovation and entrepreneurial flair as a saviour are not only wrong but deflect from the real cause of the crisis: capitalism itself and its need to expand markets in search of profits and the historic role of fossil fuel corporations. For those concerned with climate and the earth's ecosystems, placing faith in the market and technological breakthroughs is as dangerous as Trump's administration.

'The Death of King coal'; 'Electric Cars will cut CO_2 by 50%'; ' Global emission figures show climate turning point reached'. With these and similar headlines, you'd be forgiven for thinking that climate change was under control and all that was needed was just a bit more tweaking here and there to get it fully sorted. It is a beguiling scenario that tells activists not to worry, the magic of the market is going to deliver; that despite the slight blip of Trump's presidency we are heading to a new era of capitalism with electric cars and renewable energies replacing the internal combustion engine and fossil fuels.

There's just one slight problem: the facts around CO_2 emissions and the trends in energy consumption don't re-

[1] iea.org/newsroom/news/2017/march/iea-finds-co2-emissions-flat-for-third-straight-year-even-as-global-economy-grew.htm, iea.org/newsroom/news/2016/march/decoupling-of-global-emissions-and-economic-growth-confirmed.html

[2] economist.com/news/leaders/21726071-it-had-good-run-end-sight-machine-changed-world-death

ally support this optimism. These stories need to be looked at in conjunction with what scientists tell us needs to be done to avoid catastrophic climate change. The trends, if they are trends, are at best insignificant improvements, as CO_2 levels pass tipping points from which we cannot return; at worst they point to warming scenarios more catastrophic than previously contemplated.

Is Capital decarbonising? The 'death' of King Coal

The source of much of the optimism is the latest reports on global CO_2 emissions[3]. These suggest that emissions from human industry have essentially remained static for the third year running, while global GDP has increased. It is claimed that this is the first time atmospheric CO_2 has remained steady without a global recession to explain it. Among the explanations offered is that the US coal industry is being phased out rapidly and that China is also moving away from coal while the use of renewable and nuclear power is increasing. So now for the first time since the industrial revolution we can have economic growth that is decoupled from the use of fossil fuels and CO_2.

There seem at first reading to be contradictory messages in these reports. One report tells us that the world's use of renewable energy for electricity generation has never been higher and that the increase in the use of wind and solar power is historic. At the same time, another report reveals that the world has consumed the largest amount of fossil fuels in its history despite the slight decline in the use of coal. In fact both are true.

To put this 0.6% increase in consumption of fossil fuels in 2016 in some perspective, it represented: 'the equivalent of 127 million metric tons of petroleum - and was 2.6 times the overall increase in the consumption of renewables (48 million metric tons of oil equivalent)'.[4] So the 'slight' increase in fossil fuel use that is seen as heralding a new dawn for capitalist production is over 2-and-a-half times the equivalent of the overall increase in renewable energy consumption globally. 2016 also saw a record amount of CO_2 pumped into the atmosphere from human industry, so what is being discussed here is not a *decline* in the total amount, but a supposed slowing of the *rate of increase* of human-produced CO_2.

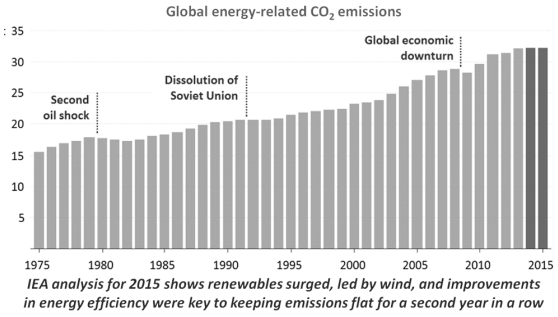

Figure 1: This is the gloss being put on recent stats, ignore the last 45 years and things look pretty good.

There are other problems aside from the reported scale of this supposed paradigm shift. The case for a historic turning point rests in part on the decline in the use of coal in both the US and China. It seems likely that this decline has little to do with a conscious or planned switch away from fossil fuels be-

[3] iea.org/newsroom/news/2016/march/decoupling-of-global-emissions-and-economic-growth-confirmed.html, bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2016/bp-statistical-review-of-world-energy-2016-full-report.pdf

[4] forbes.com/sites/rrapier/2016/06/08/world-sets-record-for-fossil-fuel-consumption/#45befd03365

cause of any concern over the effects on world climate.

Coal decline?

In the case of the US, this decline is driven mostly by the price of coal and its substitution by cheaper natural gas, coming mostly from shale extraction (fracking) in the US itself. It is true that some coal-fired power station closures are due to recent changes in laws around air quality and the cost of retrofitting these plants to comply with the new laws. However, the availability of cheaper gas is just as important. While the bankruptcy of iconic firms such as Peabody Coal and the withdrawal of big finance from other coal projects seem to confirm the headlines, there is still a lot of coal around and a lot being burned. It remains to be seen if Trump's declaration of support for coal will change any of these planned closures. Trump's White House seems to be the plaything of various fossil fuel lobbies, not just coal, with the appointment of fossil fuel lobbyists to key government roles such as former Exxonmobil head, Rex Tillerson, as the Secretary of State, responsible for foreign policy, or Scott Pruitt as head of the Environmental Protection Agency.

The decline in coal use aso needs to be put in the context of a large increase in the USA's coal exports. Someone somewhere is burning a lot of US coal.[5] Coal consumption had been rising for decades until around 2012 when cheaper gas began to replace it. These trends in coal consumption were not dictated by climate concerns but by market driven price fluctuations. It is questionable if this switch actually explains the decline in recorded emissions. The scale of the industrial wipe-out caused by the global financial crisis looks just as likely an explanation as any move from coal to gas in the US.[6]

In the case of China's coal use decline, this needs to be seen in the context of an historic rise in the use of coal in the decades and years before 2014. Plans to increase capacity in coal and other forms of energy seem to be no longer required as energy demand slackens off.[7] This has lead to many planned coal operations being shelved. While often presented as a policy decision to improve air quality especially in badly affected cities, it may in fact tell us more about the actual state of the Chinese economy than it does about the ruling Communist Party's concern with climate change.

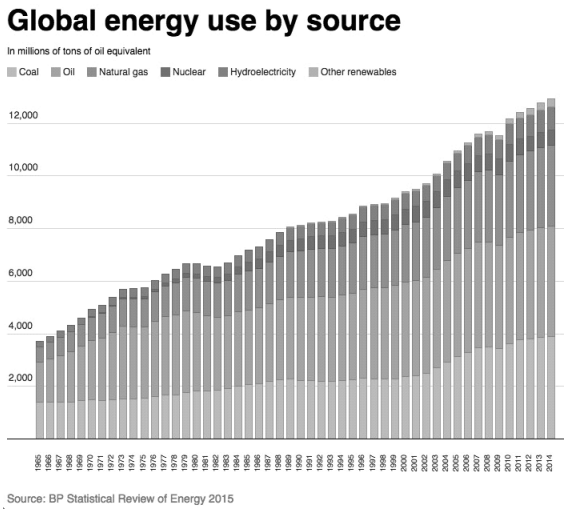

Figure 2: Where to see the death of coal, Gas or oil?

Meanwhile outside of the US and China, new coal fired stations continue to be commissioned globally with some

[5] reuters.com/article/us-column-russell-coal-usa-idUSKBN1AG0CC

[6] carbonbrief.org/the-35-countries-cutting-the-link-between-economic-growth-and-emissions

[7] forbes.com/sites/wadeshepard/2016/07/09/amid-massive-transition-demand-for-energy-in-china-drops-to-17-year-low/#60d2a3805dbf

400 planned in south-east Asia alone.[8] [9] For all the much-heralded trends in the US and China, both still aggressively export coal to other regions while being lauded for scaling down coal consumption at home. Given the present consumption of coal and the level of CO_2 emissions from that, as well as the scale of proven stocks that remain, it seems grotesquely premature to be heralding coal's death. The fact is the decline in coal use is a relative decline over the last few years. It follows on from a historic rise in coal use globally especially from 2000. Consumption levels in 2016 are well above those 10 years earlier and well above those decades before (see graph). Alarmingly, the proven reserves of coal are now higher than 10 years ago standing at 1,139,331 million tonnes. For global warming to stay below a recommended limit of a two degree rise, these reserve coal stocks, together with 80% of all proven reserves of oil and gas would need to remain in the ground, and the potential profits from them that would accrue to some of the globe's largest corporations would need to remain unrealised. All these reported statistics come with a health warning, but it is difficult to see the scale and reported levels of global consumption of coal, oil and gas as constituting anything other than confirming a death sentence for large parts of the globe.

The reality may be even worse as the statistics rely on according lower emissions from shale gas compared to coal and this remains hotly debated. Methane leakage (so called fugitive emissions) from gas wells could nullify the supposed advantage in lower CO_2 emissions from natural gas production. Far from being a source of optimism these statistics should be a rallying call for action. In any case the decline in coal comes at a time of an historic *increase* in the use of natural gas and oil.

It is relatively easy to officially record a slight decline or less of an increase in CO_2 if what we are witnessing is simply a switch from high CO_2 emitting forms of energy such as coal to supposedly lower emitting forms such as natural gas. However if humanity is to have a reasonable chance of limiting temperature increases to 2 degrees (in itself a catastrophic increase) we would have to start seeing a much more fundamental shift in production of CO_2. We would need to start seeing a whole reworking of energy production and distribution grids. Moving away from fossil fuels on the scale required and toward renewables like solar and wind etc requires a lot more action and there is no sign global capitalism has any appetite or desires to make that kind of switch.

It is not just the statistics from coal that should alarm activists. The proven reserves of gas globally are higher now than 20 years ago (186 trillion cubic meters compared to 123 in 1996). The consumption of gas last year (as measured in Billion cubic meters) was 3,542 compared to 2,850 in 2006. The proven reserves of oil are now at 1,706 thousand million barrels compared to 1,148 twenty years ago. Each day, globally 96 million barrels of oil are consumed; ten years ago it was 85 million barrels a day. If this were indeed the beginning of the end of fossil fuels then consumption should be going down not up.

[8] 'Trends in global CO2 Emissions' from the *Netherlands Environmental Assessment Agency*. jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf

[9] energydesk.greenpeace.org/2017/01/13/southeast-asia-coal-plans-health-japan-indonesia/

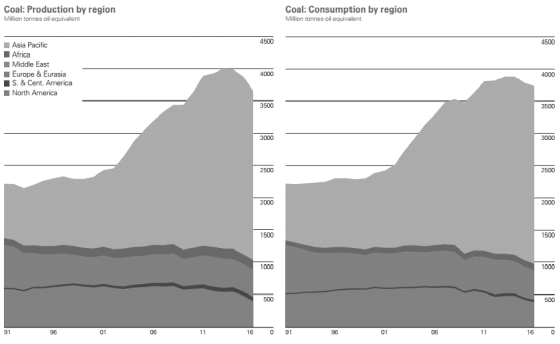

Figure 3: From the BP stat review; the 'death of coal' in perspective with the historic rise since 2000.

Green Ireland?

It is possible of course that these reports are picking up a trend that has little to do with any move away from a reliance on fossil fuel use. In one report[10] which examined the data, they listed 35 counties they claimed are blazing a trail in decoupling CO_2 emissions from GDP growth: the holy grail of those environmentalists who are pro-capitalist. Here, almost at the top of the class with a 16% cut in CO_2 levels since 2000 and a GDP growth rate of 47% during the same period rests plucky little Ireland. From these stats you'd be forgiven for thinking Ireland was blazing a trail or on a par with Sweden when it comes to decoupling its economy from carbon.

There are huge issues with this kind of slant in such reports. As others have pointed out[11], there are problems with the accuracy and honesty of many of the countries reported statistics, both in GDP and emission levels. Second, and perhaps more fundamentally, the use of GDP as a metric is dubious. It's true that the lock step between carbon and economic growth was a feature of capitalism to some extent since the industrial revolution. However when you look at Ireland's presence in this list it hints at a more fundamental flaw in this association. The assumption has been that GDP increases measure, to some extent, greater consumption, and therefore development, in terms of standards of living etc. In terms of Ireland's recent past this clearly isn't the case. While Ireland's reported GDP can measure a 24% leap in a given year (the so-called Leprechaun economics) we can still have 100,000 people in housing need or 7,000 homeless as well as a health system lurching from crisis to crisis. What is being measured as increased production may actually represent speculative forms of financial exchange and activity rather than the actual production or manufacturing of goods and services. A business venture will emit less CO_2 if the economic activity engaged in is shifting multinationals profits to an Irish-based tax haven rather than running a laptop manufacturing plant. But this doesn't mean humanity and the earth's biodiversity is safe from harm, nor that Ireland is an example to be followed. The financial wizardry that boosts one nation's GDP in a low-carbon way is intrinsically linked to another country's higher Greenhouse gas (GHG) emitting activities.

The chief reason for the 'impressive' decline from 2000 to 2016 in CO_2 levels is obviously the 2008 catastrophic economic recession and collapse of the building industry etc. This sharp decline in Ireland's CO_2 emissions is mirrored by a sharp increase in the years prior to this. None of this decline was due to any policy of a

[10] carbonbrief.org/the-35-countries-cutting-the-link-between-economic-growth-and-emissions

[11] steadystatemanchester.net/2016/04/15/new-evidence-on-decoupling-carbon-emissions-from-gdp-growth-what-does-it-mean/

planned reduction in fossil fuel use. Picking the year 2000 as a starting point and proclaiming a decline is meaningless. The reality is that CO_2 per capita has grown steadily since the 1960s and Ireland has the third highest emissions in the EU per capita.

Ireland's place in the *Carbon Brief* website's list of countries successfully decoupling does not mean that Ireland's record on climate is good or even adequate; it's record is largely nonexistent and determined by the vagrancies of market fluctuations. Yes, there have been increases in energy efficiencies as new technology comes into use but none of this has resulted in a planned reduction of fossil fuel use or emissions of greenhouse gases like CO_2. Ireland's emissions grew massively until 2001/2002 when the Celtic Tiger boom ended to be replaced with seven years of a financially speculative fuelled boom. The financial speculation model didn't produce as much CO_2 but neither did it produce a sustainable economy or environment either!

If these figures measure anything useful or meaningful it is as likely to be the fact that global GDP can rise without a commensurate rise in people's living standards or consumption under modern capitalism. The continued sluggish recovery from the recession and the continued weight of financial speculation over actual production may be feeding into the statistics. Allied to modest gains in energy efficiency and even more modest growth in low CO_2-emitting forms of energy and you have a snapshot that explains the 'stalled' rises in CO_2.

That stalled rise in CO_2 may also be influenced by factors such as some regions experiencing milder winters and hence lower demand for energy to generate heating. It is very likely that the trends in CO_2 emissions are temporary and could be reversed should the international economy register real growth following the years of relative stagnation after the great recession. Moreover, the question is whether or not there is a momentum that will force the global corporations to leave their reserves (and thus profits) in the ground. Market fluctuations on their own may delay but not stop extraction and use of fossil fuels. Even with this static, but historically high level of CO_2 emissions, the point remains that the overall architecture of capitalism is very much based on fossil fuels. The energy grids and transport (including aviation and shipping) that moves capitalism globally is not becoming green. It remains based on fossil fuels with renewable sources only at the margins of the system. The wealth and power of the richest corporations and the profits of much of the financial world remain wedded to the use of the proven reserves of oil, coal and gas. Market magic and tech breakthroughs will not change that; only a mass movement that links climate change to the need for radical social change can break that link.

Exportin CO_2 Emissions

Decoupling the economy from carbon within a capitalist, free-market system is often the clear aim of many mainstream environmental movements: 'We can't change capitalism so let's work within it'. The example of countries that are lauded as successfully decoupling are seized on; none more so than Sweden. While often held up as a paragon for many pro-market environmentalists, Sweden's is not a path that can be followed by others in a capitalist world. Sweden, like some other European countries appears on these figures to be successfully decoupling its economy from carbon. In

reality, many of the reported cuts on CO_2 emissions by western economies like Sweden have simply been exported abroad as some large scale and CO_2 intensive industries shifted to developing nations with lower costs and wages and thus higher profit margins.

The entire globalisation project, as implemented under neoliberal economic policies, means that much of the credited cuts in CO_2 by western economies are largely illusionary.[12] [13] In many cases when emissions embedded in trade and in the import of goods are taken into account, the supposed reductions in CO_2 disappear. In the case of Sweden: yes its level of CO_2 has fallen dramatically, but Sweden, like everywhere else, is embedded in a global system of capitalist exchange and production. IKEA and Volvo, just as much as Skype or Spotify benefit from that system and its reliance on fossil fuels. Sweden has been able to reduce its level of CO_2 and grow relatively prosperous for a range of reasons. Access to alternatives like nuclear, thermal, and hydro is part of the answer. As important however, is that, like many other western economies, it directly benefits from the way the international division of labour breaks down. China's historic surge in coal use since 2000 facilitated its manufacturing boom and its export of many consumer goods to countries like Sweden. A Swedish path to lower carbon emissions is not possible for other counties that don't benefit from the way capitalism has carved up the globe. Sweden can be low carbon because China, India and Indonesia aren't. It is estimated for example that over 30% of China's CO_2 is directly linked to its manufacture of goods destined for the west.

The use of Sweden as an example to be followed seems to be chiefly about supposedly showing how a modern capitalist state can also be environmentally sound. Here the planet gets saved and so does the basic structure of capitalism. There are variations on this theme in many academic studies about the way forward. Market magic and a bit of Keynesianism is all that's required in this rosy future. There is no need, and indeed we are told it is counterproductive, to say that capitalism is the problem. We are assured that an alliance of financiers, pension fund managers and the insurance industry is overflowing with funds to invest in a renewable future. Allied to the next big technological breakthrough, this alliance can save the day more effectively than any protest movement that might only scare away potential capitalist allies.

A lot of this is plainly guff whose credibility rests on ignoring what is actually happening to the volume of emissions of CO_2 and to what is happening in the natural world while we wait for capitalism to save us. The embrace of the market from activists like Bill McKibben and some mainstream environmental groups comes against a backdrop of deep pessimism about what is happening in the natural world and a justifiable panic that time is running out to avert disaster as if to say: 'We don't have time to overthrow capitalism so we must try to use it'. In reality adapting to capitalism means adapting to, and accepting as inevitable, catastrophic climate change. In many cases however, the rhetoric involved is plainly self-serving 'green washing' that refuses to locate the causes of the damage be-

[12] `carbontradewatch.org/articles/fraud-and-scams-in-the-eu-emissions-trading-system.html`

[13] *When Markets are Poison; Learning about Climate policy from the financial Crisis* by Larry Lohmann from The Corner House

ing done to the world as lying within the dominant economic and political system that is capitalism.

Big Capital and clean energy

It is true that there is a great deal of finance going to renewable energy from big capital.[14] With government tax breaks and incentives and a demand by ordinary people for alternatives this is to be expected. It is also true that there is a great deal of innovation and advance in the technology around renewables such as battery efficiency, carbon storage or solar engineering. However, it is nowhere near the scale of the finance, subsidies and investments that continue to go toward research, exploration and investment into fossil fuels and toward preserving their infrastructure.

An IMF report estimated that direct and indirect subsidies to fossil fuels globally were $5.3 trillion a year.[15] Another estimated that richer OECD countries were directly subsidising oil and gas companies to explore for more fossil fuels to the tune of $88 billion a year. The IEA in 2014 found that while fossil fuels were directly subsidised to $490 billion a year, renewables received $112 billion. Optimists may suggest that in some countries renewables receive more subsidies than fossil fuels. This is misleading as such stats are usually based on a comparison of subsidy per unit of energy produced. Fossil fuels still consume a vast amount of direct and indirect subsidies from States. Figures for renewables may also include nuclear energy or biomass and biofuels. All come with question marks around their sustainability and whether or not they are in fact really carbon free.

The backdrop to this debate was a global collapse in the price of oil since 2014. Figures that show large drops in oil and gas Companies' investment have nothing to do with the fossil fuel industry being on the run as renewables take off. Globally, energy investments have fallen in the last few years as a result of price fluctuations and slack demand as the world economy staggers from the recession. This fall in investment also affected renewable energy. As oil price rises, new projects, new wells, new rigs will get built and new exploration plans will arise. One survey estimated that globally, oil and gas industry capital expenditure will rise by 7% this year alone.[16] This means more carbon. This is not a sign of climate action but of market-driven profit seeking. It is bad news for humanity and the planet and trying to gloss over that reality is surely criminal. 'Stalled' carbon emissions, reduced investment figures and coal companies' closures are evidence of the madness of the market, not a planned or rational move away from fossil fuels. The danger is reading too much into recent trends. What market fluctuations give, they can also take away. As prices and profit opportunities rise, investment levels will also rise and with them carbon emissions unless there is a force in society that demands that these fuels are left in the ground. The market won't do that by itself.

Some activists laud the French oil giant Total while lambasting BP or Exxon for their relative levels of investments in renewables. Many hope that higher levels of investment in wind or solar signal the start of these companies exiting from fos-

[14] news.nationalgeographic.com/energy/2016/01/160122-why-solar-and-wind-thrive-despite-cheap-oil-and-ga/

[15] theguardian.com/environment/2015/may/18/fossil-fuel-companies-getting-10m-a-minute-in-subsidies-says-imf

[16] strategyand.pwc.com/trend/2017-oil-and-gas-trends

sil fuels. This is a dangerous illusion: the decision to acquire a company involved in wind or solar does not signal a desire to save the planet; it's a business decision based on the likelihood of a profitable return. The same campaigners seem to forget the promises of BP to move 'beyond petroleum' only a decade ago before dropping all such pretence and winding down its renewable investments. Once profit and competition are the defining rules of the game, the planet, its climate and life are in danger and likely to be sacrificed.[17]

Given what we know about climate and the threats we face, the continued levels of investments and subsidies going to fossil fuels are truly extraordinary. These subsidies are largely dismissed by those apologists of the market who are content to seek signs of a new dawn as the planet heads inexorably towards a two degree temperature rise. 'Never mind the heat', they seem to say, 'look at the increase of renewable energy which now stands at 2.8% of global energy consumption'

Technology to the rescue? All hail the Electric Vehicle?

Increasingly, pro-market commentators have fallen to talking up the contribution that new technology can make to achieve reduced CO_2 targets. The IEA explicitly states that limiting rises to 2 degrees will require a massive roll out of, not only *unproven* technology but as yet *uncreated* technology to capture and store carbon! It's important to understand the scale of this fantasy. In order to remove carbon already in the atmosphere, or to continue using fuels like oil, coal and gas, what is being contemplated is an engineering feat beyond possibility using technology not yet invented or tested. It seems to be the case that some can contemplate the end of the world before contemplating the end of capitalism. To give an idea of the scale of the undertaking required one commentator asked the following question of one proposed project which sought to cut CO_2 emissions by 16% and which would liquefy carbon from oil/gas use and then store it deep underground:

> 16% of current daily global CO_2 output when liquefied...would fill 100m barrels each day, which is about the daily volume of oil handled by the entire infrastructure heritage of the global oil industry from the last 100 years. Who is going to build such immense new global infrastructure for only a 16% cut in CO_2 emissions ?

The answer is no one, certainly not under capitalism. These fantasies play an important role however in pretending that there is an avenue out of catastrophic climate damage within the existing fossil fuel structure and with the basic infrastructure of capitalism intact.

Less fantastical tech breakthroughs are also heralded with playing a crucial role in the future. The latest is the arrival of electric vehicles (EVs). Electric and driverless cars are trumpeted as a way that CO_2 emissions will fall in the near future. In fact, by most estimates that future is not that near. Some optimistic estimates suggest that by 2040 as much as 35%-50% of new sales of private vehicles could be electric, while the proposed ban on sales of internal combustion engine (ICE) models in Britain is also

[17] theguardian.com/business/2016/may/21/oil-majors-investments-renewable-energy-solar-wind, theguardian.com/environment/2015/apr/16/bp-dropped-green-energy-projects-worth-billions-to-focus-on-fossil-fuels

planned for 2040. Even with manufacturers promising to switch fully to EVs or hybrids this still means a huge number of cars will continue to operate on oil and diesel for the foreseeable future.

The EV story is an example of the utter bankruptcy of vision for many who look to both new technology and markets as a solution to climate change. The vision of the future with Tesla, Google etc looks remarkably like that of the past with GM or Ford. Private transport remains the model. We will replace a couple of million private ICE vehicles with millions of Electric Vehicles. It is questionable if under capitalism such a switch would actually mean reduced greenhouse gas (GHG) emissions.

Firstly, whether less CO_2 is produced depends entirely on how the electricity is generated to power the EV. While some estimates say up to 50% less CO_2 could be emitted, this depends on the fuel mix involved in the generation of electricity. If the region/country relies on Coal, the saving is obviously much less. If it's a mix of gas and oil and renewable there is some reduction if the comparison is with just the emissions coming out as a result of driving the vehicle. But the mass production of millions of EVs globally to replace the current global numbers of ICE vehicles would unleash vast quantities of GHGs and makes the entire eulogising of the EV a farce. The required volumes of steel, aluminium, rubber and glass, the use of cobalt and lithium in vast quantities all come at a cost in terms of GHGs. Neither is the GHG content of producing millions of electric batteries negligible. It is largely however uncalculated when enthusiastic accounts are being written. Of course electric vehicles could play a major role in a radical switch away from fossil fuels and in reducing GHG emission, especially if they are used as a form of mass transit that substitutes for private transport such as trains or trams. But as with all new technology, its application under capitalism is incompatible with a sustainable path.

EVs are the latest in a long line of promised advances in fuel efficiencies in cars that have been heralded as ways of reducing the use of oil or diesel. Between the 1970s and 80s average fuel efficiency doubled and cars could reach 27mpg. Now the target is set at 54 mpg.[18] In fact there always existed the engineering capability to use fuel more efficiently even in past decades. Some potential technologies were sidelined when they threatened big oil or gas, but even when new advances and efficiencies were introduced it did not result in less oil or diesel being used. In fact global consumption of fuel has accelerated at each advance in efficiency in the use of that fuel. Obviously more fuel would have been used without the technological advances, but expecting greater efficiencies or advances in engineering to deliver more sustainable uses of anything is a mistake. There is an imperative under capitalism to expand markets and for each company to increase its sales and size. Growing markets, selling more and making a profit is what capitalism is about, not reducing the use of any commodity or material. There is always an incentive for an individual capitalist to use a material efficiently. There is usually a pressure under competition to improve the performance of a given product, not to reduce its use but to expand its saleability and outdo your competitor. Past improvements in the technological ability to conserve fuel did not lead to reduced overall use; car manufacturers pro-

[18] pewtrusts.org/en/research-and-analysis/fact-sheets/2011/04/20/driving-to-545-mpg-the-history-of-fuel-economy

duced heavier vehicles and SUVs,[19] people were forced and encouraged to travel more for work and recreation.

This is one good reason why we will wait a long time under free-market regimes for a reduction in fossil fuel use as a result of technological breakthroughs. No new technology is politically neutral; it will be applied and unrolled in a particular way in a class society. Driverless trains and vehicles are attractive to some enterprises not because they might reduce fossil fuel use but because they reduce the power of a cohort of unionised workers with a militant tradition. A new round of accumulation spearheaded by Tesla or Google will ultimately be as damaging for the planet and people as previous ones spearheaded by railroad magnates or Henry Ford. Even advocates admit that large scale use of EV s in the years ahead will see a large increase in demand for electricity.

Conclusion

The backdrop to this debate is the unfolding global climate disaster. The figures for CO_2 emission and fossil fuel usage come with these facts in mind. Environmentalists talk of a 'carbon budget', an amount of carbon that we may emit globally and still hope to limit temperature rises to 2 degrees or 1.75 degrees etc. At the present rate of emissions we have four years before we pass the chance to limit temperature rises to 1.5 degrees. To put the stalled rises in emissions in perspective, it is the equivalent of a bus careering towards an abyss with only a few hundred meters of road ahead slowing down from 100 mph to 99 mph, while sticking to the same course. Hardly great news for those on board.

Last year more CO_2 was released into the atmosphere than ever before by human industry and economic activity.[20] That simple fact is true despite almost three decades of various market mechanisms to curb CO_2 and other GHGs. This includes a sorry history of offsets, emission trading and various fraudulent schemes whose sole purpose was to permit the continued release of CO_2 from fossil fuels while pretending action was being taken. The levels of CO_2 in the atmosphere have passed 400ppm for the first time in 3 million years despite the scientific knowledge that this was happening and that the consequences could threaten the habitability of the planet for human civilisation.

It is possible to imagine a capitalism that runs on other forms of energy that don't release CO_2. That capitalism would still be unsustainable, still breed war and racism and still need to be fought. Such capitalism does not however exist. The shift from water powered energy to steam powered energy in the early stages of the industrial revolution is an example of how capitalism can shift and adapt. Then, despite water power being cheaper, capitalists chose coal as the form of energy as it allowed production to move to cities where there was a working class to employ and exploit. The few capitalists that remained wedded to water power could not compete and did not have the social weight to stop others from adopting coal.[21]

Today, looking to opposing forces within capitalism and hoping that those behind renewables will win over those be-

[19] Foster, John Bellamy (1999). 'Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology'. *The American Journal of Sociology.* 105 (2): p186

[20] `bbc.com/news/science-environment-41778089`

[21] Andreas Malm. 2016. *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming.* Verso.

hind fossil fuels is a dangerous illusion for climate activists. The sheer size, infrastructure, wealth and social weight of the fossil fuel industries means any comparison with the water run mill owners of Victorian England is void. Water mill owners did not have the global infrastructure of the fossil fuel industry, they could not force States to wage wars for resources. Cities and nations were not built around their preferred energy source and for that source. Capitalism has grown and spread across the globe powered by fossil fuels, that link and the attachment to profits will not easily be broken. A peaceful transition to new carbon-free energies which sees remaining stores of fossil fuels unused by capitalism's free markets is an impossibility given the profits and wealth stored for significant sections of the world's elites in those same fossil fuels.

Nor are the green industries, their shareholders and CEOs necessarily a different, separate breed from the fossil fuels ones. Big capital can happily finance a massive wind farm, but such enterprises are happening within an overall architecture that remains wedded to fossil fuels. The capitalism yearned for by some environmentalists does not exist. It must expand to survive and it must always use greater amounts of materials to do so.

The economic system we have is intrinsically linked to fossil fuels and carbon. A transformation to a carbon-free capitalism is not happening. It seems unlikely that such a change can happen without a mass movement forcing such changes onto the world's elites and the powerful fossil fuel reliant industries. The important point is that such a transformation is not happening, not on the scale the earth and its people need and not by the mechanisms lauded as delivering it, that is, free markets, capitalist flair and innovation. New technology could play a vital role in stopping the worst scenarios unfolding, and in ameliorating the consequences of what will now unfold from thresholds and tipping points that have already been passed. If left to an expansionist, market driven system this will not happen. Technological fixes such as electric cars or carbon storage and capture will remain unreliable reassurances as the crisis unfolds.

Capitalism has unleashed a horror on the world in the shape of climate change. Despite alluring noises that all will be well, it won't be until the logic of expansion, profit and competition are challenged and replaced with cooperation, sustainability and production for need not greed.