Elon Musk's electric planet-suicide vehicle: Automobiles, emissions and degrowth

The climate crisis demands immediate and massive cuts in our emissions of greenhouse gases. In turn, this requires a transformation of the global economy – a transformation that would be unprecedented in scale, scope and speed. Such a shift to an ecologically sustainable economy cannot occur under capitalism. As a case study, this article looks at what would be required to meaningfully reduce emissions from road transport. Promoters of 'green capitalism' have claimed that the solution is electric cars powered by renewable energy. However, most of the emissions of an automobile are produced during its manufacture, and the profits of automobile companies are built around planned obsolescence and short lifecycles. The actual solution to minimizing greenhouse gas emissions from the transportation sector – as for the economy as a whole – is a system that is designed on the basis of rational social need rather than corporate profit.

The Intergovernmental Panel on Climate Change (IPCC) special report *Global warming of 1.5°C* (2018) describes the enormous gap between where we are and where we need to be to prevent dangerous levels of global warming. The 2015 Paris Agreement committed industrial nations to reduce their emissions sufficient to keep global temperatures within a 2°C rise over pre-industrial levels. In the final accord, highly vulnerable island nations and faith communities represented at the UN pressed the authors to include the 1.5°C limit as an aspirational target in the final draft of the accord, with 2°C as the backup target.

Soaring emissions over the past five years, rising atmospheric CO_2 concentrations, ice-cap retreats, intensified storms, summer forest fires reaching even above the Arctic circle, and die-offs of the world's coral reefs have all raised concerns about what even a little bit more warming would bring. Parts of the planet including the Arctic and many inland areas have already warmed beyond 1.5°C. California is now on fire much of the year; Australia has just seen historically unprecedented levels of bushfire. The worst hurricanes are twice as severe (more precipitation, slower passage, greater wind speeds) than they used to be. This is just the beginning of the banquet of consequences that humanity has prepared for itself and the more-than-human world.

Climate breakdown occurring much more quickly than expected is one reason why climate scientists now think that the goal just five years ago of limiting warming to 2°C "increasingly seems disastrous in this context" (Mooney and Dennis, 2018). The Paris pledges were never sufficient even to keep warming below 3°C, let alone 2°C. In any case, few of the signatories have even managed to meet the low bars they set for themselves, and the world's largest countries – including China, the US and Canada – have us on track to a 4–5°C warming. As CO_2 concentrations continue growing, preventing runaway warming is going to require ever deeper, truly draconian cuts in emissions, which will mean greater economic disruption. IPCC estimates already show us needing to achieve a near vertical drop in emissions in this decade. Every day we delay getting off of fossil fuels increases the probability that we will not be able to save the planet's ecosystems.

The 2018 IPCC special report painted a stark portrait of how quickly the world is heating up and called on governments to take *immediate* steps to suppress

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emissions. It argues that in order to prevent temperatures from rising beyond 1.5°C above preindustrial levels, anthropogenic CO_2 emissions must decline by around 45% worldwide from 2010 levels by 2030, and by 100% by 2050. As the report remarks (IPCC, 2018), such a huge reduction in global emissions,

> would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems. [...] These systems transitions are unprecedented in terms of scale [...] and imply deep emissions reductions in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options.

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Preventing ecological collapse thus requires transforming the world economy at a speed and scale that "has no documented historic precedent" (Mooney and Dennis, 2018). In the words of Myles Allen, Oxford University climate scientist and one of the authors of the IPCC report, "we need to reverse emissions trends and turn the world economy on a dime" (quoted in Davenport [2018]). Drew Shindell of Duke University, another author of the report, similarly remarked that the "monumental shift toward decarbonization" that is demanded, "would really be an unprecedented rate and magnitude of change" (quoted in Mooney and Dennis [2018]).

Capitalism prioritizes growth and profits over people and planet

Given this unprecedented existential crisis, one might expect that governments would respond with emergency plans to prevent ecological collapse – bold proposals for "deep emissions reductions in all sectors," for "far-reaching transitions in energy, land, infrastructure, and manufacturing" and so on. After all, the 2018 IPCC report makes clear that on present trends we could – well within the lifetime of many leaders today and certainly their and our children's – be facing the collapse of agriculture in much of the US, India, China and Africa, along with mass famine, submerging coastal cities, widespread species extinctions, destruction of the world's last forests and worse.

What is more, the solution to our climate crisis is astonishingly simple and does not require any new technological breakthroughs. The first step is simply *to stop doing what we're doing*: immediately begin shutting down fossil fuel production, stop new drilling, stop producing and registering fossil fuel powered vehicles, drastically curb air travel, ration fossil fuels, curtail manufacturing and construction. The second step is to force through an immediate transition to renewable energy across the economy (and do what we can to enable this transition around the world).

Yet we hear no bold proposals to meet the challenge from any governments – not from European socialist parties, not from Canadians or Australians (the leading exporters of the world's dirtiest fuels), certainly not from the Chinese (the world's largest polluters who, moreover, are now abandoning the limits on coal-burning they just imposed last year in order to restore growth in the face of the trade war [Cai, 2018]), let alone from the Trump administration. Trump's response to his own government's prediction of a 4°C warming by 2100 is 'the planet's fate is sealed' so we may as well abandon Obama's federal fuel-economy standards for cars and light trucks, and 'burn baby burn' (Eilperin *et al.*, 2018). To the extent we hear any proposals at all from governments, it is just renewed calls for more of the same carbon taxes and the same fantasy tech fixes like 'carbon capture and storage' that have so manifestly failed to staunch emissions to date (Snyder and Drajem, 2015).

Why is that? The reason why no government dares take the obvious steps to save the planet is because no one has come up with a magic fix to suppress emissions without simultaneously suppressing economic growth and profits. Given capitalism, economic growth and profit maximization must be systematically prioritized over all other considerations including emissions reduction – for

otherwise companies will fail, the economy will collapse and mass unemployment will be the result (Smith, 2016a). Global warming may kill us in the long run but economic collapse will kill us in the short run. This is the ultimate contradiction of capitalism: We have to destroy our children's tomorrows – along with much of the Earth's ecosystems – in order to hang onto our jobs today.

That is why from the very first climate negotiations around the Kyoto Protocol in the 1990s, all efforts to contain emissions have been subordinated to maintaining economic growth. Year after year, decade after decade, for 25 straight years to COP 24 at Katowice in December 2019, the Framework Convention on Climate Change (UNFCC) annual summit negotiations invariably collapsed in failure and acrimony. Despite the pleas of climate scientists, desperate submerging Pacific Islanders, Africans, Indians and others who contribute few emissions but suffer disproportionately from global warming induced drought and crop failures, no industrial nation has been willing to accept binding emissions limits because they all understand that such caps would suppress economic growth. As George Bush Sr infamously told the 1992 Climate summit, "The American way of life is not negotiable." And if the US will not accept binding emissions caps, why should China?

Facing growing protests over their do-nothing annual summits, the only thing negotiators at Paris could agree on was to stop holding their embarrassing annual farces (henceforth they agreed to meet every five years instead) and contrive another 'agreement' in which industrial countries pledged to reduce their emissions somewhat, some day but are under no legal obligation to do so. This prompted James Hansen, the world's foremost climate scientist, to complain that:[1]

> It's a fraud really, a fake. It's just bullshit for them to say: "We'll have a 2°C warming target and then try to do a little better every five years." It's just worthless words. There is no action, just promises. As long as fossil fuels appear to be the cheapest fuels out there, they will continue to be burned.

Halting global warming requires degrowth: Substantial de-industrialization in the over-industrialized economies

If there is no 'magic' technological fix then phasing out fossil fuel consumption has to mean shutting down – or at minimum, drastically retrenching – companies, beginning with the fossil fuel producers like Peabody Energy, Exxon Mobil, BP and Chevron. However, this must continue down the petrochemical food chain through to all the fossil fuel dependent industries.

Environmental groups have tended to focus too narrowly on fossil fuel producers, their pipelines and such, while ignoring the downstream industrial and personal consumers. This can be seen, for example, in claims that a mere 100 fossil fuel producing companies are 'responsible for' 71% of global emissions (Griffin, 2017). Not to put too fine a point on it, but the fossil fuel producers don't burn the oil, the coal and the gas. *We* burn it; we burn it producing, processing, transporting and refrigerating food, driving our cars, building, heating and cooling our homes, manufacturing this and that, jetting off on vacations, and so on. Fossil fuels are all pervasive. Using the US as our example of a 'developed' economy, percentages of total greenhouse gas emissions by economic sector in 2017 were as follows (US Environmental Protection Agency, 2019):

- transportation, 29%;
- electricity generation, 28%;
- industry, 22%;
- commercial and residential, 12%;
- agriculture, 9%.

If governments in the industrialized economies had listened to climate scientists in the 1980s and taken steps then to radically suppress emissions, perhaps we would not be in the desperate fix we find ourselves in today. But they didn't. They dithered, stalled, insisted on 'market solutions' that were, in reality, designed to fail – with the result that now, after decades of 'green capitalism,' we find ourselves facing an existential crisis that admits of only one proximate solution: state intervention to

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slam the brakes on emissions by shutting down the emitters. If we are serious about suppressing fossil fuel emissions, then we have no option but to drastically retrench and in some cases completely shut down thousands of downstream fossil fuel dependent companies in transportation, petrochemicals and plastics, manufacturing, construction, agribusiness, tourism and more in the US alone. In cases like plastics, disposable products and others, we would have to virtually abolish entire industries, because there is simply no other way to suppress their emissions and make them sustainable.

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Transportation is now the leading source of CO_2 emissions in the US

As shown in the table above, in 2017 transport was the source of nearly a third of greenhouse gas emissions in the US – having overtaken power generation for the top spot in 2016. In turn, road transport accounts for the largest share of these emissions: 82% in total, comprising 59% from light-duty vehicles, and 23% from medium- and heavy-duty trucks (US Environmental Protection Agency, 2019).

Tesla car charging points at Sindlesham, UK, underwater owing to heavy winter rain (photo: Phil Creighton, Editor of *The Wokingham Paper*; see https://is.gd/teslaflood for more).

Auto emissions are surging despite the advent of all-electric and hybrid cars, because electric-car sales comprise such a tiny share of the total market (2.1% of US sales in 2018 [Irle, 2019]), petrol-powered auto sales are surging, and especially because of the industry and consumer preference for enormous, petrol-guzzling 'sports utility vehicles' and 'light' trucks (which can weigh 2–3 tons) which have become the biggest selling automobiles in the US today (Condliffe, 2016; Ferris, 2018).

The electric car: A solution to what?

Environmentalists who subscribe to the idea that capitalism can be made 'green,' such as Bill McKibben, think the solution to reducing emissions from the transportation sector is simply to replace fossil fuel powered cars with cars powered by electricity generated from renewable sources, such as solar and wind (McKibben, 2016). It is worth examining this suggestion more closely, as a case study of how 'green' technological innovations are not sufficient, so long as we remain within a capitalist framework.

There is, no doubt, a place for electric cars in a genuinely ecologically sustainable society, but this is not *the* solution to reducing emissions from transportation. Why? First, because the bulk of all the pollution produced over the life cycle of any vehicle, petrol or electric-powered, is generated *before it leaves the showroom*, in the production of the car (the extraction and transport of raw materials, the steel, aluminium, rubber, plastics, fabrics, leather, adhesives, electronic components and so on that go into the car, the manufacturing process itself) and in the final disposal of the car. Cradle to grave studies show that petrol-powered cars emit more than 50% of their pollution before they ever hit the road, and a further 4% after they are junked (*e.g.* Nealer et al., 2015).

It turns out that the production of electric cars is even more polluting than the production of petrol-powered cars – a lot more. Take Elon Musk's Tesla S which he touts as a 'zero emission vehicle.' That's false advertising. The Tesla S could emit

zero CO_2 emissions during its 'driving' life phase if it were always charged with 100% renewable energy – virtually impossible in the US, where the national grid is still on average 65% powered by fossil fuels and likely to remain so for decades to come. But even if it were 100% solar or wind powered, when emissions from the Tesla's production and disposal phases are taken into account, it would be more accurately described as a '50% lower emissions vehicle' – at best.

In a life-cycle comparison of greenhouse gas emissions from electric versus petrol cars, the Union of Concerned Scientists found that battery-powered electric vehicles release significantly more emissions (15% more for a mid-size Nissan Leaf, 68% more for the full-size Tesla S) during their production phase than comparable petrol vehicles, mostly due to materials and fabrication of the lithium-ion batteries (Nealer *et al.*, 2015: 3, 5). The study still concludes that, from cradle to grave, electric vehicles produce around 47–9% of greenhouse gas emissions of comparable petrol powered vehicles. So electric cars are cleaner by half, but nowhere near zero emissions.

Furthermore, because of their batteries electric cars typically weigh 25% more than comparably-sized petrol-powered cars. For example, with its 500-kg 85 kWh battery, the full-size luxury Tesla Model S weighs around 2.2 tons, nearly 700 kg heavier than a comparable petrol-powered Cadillac CT6 or Mercedes-Benz C300. To compensate somewhat for the battery weight, Tesla uses aluminium for the body and chassis of the car. But aluminium smelting is extremely energy intensive. Australia's leading public research agency, the Commonwealth Scientific and Industrial Research Organization (CSIRO), calculates that "the embodied energy (all the energy used to make the material) for aluminium is 211 GJ per tonne, compared to 22.7 GJ per tonne for steel" – and thus the "joke description of aluminium as 'congealed electricity' is never far away" (Brooks, 2012).

So if producing the aluminium body and chassis requires roughly, by weight, ten times more energy (and thus produces ten times more CO_2 emissions) than producing the steel body of a Cadillac or Mercedes-Benz, and then you consume 25% more energy (from our still mainly fossil fuel-powered grid) to drive your 2.2-ton Tesla S a few kilometres to work or pick up some bags of groceries at the mall than if you drove a lighter-weight petrol-powered car, how 'green' is that? How much emissions, if any, are you really saving? And that is just the Model S sedan. The Tesla Model X SUV is so obese – weighing more than 3 tons –that it's actually *illegal to drive over the Brooklyn Bridge* (Alter, 2016; Courtney, 2016). Who knew that Americans would one day be driving passenger cars that weigh three tons or more?

Given the foregoing it is difficult to see how replacing the US fleet of half a billion fossil-fuel powered cars with half a billion somewhat-less-polluting electric cars, is going to save the world.

My own vote for the title of 'The World's Most Ecological Car' goes instead to the 1953 (or thereabouts) Chevrolet Bel Air I once saw driving on the streets of Havana, Cuba. These Chevrolets got about 19 L per 100 km – a fuel efficiency slightly better, actually, than the 2018 Chevy Impala, rated at 20 L per 100 km for city driving (figures from https://is.gd/4MGRUv). Note also that the 1953 Chevy weighed just 1.6 tons compared to the Tesla S's 2.2 tons. But the fuel efficiency is not so important. What is important is that this car has a massively smaller carbon footprint than any Tesla or Prius or Volt *because it was only produced once and Cubans have been (rather stylishly) driving it for 65 years*. Since the US imposed its blockade on Cuba in 1962, we *Norte Americanos* have gone through six to eight cars – with all the pollution entailed by their production and disposal – while the Cubans have thriftily and ecologically repaired those old cars and kept them on the road; not their own choice to be sure, but nonetheless.

If the bulk of CO_2 emissions from cars are produced before the car leaves the showroom then, obviously, the best way to suppress vehicle emissions is to produce as few cars as possible and make each of them last as long as possible. But of course that

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runs directly opposite to the needs of the capitalist auto industry which must seek to maximize sales by driving repetitive consumption – the faster the cycle, the higher the profits.

Planned obsolescence: The underappreciated main driver of vehicle CO_2 emissions

Like most other markets for consumer goods, ever since the 1920s the auto industry has been based on designed-in and advertising-driven obsolescence, as the industry ritually pushed 'new' but trivially different models each year. Detroit's Holy Grail was to get you to trade in your 'old' car every year. They used to focus on style – grills and tailfins – and of course they have always pushed the biggest 'fully loaded' models like the ponderous Cadillac Escalades and Lincoln Navigator barges one sees all over my home town of New York City. As the industry phrase puts it: 'big car, big profit; small car, small profit.'

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Today the industry has ramped up the technology, larding their cars with high-tech features and gadgets: hybrid or all-electric motors, driver assist, rear cameras, dangerously distracting infotainment systems (unsafe at any speed!), radar, automatic braking, computerized suspensions, heated (and massaging) seats, heated steering wheels, and more. Much of this high-tech is rapidly obsolesced, cannot be upgraded, and is prohibitively expensive or impossible to repair. Rapid technological obsolescence and the high cost of repairs is driving consumers to lease cars short-term instead of buying them, and short-term use is, in turn, accelerating the disposal of perfectly good but 'obsolete' vehicles (Fleming, 2017; Sorrel, 2016).

That new Fiat 500e electric car with its 130-km range will be obsolete in a year or two as new models boast much higher figures. Like your perfectly functional iPhone 5 that Apple refuses to upgrade because they would rather you buy the latest model, chances are it will become e-car waste, junked long before it is worn out. The replacement battery for a Tesla S costs US$44,000, more than half the cost of the car (base price: US$75,000). How many people are going to buy a second-hand Tesla that needs a US$44,000 battery – especially when the 2022 model will have double or triple the range? I think it is also a safe bet that Tesla will ensure that that 2022 long range battery won't fit in your 'obsolete' 2018 Tesla. We'll see.

If the shift to electric cars ends up shortening the life cycle of cars, that could drive up resource consumption and CO_2 emissions from automobile production, just like it has done with phones, computers and appliances, instead of reducing it. But, meanwhile, industry consultants McKinsey and Company (2016) cheer on disposable cars, predicting that "technology-driven trends," "shorter lifecycles" and "faster replacement rates" will drive up profits for the automobile industry.

In short, the entire auto industry – electric and gas-powered – is completely unsustainable. We don't need an auto industry that produces tens of millions of new cars every year. What we need is a different transportation system. The actual solution to minimizing greenhouse gas emissions from the transportation sector – as for the economy as a whole — is not technological innovation, *but social and economic transformation.* We need to redesign the entire transportation system on the basis of rational social needs, rather than corporate profit, to minimize resource consumption instead of maximizing it. The only way to suppress emissions from the auto industry is not to leave it to the operation of markets, but via democratically managed 'command and control' (Smith, 2016b): drastically reduce vehicle production, ban the production of needlessly large vehicles, vastly expand many modes of public transit and biking, discourage private ownership of cars and encourage the use of shared vehicles. And to the extent that we need cars, if we are going to conserve resources and minimize pollution we would have to make them small, simple, durable energy-sippers, endlessly rebuildable, easily upgradeable (a good model here being the venerable

VW Beetle [Ross, 2015]). Such radical but necessary changes would demolish Detroit's business plan. But either we save GM, Ford and Tesla for a few decades till we face total ecological collapse, or we save the Earth. Which is it to be?

In short, 'de-growing' so much of the economy, wrenching down and phasing out polluting industries would certainly be "huge" and "unprecedented" shifts. But isn't this exactly the sort of "systems transitions [...] unprecedented in terms of scale" that we need to be making? ■

Notes

1 Quoted in Milman (2015). See also Bawden (2016).

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