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Communications and the Capitalocene: Disputed Ecologies, Contested Economies, Competing Futures

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Abstract

There is now incontrovertible evidence that the accelerating rise in the earth's temperatures and its associated environmental impacts, which begins with the emergence of an industrial capitalist order reliant on fossil fuels, has initiated a new phase of human and geological history. This phrase we call the Capitalocene, rather than the more common term Anthropocene. Communication systems are playing a pivotal role in the Capitalocene. They are central and contested spaces for information and debate, and are the primary arenas promoting destructive hyper-consumption. Communication systems are also constituted by material infrastructure and devices that deplete scarce materials and energy resources and generate pollution and waste. This article details how the proliferation of digital media under conditions established by the globalisation of neo-liberalism has exacerbated the negative environmental impacts of communications. It also examines the political and public relations offensive now being waged by the proponents of corporate business as usual, and explores the central issues facing proposals for radical change in the organisation of contemporary communications.

Introduction: liar, liar, house on fire

In August 2018, during the hottest Swedish summer in 262 years, 15 year old high school pupil Greta Thunberg, skipped classes to stage a lone protest outside the parliament building in Stockholm. She sat on the steps holding a home-made sign declaring a 'School strike for the climate' and called for immediate and concerted government intervention to reduce carbon emissions.

Initially ignored by passing pedestrians, her solitary action attracted increasing attention after photos and video of her protest were posted on the major online platforms. By November, an international school strike movement was under way. That same month, the panel appointed by the US Congress to assess the likely impact of the climate crisis on the national economy reported that "without substantial and sustained reductions in global greenhouse gas emissions annual losses in some economic sectors [were] projected to reach hundreds of billions of dollars by the end of the century" (US Global Change Research Program, 2018: 12). President Trump, a long-standing climate crisis denier, dismissed the projections out of hand declaring that "people like myself, we have very high levels of intelligence but we're not necessarily such believers. As to whether or not it's man-made or whether not the effects that you're talking about are there, I don't see it" (quoted in Cole, 2018).

In January 2019, Greta Thunberg, by then a globally recognised figure, was invited to address the captains of contemporary capitalism assembled at the World Economic Forum in Davos. She delivered a devastating rebuttal of the single-minded focus on the immediate economic costs of the climate crisis and the militant advocacy of continuing economic growth.

> Here in Davos-just like everywhere else-everyone is talking about money. It seems that money and growth are our only main concerns [but] [t]he bigger your carbon footprint - the bigger your moral duty. The bigger your platform-the bigger your responsibility… I want you to feel the fear I feel every day. And then I want you to act…I want you to act as if your house is on fire. Because it is (Thunberg, 2019: 22/24).

Two months later, on March 15, an estimated 1.4 million school pupils filled streets and squares in 112 countries to support her call for inter-generational justice and a liveable future.

As the central public arenas of representation and debate, communications systems play a pivotal role in organising and disorganising popular understandings of climate crisis and promoting or impeding action for change. Greta Thunberg's rise to celebrity status and Donald Trump's manipulation of Twitter and supportive media channels led by Fox News exemplify this pivotal role.

We will return to this central linkage between communications and contemporary capitalism presently, looking particularly at continuing corporate efforts to deflect or deny calls for radical action. But as argued in our volume *Carbon Capitalism and Communication* (Brevini and Murdock, 2017), where we outlined an agenda of inquiry for the field of political economy of communication, two other essential points of connection need to be considered. Firstly, as profit-generating enterprises dependent on advertising revenues, the major popular media carry substantial volumes of content that insistently promote practices of hyper-consumerism which fuel the ecologically destructive pursuit of economic growth. Secondly, as proliferating assemblages of material devices and infrastructures, communication systems deplete scarce resources in their production, consume increasing amounts of energy in their use, and exacerbate problems of waste and disposal.

Essential insights into these linkages have come from researchers working in specialisms across the natural and social sciences. There is an urgent need to bring these diverse contributions together as the basis for a comprehensive and integrated overview of relevant scholarship. The conceptual and practical challenges facing us can then be identified (Brevini, 2016). There is also a need to broaden debate by drawing on the experiences and insights of movement activists. Indigenous peoples have been on the front line at key sites of protest against the corporate capture of natural

resources, from the encroachment of logging and cattle farming in the Amazonia rain forest to the building of the Adani coal mine complex in Queensland. Their animating moral philosophes of custodianship and community responsibility offer essential cultural resources for models of sustainability (Murdock, 2017).

The appropriation of communal resources by commercial enclosure has been central to the consolidation and expansion of capitalism from the outset. Over the last four decades, however, this process has intensified and extended under the intersecting impact of neo-liberal economic globalisation and the rapid roll-out of digital media. This has initiated a new era in humanity's relation to the natural world. The central role of communications in organising every aspect of economic and social life places a particular responsibility on media scholars to take questions of ecological sustainability fully into account in formulating both immediate policy interventions and longer-term proposals for reorganisation. Here, the critical political economy of communication can play an indispensable role by insisting that changes in the organisation of communication systems and the reduction of their environmental impacts entail prior understandings of the capitalist market fundamentalism and its global reach. This provides an essential corrective to the presentism and technologically centred discourse that saturates much public discussion around 'new' media.

These starting points for argument have led us to designate the present era as the Capitalocene, but since this is a contested term we need to explain why we prefer it to the more widely used Anthropocene. On this basis, we will then unpack the relations between capitalism, ecology and communication in more detail.

Capitalism and the earth system: the great disruption

In his 1995 speech accepting a Nobel Prize for demonstrating that chemicals commonly used in manufacturing were destroying the ozone layer in the upper atmosphere, Paul Crutzen, drew attention to a pattern of corporate and political disregard of scientific evidence already familiar from struggles around pesticides. As he noted: "Although the cause-effect relationship is very clear, for the layperson as well, it is depressing to see that it is, nevertheless, not accepted by a small group of very vocal critics without any record of achievements in this area of research. Some of these have recently even succeeded in becoming members of the US Congress". Such people continued to dispute both the causes and impacts of ozone depletion (Crutzen, 1995: 213-4).

President Donald Trump's militant climate change denial is the latest instance of calculated political support for selective corporate interests. Then, as now, it is pitched against an overwhelming scientific consensus of demonstrable and avoidable planet wide harms. Crutzen was in no doubt that "The "ozone hole" "was "a drastic example of a man-made chemical instability, which developed at a location most remote from the industrial releases of the chemicals responsible for the effect (Crutzen, 1995: 213). He added that it was "utterly clear to me that human activities had grown so much that they could compete and interfere with natural processes" (Crutzen, 1995: 200). Despite concerted corporate opposition, an international agreement, the Montreal Protocol, signed in 1987, had acted on the evidence of increased risks of cancer and other harms. The relevant chemicals were banned, generating a slow and still continuing recovery in the ozone layer.

Other significant human disruptions to natural processes continued unchecked, however, and in 2000 Crutzen argued that the Holocene (deriving from the Ancient Greek for 'entirely or wholly recent' had ended. The 10 to 12-million-year geological epoch of relative climate stability that followed the end of the last ice age was over, and a new epoch in earth's natural history had begun.

Writing in the newsletter of The International Geosphere-Biosphere Programme (IGBP), following an intervention he had made at an academic conference, he declared that with the "major and still growing impacts of human activities on earth and atmosphere, and at all, including global scales, it seems to us more than appropriate to emphasize the central role of mankind in geology and ecology by proposing to use the term 'Anthropocene' for the current geological epoch" (Crutzen and Stoermer, 2000: 17).

The term rapidly gained general currency when Crutzen elaborated on it in the major scientific journal, *Nature,* underlining the particular role of "anthropogenic emissions of carbon dioxide" on the "global climate" (Crutzen, 2000: 23). He admitted that "the choice of the start of the Anthropocene remains rather arbitrary" but settled on the "clear acceleration" in greenhouse gas emissions "since the end of the 18th century…immediately following the invention of the steam engine in 1784" (Crutzen and Steffen, 2003: 251) . While the progressive application of coal fired steam power to transportation, energy generation and industrial processes, and the later adoption of other major fossil fuels, oil and natural gas, has undoubtedly played a central role in increasing the volume of greenhouse gases in the atmosphere and in raising global temperatures, it is not the whole story. As Crutzen and Steffen (2003) note, the capitalisation of agriculture and food production and the resulting increase in "deforestation, and intensive animal husbandry, especially cattle holding" have also made significant contributions (252).

In their landmark 1998 study using tree rings and other proxy measures to trace shifts in global temperatures over the last six centuries, a research team led by Michael Mann also identified the emergence of industrial capitalism as the decisive turning point (Mann, Bradley and Hughes, 1998). After centuries of relative stability in average temperatures their investigation revealed a sharp and continuing increase from the late eighteenth century onwards, producing a pattern shaped like a hockey stick with a long flat handle ending in a sharply angled blade. In a later paper, Mann and his colleagues identify a further acceleration in rising temperatures after 1950 arguing that "only anthropogenic influences (principally the increases in greenhouse gas concentrations)" provide a causal explanation (Jones and Mann, 2004: 31). The crucial importance of the period between 1950 and 1973 was confirmed by the research undertaken by Paul Crutzen and his colleagues (Steffen, Grunewald, Crutzen and McNeil, 2011: 850). In reflecting on their research, they noted that this pattern came as a surprise:

> We expected to see a growing imprint of human enterprise on the Earth System from the start of the industrial revolution onwards. We didn't however expect to see the dramatic change in magnitude and rate of the human imprint from about 1950 onwards (Steffen et al, 2015: 82).

The advent of this 'Great Acceleration', as these authors call it, leads them to conclude: "Only beyond the mid-20th century is there clear evidence for fundamental shifts in the state and functioning of the Earth System that are beyond the range of variability of the Holocene and driven by human activities" (Steffen et al, 2015: 81). A re-analysis of available data confirmed his earlier conclusion that "The last 50 years [witnessed] without doubt the most rapid transformation of the human relationship with the natural world in the history of mankind" (Steffen et al, 2004:131). The phrase 'Great Acceleration' is designed to echo Karl Polanyi's location of the "origins of our Time" in the 'Great Transformation", (the comprehensive patterns of change set in motion by the rise of a market economy) (Polanyi, 1944).

Later commentary has built on Steffen's argument by identifying the years since 1970 as decisive in further deepening human influence on the climate (Gaffney and Steffen, 2017: 4). Thinking of this period as a second Great Acceleration, however, fails to capture the continuing violence and spoliation associated with recent interventions in the earth system or with the drastic widening of social and economic inequalities. The 'Great Disruption' better captures these dislocations.

As critics have pointed out, however, there is a mismatch between the evidence of increased warming and the claim that the earth system as a whole has entered a new geological epoch. Steffen and Crutzen opted to "use atmospheric carbon dioxide concentration as a single, simple indicator to track the progression of the Anthropocene" (Steffen, Crutzen and McNeill, 2007: 614). To demonstrate that the Anthropocene constitutes a new geological epoch, however, it is necessary to locate sedimentary layers distinctly different from those laid down in earlier eras. Following established practice this requires the identification of either a specific stratigraphic marker, a 'golden spike', or a specific date.

In 2008 the International Commission on Stratigraphy established an Anthropocene Working Group to evaluate the geological evidence. They concluded that the 'golden spike' from the fallout from nuclear weapon detonations combined with increased residues from pesticides, black carbon from fossil fuel combustion, emission from gasoline, and the appearance of manufactured materials in sediments and ice (including plastics) had created new stratigraphic signatures sufficient to support the designation of the Anthropocene as a new geological epoch beginning in the mid-20th century (Waters et al, 2016: 2). Dissenting voices, however, argued that fifty years was too short a time period to identify clear dateable changes and that significant sedimentation was unlikely to extend globally and reach the deep-ocean plains for many decades. This meant that "unless materials such as plastics" are present in the most remote locations there is no persuasive case for establishing a new geological epoch (Walker, Gibbard and Lowe, 2015). Three years later research found that plastics had become ubiquitous in the deep ocean including the bottoms of the deepest trenches (Sanae et al, 2018).

After reviewing the available evidence two leading British scientists, Simon Lewis and Mark Maslin, are in no doubt that:

> Based on what we can measure now, an Anthropocene stratum exists and will continue to develop, leaving an indelible mark which will last until a new event in Earth's history begins an identifiable post-Anthropocene stratum (Lewis and Maslin, 2018: 302).

They present the current situation as the outcome of a long process of cumulative human impacts on the earth system that began with the European invasions of the Americas. The subsequent formation of mercantile capitalism's global exchange circuits is "reinforced by the shift to fossil fuels during the industrial revolution, and then accelerated following a new wave of high-production and high-consumption globalization after the Second World War" (Lewis and Maslin, 2018: 331). As they recognise, this account presents "long term planetary environmental change" as "intrinsically linked to a profit-driven mode of living" as it progressively extends its geographical and social reach (Lewis and Maslin, 2018: 326).

The largely coal based industrialisation of the post-Revolutionary Soviet Union contributed significantly to global warming in the years between 1917 and 1991 placing it among the top seven emitters of greenhouse gases since 1850. However, the major contributions over most of this period have come from the United States and the early industrialising capitalist economies of Western

Europe; the United Kingdom, Germany and France. While the United States remains the largest emitter in cumulative terms, since 2005 it has been overtaken by China as the leading current contributor to CO2, with India and South Korea making increasing contributions (World Resources Institute, 2018).

The case for taking a longer view of cumulative human interventions in the earth system has been argued with particular force by Jason Moore, who sees the early consolidation of capitalism between 1450 and 1750 with its new "epicentres of imperial power and financial might" and "its tentacles wrapped around ecosystems from the Baltic to Brazil, from Scandinavia to Southeast Asia" as initiating a new era in human impact on the planet (Moore, 2017: 610). As Lewis and Maslin note, if the beginning of the Anthropocene is relocated to this earlier period , and particularly to the invasion and exploitation of the Americas, "then it is a deeply uncomfortablestory of colonisation, slavery" and "the deaths of 50 million people" (Lewis and Maslin, 2018: 326) . Having acknowledged this history, however, they fail to accept that assigning a central role to the dynamics of capital and empire in explaining environmental destruction poses major problems for the concept of the Anthropocene.

As Jason Moore has noted, the idea of the Anthropocene denies the central role played by the violence and inequality of capitalism and presents the planet-wide ecological devastation it has caused as the responsibility of all humans (Moore, 2018). Once we recognise this he argues, we need to move from talking about "living in the *Anthropocene* – the 'age of man'" to acknowledging that we are "living in the *Capitalocene* - the 'age of capital'- the historical era shaped by the endless accumulation of capital" (Moore, 2017: 596). It is not necessary to endorse the way Moore himself develops this argument in his model of the 'web of life' (Moore, 2015) to accept that the history of destructive human interventions in the earth system cannot be divorced from analyses of the successive transformations of capitalism. It is for this reason that we have opted to characterise the present era as the Capitalocene rather than the Anthropocene.

This choice has the additional merit of reconnecting historical accounts to the core issues in moral philosophy that have always informed critical political economy. It raises acute questions of inequality and exploitation. As Andreas Malm and Alf Hornborg have pointed out "A significant chunk of humanity is not party to the fossil economy at all: hundreds of millions rely on charcoal, firewood or organic waste such as dung for all domestic purposes" so their contribution to greenhouse gas emissions "is next to zero". Nor are the "the nearly one-third of humanity [with] no access to electricity" making demands on energy consumption (Malm and Hornborg, 2014: 65). Exclusion is often accompanied by dispossession. It is not the subsistence farmers in peasant communities or the indigenous peoples of the Amazon basin who have created the current earth system crisis. On the contrary they are the victims of the continuing appropriation and exploitation of the natural resources that their livelihoods have depended on. The aggressive forest clearances, land enclosures, and destructive mining and extraction pursued by capitalist corporations have relentlessly commodified the commons, converting shared resources into profit generating assets.

At the other end of the production chain accounts all too often jettison the moment of production and cast consumers in affluent societies as the primary agents of environmental destruction. This shifts the focus of debate from structural change to individual behaviour (Malm, 2012). Consumers are presented as sovereign individuals making uncoerced choices in the marketplace, generating demands to which companies passively respond. This construction calculatedly deflects attention away from the organisation of capitalist production. As Andreas Malm notes, a consumer wearing a t-shirt is not adding to emissions of C02, these have been accumulated in a production chain

"running all the way" from extraction, to assembly, to transportation. They are already "*embodied* in the commodity", and it is the decisions made by the corporations along this chain that determine the level of emissions (Malm, 2012:149). Someone using a smart phone, tablet or digital personal assistant is contributing to emission and energy depletion when they use these devices however. Consequently, the organisation of media consumption remains a key link in the chain of environmental impacts. But, a substantial portion of total impact is embodied in these machines and their design before they are purchased. Consequently, the use of material is determined by the manufacturers, and this places the primary responsibility on producers.

The ideology of consumer sovereignty deliberately fails to take account of the massive corporate investment in advertising and marketing devoted to sustaining and directing consumption, and the increasingly central role played by planned obsolescence in forcing consumers to upgrade or replace commodities on an accelerating basis. As we will see, both these processes have played a central role in the recent history of relations between capitalism and communications.

Acceleration, disruption and communications

Both recent accelerations in the impacts of human interventions on the earth system identified by climate and geological research coincide with significant extensions in communication systems and the consequent increased demands on material resources and energy.

The first acceleration, between 1950 and 1973, highlighted by Paul Crutzen, saw the advanced capitalist economies of the West, led by the United States, develop new infrastructures built around geostationary satellites. Television sets became the centrepiece of domestic leisure, and the advent of transistors laid the basis for miniaturised and portable personal media. The push to commandeer these innovations to deliver commercial services was partly counterbalanced in Europe by variants of managed capitalism based on the public interest regulation of corporate activity, accompanied by public ownership of key utilities and extensive, tax-funded provision of shared communal facilities and services. These provisions operated telecommunication networks as public utilities, supported advertising free public broadcasting services and went some way to delivering on the promise of universal access to key information sources and points of social connection. These developments activated the core ideal of citizenship, but they relied on the same ecologically destructive physical infrastructures, energy supplies and arrays of equipment as commercial provision. This was a major blind spot in communications policies.

This welfare, citizen-oriented variant of capitalism was progressively dismantled in the wake of the mid 1970s structural crisis of capital accumulation. Neo-liberal arguments championing private ownership, market competition, minimal regulation, low taxation, and escalating consumption as the main drivers of economic growth, gained increasing traction among politicians and policy makers in the heartlands of advanced capitalism. Elements of the neo-liberal vision came to form a template with increasing global reach as emerging economies previously organised around forms of state direction and management moved towards more market-oriented structures, either voluntarily or as a condition of loans from international financial agencies. The 1980s sees China embark on its reform process. In 1991 the Soviet Union collapses, opening the economy to rampant privatisation. In the same year India moves away from self-sufficiency and liberalises its economy followed, in the wake of 1997 Asian Financial Crisis, by South Korea.

These 'structural adjustments' in the organisation of capitalism on a global scale paved the way for a rapid increase in commercial broadcast services delivered by cable and satellite and an

accelerating transition from analogue to digital communication systems and their applications across finance, industry and everyday life. In 1986 the London Stock Exchange revolutionised financial dealing, moving from face-to-face encounters on the market floor to telephone and computerised transactions, a shift rapidly adopted elsewhere. At the level of domestic use, the 1980s also saw the introduction of mobile phones and home computers, followed in the 1990s by the roll-out of the internet as a public facility with the launch of the Mosaic browser in 1993, Amazon's online shopping site in 1994 and Google's search engine in 1998.

In 2007-8, however, the advanced capitalist economies were hit by a second major crisis originating in the financial sector and rippling out into the general economy. Governments, most notably in Britain and the United States, responded by intensifying neo-liberal polices, presiding over a further redistribution of income and wealth to the top and a continuing relaxation of corporate regulation while at the same time, cutting public funding for shared services and resources. This restructuring coincided with the emergence of social media with Facebook launching in 2006 (rapidly overtaking its main rival Myspace) to establish a dominant market position and with Google acquiring the video sharing site, YouTube in the same year.

From the mid-1970s, during the second acceleration in the impacts on man-made interventions in earth systems, we see the progressive availability and application of digital communications intersecting with the consolidation of neo-liberal capitalism to form a fateful combination of destructive forces. It is only by placing the rise of digital media firmly in the context of the wider transformation of capitalism and its global articulations that we can properly interpret the timeline of the most recent escalation in global temperatures. As indicated previously, this escalation has been identified by climate research and confirmed by the formation of new geological strata comprised of plastic residues and other 'techno fossils'.

Deepening climate crisis

In December 2015 representatives from 196 states around the world attended the 21st conference of the United Nations Framework Convention on Climate Change held at Le Bouget outside Paris. After vigorous debate they arrived at an agreement that governments should take steps to keep increases in global average temperatures to well below 2°C above pre-industrial levels with a 1.5°C rise as the desired target. The agreement was based on a general consensus that global warming was primarily caused by the greenhouse emissions of carbon dioxide CO2 which had been generated by the continuing reliance on the fossil fuels of coal, oil and gas. Reaching the agreed targets would require a rapid transition to renewable sources of energy provided by wind, water and solar power, and concerted moves to phase out carbon-based fuels altogether.

Since then an almost daily release of research studies has confirmed that the climate crisis is accelerating and that its impacts are increasing in severity. The concentration of C02 in the atmosphere has risen by 15% since 1994 and "the average global temperature, relative to the norm for the period 1951-80, has gone up by about 0.5°C" (The Economist, 2019a: 44) .The last four years have been the hottest on record. Sea ice and glaciers are melting at an accelerating rate. Methane, the other major greenhouse gas alongside CO2, is being released into the atmosphere in increasing quantities as the tundra permafrost thaws. Sea levels are rising, coral reefs are progressively bleaching, extreme weather events, storms, heatwaves and droughts are becoming more frequent.

In October 2018, after reviewing the accumulating evidence, the Intergovernmental Panel on Climate Change, the UN body charged with assessing levels of risk , issued a landmark report that redefined a 1.5 degree rise in temperatures as an absolute limit rather than the desired aspiration of the Paris Agreement. The authors warned that there were only a dozen years left to achieve this goal. Beyond that, global warming would continue to accelerate with the worst impacts being felt by later generations inheriting a disaster not of their making and by countries in the global south least resourced to respond (IPCC, 2018).

Carbon counter revolution

As the IPCC report made clear:

> …limiting global warming to 1.5°C would require 'rapid and far-reaching' transitions in land, energy, industry, buildings, transport, and cities. Global net human-caused emissions of carbon dioxide (CO2) would need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050. This means that any remaining emissions would need to be balanced by removing CO2 from the air (IPCC, 2018b:1).

This target poses an unprecedented challenge to the energy industries that have played a pivotal role in capitalism's relentless expansion. The system continues to do so, deploying formidable public relations and lobbying resources to secure a positive policy environment. Despite rapidly improving technologies, falling prices of renewable energy and the pledges made in Paris, governments around the world are continuing to fund fossil fuel projects. A recent report by a coalition of NGOs found that the G20 group of leading industrialised countries direct four times more public funding to fossil fuels than to renewable sources of energy; $71.8 billion dollars as against just $18.7 billion (Talk is Cheap, 2017). This is crucial since decisions taken now have long term consequences. C02 emissions from burning fossil fuels stay in the atmosphere for decades with a significant residue remaining for centuries.

The most recently available figures show the two leading members of the G20, China and the United States, accounting for 43% of global C02 emissions from fuel combustion, with China contributing 28% and the US 15% (Union of Concerned Scientists 2019). Both countries are continuing to invest in fossil fuel expansion. Since becoming President, Donald Trump has pursued an aggressive policy of allowing coal, gas and oil extraction in previously protected areas and of dismantling regulations designed to protect wildlife, the environment, and public health from the negative impacts (Murdock, in press). In 2018, US CO2 emissions rose by 3.4%. The increasing share of energy generation taken by natural gas, which emits around half the CO2, is not necessarily a welcome development. Gas is still a fossil fuel and cuts in emissions have been offset by escalating demands for electricity (Rhodium Group, 2019)

Faced with rising public concern over unsustainable levels of atmospheric pollution China has embarked on concerted efforts to decarbonise its domestic power generation. At the same time since 2001 Chinese led policy banks have financed almost 60 completed or under construction coal -fired power plants around the world, overwhelmingly in emerging economies. Support for electric power generation and transmission from fossil fuels has accelerated under the Belt and Road Initiative (BRI). In the three years between 2014 and 2017 only 11% of relevant BRI investment was devoted to solar and wind power as against 36% for fossil fuels. Most of these latter investments are part of larger infrastructural projects locking the installations into fossil fuel dependence over the longer term (Shearer, Brown and Buckley, 2019). Chinese investment is also playing a leading role in

financing plans for new coal fired power stations in Sub-Saharan Africa (The Economist 2019c) and in Bangladesh, a country particularly vulnerable to sea level rises from global warming (Shearer et al, 2019).

Leading financial institutions are also continuing to invest in fossil fuels despite evidence of increasing losses from owning assets that may never be exploited. They have also failed to capitalise on the growth in demand for renewables. The world's largest fund management group, Black Rock, with holdings greater than the world's third largest economy, Japan, is estimated to have "lost investors over US$90 billion in value destruction and opportunity cost in just a few select holdings over the past decade, due largely to ignoring global climate risk". Three quarters of those losses came from investments in four major oil companies (Buckley, Sanzillo and Shah, 2019: 1).

As these figures demonstrate, despite incontrovertible evidence that burning fossil fuels is the primary cause of the escalation in global warming, the destructive environmental impacts of the mining, drilling and transportation entailed in their extraction and delivery to users continues apace. There are powerful governmental and corporate interests intent on maintaining dependence on carbon and 'offshoring' the majority of risks and negative impacts by exporting them to emerging economies (thereby compounding their vulnerability to the climate crisis).

As with all counter-revolutions, sectional interests are presented as serving the common good. The statement issued by the Organisation of Petroleum Exporting Countries (OPEC) in 2016 following the Paris Agreement meeting is typical:

> OPEC is committed to doing all in its power to support the implementation of the Paris agreement. But it will always fly the flag for the continuing use of fossil fuels — particularly oil and gas — which are proven to be essential for the future welfare of the global economy and mankind in general (OPEC, 2016).

The corporate distortion of public information and debate has been one of critical political economy's abiding concerns. The neo-liberal deregulatory push combined with the rise of social media has opened new possibilities for corporate influence.

Distorted democracy: carbon captures

Political economy has been fundamentally shaped as a tradition of inquiry by the intersection of two transformations; the consolidation of capitalism as the principle form of economic organisation and the emergence of mass political participation. Adam Smith's manifesto for the primacy of market relations, *The Wealth of Nations,* and the vision of a democratic republic of citizens announced in the American Declaration of Independence appeared within months of each other in 1776. After an initial burst of optimism that viewed minimally regulated markets as a liberating force that would replace state censorship and licensing with a 'free' market in ideas, critics recognised that a system based entirely on private ownership and dedicated to maximising profits was unlikely. Such a system was often unwilling to deliver the comprehensive information and diverse analysis and debate that citizens needed to participate effectively in deliberations around issues of common concern or to make considered choices between alternative political platforms and policy proposals.

Research in critical political economy has repeatedly interrogated how corporate interests restrict the diversity of representation and debate and shape the organisation of public knowledge. Studies have focused particularly on three mechanisms of control; direct interventions by media owners using their communications properties to promote their economic interests and favoured

political positions; corporate public relations initiatives supplying news outlets with ready- made free copy glossing and washing their clients' interests; and the reliance of commercially based communication on revenues from advertising and product promotion. This last is key, because advertising has traditionally provided the primary economic base for commercial news media. Shifts in promotional spending have major consequences for the distribution of visibility and prominence among competing voices and positions.

Recent years have seen the advertising that previously provided newspapers with the bulk of their income migrate to digital platforms at an accelerating rate. Estimates from consultancy eMarketer calculate that by the end of 2019 digital media will account for over half (54.2%) of all advertising expenditure in the world's leading commercial media market, the US, with three companies, Facebook, Google and Amazon together taking a dominant 68% share. Advertising revenues going to printed newspapers and magazines are predicted to continue dropping, by almost 18%, taking their overall share to below ten per cent by 2021 (eMarketer, 2019). The result is a fundamental structural crisis in the economic base of professional print journalism. As Robert McChesney has noted, with his customary clarity, "the system is collapsing … and it is not coming back" (McChesney, 2016: 129). The consequences are already clear. Titles are closing at an accelerating rate, particularly in local markets. Those left are being incorporated into a shrinking number of consolidated corporations. At the beginning of 2018 two of Britain' longest established national newspaper publishers, the *Mirror* and the *Express*, amalgamated giving the rebranded company, Reach, almost a quarter (23%) of weekly market share (Media Reform Coalition, 2019: 5). In November 2018, Australia's oldest press group, Fairfax, merged with the Nine broadcast network to form a new multi-media entity. A month later 144 employees were made redundant (Ryan, 2018).

This new surge in consolidations, designed to shore up a declining market position, has two major consequences. Firstly, it concentrates control even more firmly in the hands of the leading media corporations. Secondly, cuts to staff, particularly in the cost-intensive areas of specialist and investigative reporting, whittle away the resources necessary to hold power to account and create an extended space for content crafted by public relations companies. Back in 1990, PR operatives already outnumbered working journalists by two to one in the US. By 2012 that ratio had doubled to four to one (McChesney, 2013: 183). The services provided have become more comprehensive. The established information subsidy provided by press releases available for tweaking has given way to an editorial subsidy offering "targeted, tailored and page-ready news copy that contains key client messages" (Jackson and Moloney, 2016: 763).

As Bill McKibben, founder of the fossil fuel divesture movement, 350.org, reminds us, "The coal, oil and gas industries have been the architects of the disinformation campaigns that kept us from responding earlier to scientists' warnings about climate change, and they are using every trick they know to keep us from making a quick transition" to renewable energy (McKibben 2019:6). These companies have persistently presented the scientific evidence for human-made global warming as inconclusive and contestable even when they knew perfectly well that it was not (see Anderson, Matt and Pomerantz, 2017). In 1988, the year that the United Nations Intergovernmental Panel on Climate Change was founded, and before it had published its first report in 1990, the power generation industry was already aware that the scientific consensus was predicting increasingly catastrophic consequences arising from the continuing use of fossil fuels. An editorial published that year in the journal of the Electric Power Research Institute, the main organisation undertaking evaluations on the industry's behalf, was in no doubt that;

> There is growing consensus in the scientific community that the greenhouse effect is real. Combustion-generated carbon dioxide may indeed cause significant warming of the atmosphere… Even more disconcerting is the possibility of destabilisation of the earth's entire weather system (EPRI Journal, 1988:1).

Knowing this, major providers of fossil fuels did everything they could to keep this stark warning to themselves and undermine critics. Between 1997 and 2014, for example, only 12% of the paid-for advertorials Exxon Mobil placed in *The New York Times* conceded that "climate change was real and man -made" compared to 80% of the internal documents and peer reviewed articles the company produced for its own use (Supran and Oreskes, 2017). The public discourse of coal, gas and oil interests has also displayed a marked tendency to emphasise the negative economic impacts of concerted action to reduce reliance on fossil fuels, foregrounding lost jobs and reduced growth, while ignoring the collective social costs of not taking action (Gaither and Gaither, 2016). When the need for action is discussed the available options are marketised and reduced to cost-benefit calculations. Preferred policies such as carbon credits are presented as a way of sustaining business as usual, deflecting and marginalising alternatives that entail more radical changes to the organisation of contemporary capitalism (Nyberg and Wright, 2016).

Corporate denial, disinformation and deflection has been bolstered by the journalistic convention of 'balance' which operates with particular force in public service media. By presenting climate crisis scepticism as a credible counterbalance to the overwhelming scientific consensus, the injunction to cover both sides of the argument, which in other contexts is a necessary guarantor of plurality and open debate, has given sceptics "exceptional media exposure" (Park 2017:2013). However, the major boost to their visibility and purchase on public discourse has come from their access to sectors of the contemporary media system where 'balance' has been suspended or jettisoned in favour of militant partisanship

Two policy decisions taken in the United States at the end of the 1990s have had particularly far-reaching impacts. In 1996, Section 230 of the Communications Decency Act classified the emerging internet sites as platforms, aligning them with telephone companies rather than press and broadcasting organisations. It specified that: "No provider or user of an interactive computer service shall be treated as the publisher or speaker of any information provided by another information content provider" (quoted in Digital Media Law Project, 2019). This meant that internet sites were exempted from the obligation to exercise editorial control over the content they carried. This cleared the way for a massive increase in partisan posts, which were also encouraged by the business models adopted.

The two leading online platforms, Google and Facebook, operate models that harvest users' personal information for sale to advertisers who can target their appeals more precisely. This promotes an operating principle of "radical indifference" to content. Posts are evaluated by the number of users they attract, how long people stay on the site, how many people they repost to, and the range and depth of personal information their interactions provide. Partisan and sensational posts are more likely to meet these criteria than measured analysis. As one Facebook senior executive explained in an internal memo to staff in 2016, "The ugly truth is that …anything that allows us to connect more people more often is de facto good …The best products don't win. The ones everyone uses win" (quoted in Zuboff, 2019: 506). In 2016 the most shared climate change post on Facebook was produced by a right -wing website, Your News Wire, which recycled one of the core planks of the climate denial position. Headed 'Tens of Thousands of Scientists Declare

Climate Change a Hoax' it was shared three times as often as the second most popular story reporting that the state of California would continue to abide by the Paris climate agreement even if President Trump withdrew (Readfearn, 2016). In 2018, a short video reasserting key climate change claims posted on Facebook by Mike Morano, Communications Director of the fossil fuel lobby group, Committee for a Constructive Tomorrow, funded among others by Exxon Mobil and Chevron, was shared 75,000 times and seen by over five million users (Nuccitelli, 2018).

Since December 2016 Facebook has employed independent fact-checking agencies to review and rate posts that the company refers on to them. Evaluation proceeds on the basis of users' comments and reactions and computer-generated sorting. There are two major problems. Firstly, much of the material sent to checkers consists of expressions of opinion or random posts, including *Mr Bean* videos, which are not eligible to be evaluated. Secondly, although posts rated as false are flagged to users that they are still available for sharing (Lu, 2019).

The other major social media platform, Google's YouTube, has also played a major role in promoting climate denial. Open to posts from anyone, it is currently visited at least once a month by 2 billion people outside China (where it is banned alongside Facebook and Twitter). It regularly hosts videos from the Heartland institute and other right- wing lobby groups championing climate denial. This is not an isolated exception. A recent analysis of 200 climate-related videos posted on YouTube found 107 promoting word views opposed to the scientific consensus. Ninety-one of these recycled conspiracy theories, including the widely circulated assertion that climate change is caused by aircraft condensation trails that have been deliberately adulterated by secret government, military or industry agencies (Allgaier, 2019). Under increasing pressure to limit the promotion of misinformation and conspiracy theories, in July 2018 YouTube tagged climate denial posts with the following text taken from Wikipedia; "multiple lines of scientific evidence show that the climate system is warming". The algorithm that selects which videos will carry the text, however, only responds to obvious labels such as 'global warming' and 'climate change' leaving plenty of scope for climate denialists to find alternative wordings that evade control.

Responding to outside pressure, Facebook has enlisted a number of outside organisations to act as fact checkers for the material posted. They include CheckYourFact, an affiliate of *The Daily Caller* which has persistently questioned the solidity of the scientific consensus on the climate crisis. Co-founded by Fox News host Tucker Carlson, many of the stories *The Caller* carries are produced by a news foundation partly funded by Charles Koch, one of the major donors to climate denial organisations. This raises questions about the independence and impartiality of CheckYourFacts' judgements (Waldman 2019). Facebook is also a significant site of 'astroturfing', presenting synthetic and manufactured material as originating from grass-roots action. Using Facebook's 'business manager' function, which allows a variety of sites to be centrally administered without declaring their linkages or who is funding them, the public relations firm CTP Partners launched Green Watch, a name chosen to suggest independent oversight of green initiatives. Funded by the major coal mining corporation Glencore the site repeatedly attacked subsidies for offshore wind farms (Watson 2019).

The continuous stream of disinformation and denial on the main social media platforms has recently moved from the margins to the mainstream as a result of the spurious legitimacy accorded to the pronouncements and policies of US President Donald Trump. He is a card-carrying climate crisis sceptic. As he explained in a radio interview at the end of 2016; "I believe there's weather. I believe there's change, and I believe it goes up and it goes down, and it goes up again depending on years and centuries, but I am not a believer" (quoted in Lewis, 2016). Trump is aggressively

dismissive of mainstream news outlets that question his policies, castigating them as conduits of 'fake' news and prefers to communicate directly to his electoral base through his Twitter feed. The single exception is Fox News.

In 1987, the year after Section 230 was enacted, the Fairness Doctrine requiring broadcast licence holders to present controversial issues in a way that was honest, equitable and balanced was abolished. The Federal Communications Commission had introduced the doctrine in 1949, just as television was taking off as a mass medium. The main beneficiary of this retreat from public interest regulation has been Rupert Murdoch's Fox News, launched in October 1996 as a platform for mainstreaming overtly conservative political positions. Fox actively promoted the Tea Party movement on the right of the Republican Party and enthusiastically endorsed Trumps' bid for the presidency when he adopted many of the Party's core demands as part of his own platform. The result is a new communications circuit linking Trump, Fox News and Twitter in a self-reinforcing circle.

In March 2019 Patrick Moore appeared on Fox News' leading current affairs show, *Fox and Friends,* promoting his new book denying the climate crisis. The program's Twitter site posted an unashamedly celebratory precis of his core argument:

> Patrick Moore, co-founder of Greenpeace: 'The whole climate crisis is not only Fake News, it's Fake Science. There is no climate crisis, there's weather and climate all around the world, and in fact carbon dioxide is the main building block of all life' @foxandfriends Wow!" (quoted in Holmes, 2019).

The tweet sought to capitalise on the claim that as a prime mover in creating one of the most active environmental groups who now realises his mistakes, Moore could speak with authority. It was an entirely false attribution. Moore was not one of the co-founders of Greenpeace. Although involved in its Canadian wing in the early years, since the early 1990s he has been a lobbyist and public speaker on behalf of a range of corporations making a material contribution to the worsening environmental crisis through mining, logging and PVC manufacture. The Fox News tweet was immediately reposted on the White House Twitter feed, reinforcing Trump's own frequent dismissals of climate change science and completing the circle of misrepresentation and false argument.

The blatantly partisan employment of Facebook posts by right-wing groups during both the US Presidential election and the Brexit referendum debate in Britain has fuelled mounting calls for tougher regulation to control the stream of lies, conspiracy theories, and abusive expressions of partisanship, appearing on Facebook, YouTube and Twitter. In response, all three have introduced selective bans and new monitoring systems in an effort to forestall statutory intervention. But the fundamental problem with the basic business model remains. It is not simply that the drive to maximise revenues from advertising favours sensational and contentious content most likely to secure attention and engagement. It is also that the advertising itself is both ubiquitous and designed with the same aims in mind, a combination that reinforces an environmentally destructive culture of hyper-consumerism

Saturated promotion: hyper consumerism

Addressing capitalism's structural crisis of the mid-1970s required a fundamental reorganisation of both production and consumption (Streeck, 2016). Neo-liberal globalisation saw increasing

numbers of routine assembly and clerical jobs 'outsourced 'to low income economies overseas, and an accelerating shift from heavy industry to services within advanced capitalist societies accompanied by increasing casualisation and precarity and attacks on trade unions. At the same time, restoring profitability required a major extension of consumption. In the decades between 1945 and 1975, rising real wages enable increasing numbers of households to join the mass consumption society and acquire the desired domestic commodities. Media devices were central to this shift. The idealised home contained a television set, radio and record player alongside a refrigerator and vacuum cleaner.

In 1955 the marketing consultant, Victor Lebow, issued what became a de facto manifesto for the new consumerism. Writing in the house journal of the retail industry he argued that it was not enough simply to persuade people to consume more, they had to be convinced to make "buying goods into rituals… to seek spiritual and ego satisfaction in consumption" and to express the "very meaning and significance" of their lives "in consumption terms". "The greater the pressures upon the individual to conform to safe and accepted social standards", he argued, "the more he [sic] tends to express " his [sic] aspirations and his individuality in terms of what he wears, drives, eats- his home, his car, his pattern of food serving" (Lebow, 1955:3). Aggressively promoting this radically individualised conception of the fulfilled self and the good society necessarily devalued and marginalised the socialised identities of citizen and worker. As Bonneuil and Fressoz point out, the 'disciplinary hedonism' at the centre of the consumer system pivoted on accelerating obsolescence and disposability. It required a major transformation in values and practices. "Economising and saving were presented as outdated habits …while repeated and ostentatious consumption, fashion and obsolescence became respectable objectives" (Bonneuil and Fressoz, 2016:157). But there was a problem. In households on modest incomes, if valued machines or appliances broke down, a local repair shop would install replacement parts, prolonging their useful life. As a result, by the mid-1970s, consumption of big-ticket items had hit a ceiling. Boosting it required a major extension of promotional spaces geared to pursuing Lebow's project of celebrating consumer choices as the primary arena of personal expression and self-realisation backed by a rapid roll-out of the easily accessible personal borrowing offered by credit cards, and later, store cards (see Murdock, 2014).

Neo-liberalism's insistence on opening markets to competition propelled a rapid global expansion of new commercial cable, satellite and terrestrial television channels which significantly expanded the space available for product advertising. By and large however, they were subject to many of the same restrictions on the amount and types of advertising that had been developed for the first television age. In contrast, social media were permitted to operate with considerably greater degrees of freedom allowing them to integrate product promotion more securely into the entertainment forms that engaged attention and involvement. A range of devices, from product placement to advergames, presented brand images, logos and commodities as sites of personal pleasure and cemented associations with universally recognised expressions of lifestyles and personal identities. In addition, as agencies of hyper consumption, on-line platforms offered three other advantages over traditional commercial media.

Firstly, as noted earlier, accumulated amounts of personal data harvested from users provided raw information that could be converted into increasingly fine-grained mapping of markets and personalised appeals. Secondly, the introduction of smart phones that operate as both platforms for promotion and payment devices has radically reduced the time consumers have to reconsider purchasing decisions. No more counting out coins and notes or keying in credit card security numbers. Simply swipe your phone across the pay point. Thirdly, social media platforms have been

able to harness the horizontal, peer-to-peer, organisation of the internet. From the ubiquitous clicks on 'likes' and smiling emoticons to the ranks of young 'influencers' on YouTube talking about and demonstrating products, including digital games and cosmetics, social media have comprehensively incorporated networks of friendship and peer recognition into their promotional portfolios. In a recent YouTube survey of young people, 40% claimed that the site's star influencers "understood them better than their friends or family, and 60% said [they] had changed their lives or worldview" (quoted in The Economist, 2019b: 22). This outsourcing of emotional connection is one of the key contributions that commercially based social media are making to reproducing an environmentally destructive culture of hyper consumption.

Food choices are integral to contemporary cultures of hyper-consumption with social media providing extended promotional platforms for meat rich diets and fast foods and drinks with high sugar and fat content. Publicity aimed expressly at children is a particular concern given the long-term damage to health from obesity, heart disease and other chronic conditions. A survey of the most popular online game sites for children in the US found food-based games on half the sites carrying advergames. Of these, 90% gave users no indication that the material was devised by companies promoting their products. The pleasures of play are integrated seamlessly into brand recognition and engagement (An and Kang, 2014).

The accelerating land clearances and intensive agriculture that have developed over the last three decades to meet changing food demands have had two major environmental impacts. Firstly, it reinforces global warming by eroding the forest and woodland cover that acts as a vital carbon 'sink' absorbing CO2 in the atmosphere. Secondly, it destroys the habitats that support the diversity of plant, insect, bird and animal life that sustain vibrant ecosystems. A landmark report from the United Nations Intergovernmental Science-Platform on Biodiversity and Ecosystem Services (IPBES) published in May 2019 assessing the range of available scientific research concluded that around one million plant and animal species were threatened with extinction, many within decades, more than at any time in human history (IPBES, 2019). A recent re-analysis of current data has revised this estimate downwards, but the predicted loss remains substantial (Costello 2019). Underlining the urgency of the situation the IPBEC's Chair, Sir Robert Watson, concluded: "We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide" (UN Sustainable Development Goals, 2019).

The negative environmental impacts of commercial social media derives from their incessant promotion of commodities and lifestyles that depend on accelerated cycles of obsolescence and disposal and which make increasingly unsustainable and destructive calls on resources and energy in their production and use. And, most fundamentally, their own business strategies are primary drivers of this process.

Toxic materials: devices and infrastructures

Since the introduction of the telegraph in the first half of the nineteenth century commentators have seen advanced communication technologies as immaterial, no longer reliant on the physical constraints and pollution of transportation. Railways driven by coal-fired steam engines belched dark clouds of very visible smoke and soot. The environmental impacts of the telegraph systems that ran alongside railway tracks remained invisible. While they were traveling over the wires as pulses of electricity telegraph messages were indeed immaterial. Coded with Samuel Morse's binary system of dots and dashes they initiated digital communication. But their transmission and

delivery depended on a series of solidly material installations and machines. They were: coal fired power stations that provided electricity; wired networks strung on poles or running through subterranean and undersea cables that had to be built and maintained; the telegraph machines at either end of the connection that translated between written messages and Morse code; and the physical transportation that delivered messages to customers. This pattern of fundamental dependence on physical resources, energy supplies, and the making of machines, has been repeated for every seeming immaterial communications technology, from broadcasting to the internet. The history of the telegraph also reminds us that many of the core resources for advanced communication are obtained from locations removed and remote from their eventual final use. This conceals the environmental despoliation that enables our technological access. Also concealed are the dispossession of indigenous peoples and the destruction of their traditional economies and cosmologies. For example, the early undersea telegraph cables were protected from erosion by casings made from gutta-percha, a resin extracted in huge quantities from trees found mainly in south east Asia at the expense of both natural habitats and native livelihoods (see Tully, 2009).

This pattern of failing to notice the material bases of seemingly immaterial forms of communication and the social and environmental costs involved in their construction and operation has been reproduced in commentary on both broadcasting and the internet. As a consequence, "In communications and media scholarship, the overwhelming focus has been on texts, the industry that produces them, and the viewers that consume them; the materiality of devices and networks has been consistently overlooked" (Gillespie, Boczkowski and Foot, 2014: 1).

In recent years, critical political economists of communication have increasingly heeded Marx's injunction to look behind the sphere of exchange and interrogate the 'hidden abode' of production. One must critique the varieties of exploitation entailed in the labour processes around the making of digital devices and services. Fewer have travelled further down the production chain to detail the environmental costs of extracting the raw materials and generating the energy digital media require or to trace the trails of pollution and waste incurred in transportation, use and disposal. The work of Richard Maxwell and Toby Miller stands as a notable exception (Maxwell and Miller, 2012; Maxwell and Miller, 2019).

The present assembly of digital machines and networks is the product of a long process of increasing proliferation. The collective experience of watching films in the cinema has given way, progressively, to the shared domestic experience of watching the single household television set and now to the individualised experience centred around personal smart phones and tablets. At each stage in this process the number of media machines in use has increased. Connecting networks have expanded with the addition of satellite systems, and the speed with which consumer devices are superseded and replaced has accelerated. Shared domestic landline telephones and public call boxes have been replaced by personal smart phones which users are exhorted to replace on an almost yearly basis as improvements and modifications promised by the latest model are promoted as indispensable. Older models are rendered obsolete by the withdrawal of spare parts and the ending of support for previous generations of software. The successive iterations of the iPhone embody this new iron law of rapid replacement perfectly. The result is an increasing use of scarce resources and energy and mounting volumes of waste.

Information industry estimates are projecting a sharp increase in the number of networked devices in use globally, up from 18 billion in 2017 to 28.5 billion by 2022 (3.6 devices per person). The great majority of traffic (82%) will be bandwidth heavy video (Cisco, 2019). Netflix's high-resolution videos already account for 15% of total global internet bandwidth, closely followed by

YouTube's 11% (The Economist, 2019b). At the same time, rapid expansion of the internet of things and the application of artificial intelligence and robotics to an increasing range of manufacturing and service systems will massively increase the volume of data needing to be transmitted, analysed and stored. As Anders Andrae, an industry analyst working for the Chinese telecoms firm, Huawei, points out:

> We have a tsunami of data approaching. Everything which can be is being digitalised. It is a perfect storm. 5G, [the fifth generation of mobile technology] is coming, IP [internet protocol] traffic is much higher than estimated and all cars and machines, robots and artificial intelligence are being digitalised, producing huge amounts of data which is stored in data centres (quoted in Vidal 2017).

His pessimistic prediction is that these escalating communication demands could command a quarter of the world's total electricity supply by 2025. The recent growth of cryptocurrencies offers a cautionary tale of the environmental costs of current innovations. Because there are no centralised registries processing Bitcoin transactions requires connections between multiple data points. This generates calls on electricity supply that approach those made by entire nations. Current demand is approaching Ireland's and is predicted to match Austria's in the near future (de Vries, 2018)

Mobilisations and contestations

Daily confirmation of the increasing severity of the climate crisis has prompted a renewed wave of popular mobilisation. In November 2018 Britain witnessed the country's largest ever sustained mass demonstration of peaceful civil disobedience as supporters of the Extinction Rebellion movement assembled a coalition of all ages. In a week of concerted action, they successfully blockaded five bridges across the Thames and occupied key transport hubs in the city while unfurling banners reading 'Rebel for Life'. Up until recently, climate crisis protests have been heading into a largely hostile wind of corporate disinformation and governmental delay in taking concerted action. This may be beginning to change. In response to Extinction Rebellion's action on 1 May 2019, the leader of the opposition Labour Party tabled a motion in the British parliament calling for a state of climate emergency to be declared. It was endorsed unanimously without a vote.

Money is also talking. One recent analysis predicts that demand for fossil fuels will stop growing by the early 2020s as the prices of solar and wind power and battery storage continue to fall, making fossil fuels uneconomic and prompting investors to move their money to renewables (Bond, 2018). A detailed evaluation from the Institute for Energy Economics and Financial analysis now advises investors to withdraw their investments from fossil fuels noting that:

> …the blue-chip veneer of the sector has long since eroded, which changes the cost-benefit calculation for all types of investors….Taken together, these findings show clearly that it is incumbent on investment trustees to ask the following question of their money managers: Why are we in fossil fuels at all? (Sanzillo, Hipple and Clark 2018).

Major institutional investors have already made the decision to divest. In June 2019 the major global insurer, Axa, announced that it was strengthening its 2017 decision not to underwrite new coal projects by extending the provisions to third parties. They informed investors that: "Coal ….is very much a commodity of the past. As a result, we do not see a long-term future for it" (Moret and McDonald, 2019). Two months later a vote in the Norwegian parliament endorsed a

recommendation by the Finance Committee and instructed the country's sovereign wealth fund, the world's largest, to sell $10 billion worth of stock in fossil fuel companies (Nikel, 2019).

Despite the evidence of environmental destruction and long-term economic unsustainability, calls to divest from fossil fuels continued to be met with concerted opposition from leading financial institutions. Since the Paris Agreement was adopted, certain banks, led by J P Morgan Chase, have invested $1.9 trillion in fossil fuel projects with the funds allocated increasing year on year. Significant sums are being directed to oil and gas exploration in the Arctic and the deep ocean floor where environmental impacts are likely to be particularly severe (Stockman, 2019). At the same time, influential political voices, led by Donald Trump, continue to deny and contest the scientific evidence and pursue policies that intensify the climate crisis. But here too there is writing on the wall. During his presidential campaign Trump toured coal mining districts standing in front of a banner decaling that 'Trump digs coal'. In a move charged with symbolism, in 2017 "Kentucky's coal mining museum installed solar panels on its roof to save $10,000 in electricity costs" (McKibben, 2019: 4).

Interventions and transformations

Critical political economy has always been informed by a commitment to praxis. Its analyses of capitalism's distortions of public knowledge and debate are taken into the political arena with campaigns for change. The transformation of contemporary communication under the double impact of neo-liberal economic policies and digital innovation lends new impetus and urgency to both long standing issues around ownership, control and performance and emerging questions around materials and energy. Faced with an accelerating climate catastrophe, how we organise our major channels of public communication as cultural and material complexes matters more than ever.

The struggles begin with language. In May 2019 *the Guardian* announced that the terms "climate emergency, crisis or breakdown" would be preferred over "climate change" in all future coverage. As the editor-in-chief, Katherine Viner, explained "The phrase 'climate change' sounds rather passive and gentle when what scientists are talking about is a catastrophe for humanity… we want to ensure that we are being scientifically precise" (quoted in Carrington 2019). *The Guardian* has also joined the *Covering Climate Now* consortium of over sixty news outlets that have undertaken to devote a week to covering the climate crisis when the Climate Action Summit convenes in New York in September 2019. As the initiative's organisers explained:

> The point is to give the climate story the attention and prominence that scientists have long said it demands and to make it clear to audiences that climate change is not just one more story but the overriding story of our time.

They added that:

> We see Covering Climate Now as a fulfilment of journalism's most sacred responsibilities, which are to inform people and foster constructive debate about common challenges and opportunities (Hertsgaard and Pope, 2019).

Given the continuing squeeze on press resources and revenues we have outlined, fulfilling journalism's promise over the longer term presents a formidable challenge. Investigative analysis that speaks truth to power but takes time and money to assemble is under particular pressure. One solution, proposed by Robert McChesney, is to define investigative journalism as an essential

public service in support of a vibrant democracy and to fund it out of the public purse, giving every citizen a set sum to spend on projects of their choosing (McChesney, 2016). While this would potentially boost the number and range of available stories it would do nothing to weaken the control over their distribution. This resides with media owners who promote interests that contribute to the climate crisis.

The urgent need to counter the concentrated market power of the dominant press groups has renewed interest in alternatives to the dominant model of ownership. Debate has to focus particularly on trust structures, where there are no shareholders and profits are reinvested in support of journalism (see Ellis, 2012), and on co-operatives owned and run by journalists in collaboration with readers (Boyle, 2015). The potential of co-operatives is arguably at its greatest in local markets, which have been particularly hard hit by closures and consolidations in the commercial press sector but where communities are often on the front line of climate related struggles. They urgently need comprehensive information and analysis of corporate and governmental plans and actions.

Operating as not-for-profit islands surrounded by an ocean of commercialism, however, can be an isolating experience. Redressing this has led to concerted efforts to create networks of support and exchange. The founding declaration of the Institute for Nonprofit News, for example, commits its 200-member organisation to:

> … aid and abet, in every conceivable way, individually and collectively, the work and public reach of its member news organizations, including, to the fullest extent possible, their administrative, editorial and financial wellbeing. And, more broadly, to foster the highest quality investigative journalism, and to hold those in power accountable, at the local, national and international levels (Institute for Nonprofit News, 2019).

While these initiatives go some way to ensuring that the press continues to provide a public forum for reliable information, informed analysis and consistent critique of powerful interests, they do nothing to redress the persistent misinformation promoted by partisan television channels and on-line platforms. The problem of blatant bias, exemplified by Fox News, could be tackled by restoring the Fairness Doctrine and requiring adequate representation of contesting views as a condition of holding a licence to broadcast.

As news consumption has increasingly migrated to internet sites, however, they have become the principle battleground. Faced with a rising tide of political concern the major online platforms have been forced to abandon their claim to be platforms rather than publishers and accept responsibility for the contents of the material posted on their sites. Their procedures for self-regulation, involving the employment of automatic content filters and increasing numbers of human evaluators, have increasingly been viewed as inadequate. This has fuelled calls for statutory controls. The most extensive legal intervention to date is the German Network Enforcement Act (NetzDG) which came into full effect in January 2018. This requires platforms to respond to user complaints by blocking or removing content that is legally prohibited within 24 hours and to take down 'all unlawful content' within seven days. Failure to comply can incur fines of up to €50 million. As critics have pointed out, however, by "outsourcing decisions about the legality of speech to private corporations" NetzDG may lead to 'over blocking' as platforms err on the side of caution and take down legally permitted material that users find offensive or objectionable (Gollatz,

Riedl and Pohlmann, 2018). The alternative is to demand greater transparency. As Peter Pomerantsev argued:

> Instead of closing down rights to receive and impart information, we should demand more. For starters, we should have the right to know whether an account online is a bot or someone genuine, whether content is organic or amplified by trolls [and] who is behind a 'news' site (Pomerantsev, 2019).

One of the persistent tactics employed by fossil fuel interests in pursuing disinformation campaigns has been to fund seemingly independent think tanks and research centres and to retain politicians and academics as lobbyists and spokespeople. Making these links evident whenever material from these sources is posted online, or appears in all other media outlets, would introduce a long overdue transparency to debates. Greater transparency also needs to be rigorously applied to online advertising and marketing so that promotional payment and intent is made clear to users. The increasing use of devices that integrate product and brand promotion into expressive forms which present themselves as entertainment or information, as with advergames and paid YouTube 'influencers', makes this a priority.

Addressing the presentation of content online is a necessary intervention, but it is not sufficient since it leaves the core business model of the internet majors entirely untouched. This requires users to grant major platforms monopoly rights to the collection and sale of the personal data they generate through their on-line activities in return for 'free' access. Recent revelations, however, have revealed extensive and persistent abuses of user data.

In February 2019, the German federal competition regulator (the *Bundeskartellamt*) reported that their inquires had established that Facebook had abused its market dominance in social media by collecting and merging user data from across its various platforms, including Instagram and WhatsApp. The regulator ordered the company to seek informed consent from users. In July 2019, Facebook was fined $5 billion by the US Federal Trade Commission for repeatedly violating a legally binding undertaking made in 2012 not to promiscuously share user data with third parties. This agreement was broken in spectacular fashion during the Trump Presidential election campaign and the UK referendum on leaving the European Union. Huge stores of user data were harvested without their prior knowledge or consent by the digital marketing firm Cambridge Analytica, who then used it to profile 'persuadable' micro groups of voters and target them with carefully orchestrated online ads (see Cadwalladr and Graham-Harrison, 2018).

Although the fine was the largest imposed in the Commission's history, given Facebook's profits at the time, it took only 27 days to pay off. The settlement was also remarkably generous in other ways. It avoided the court proceedings some members of the Commission had pressed for, and indemnified the company against all claims prior to June 12 2019. As the surge in the company's stock price following the announcement suggested, the Commission's judgment was widely seen by investors as endorsing business as usual. As Commissioner Rohit Chopra, who voted against the final settlement noted:

> …[it] imposes no meaningful changes to the company's structure or financial incentives, which led to these violations. Nor does it include any restrictions on the company's mass surveillance or advertising tactics (quoted in Davies and Rushe, 2019).

Elsewhere, however, plans to tackle structures and financing have gained increasing traction in political debates. In Europe, concerted action is already well established. Since 2017 the European Commission has fined Google a total of $9.5 billion for abusing its market dominance in a range of areas, including search and online advertising. In March 2019, Senator Elizabeth Warren, a leading contender for the Democratic Party's presidential nomination, released a position paper that went beyond fines to advocate tackling market concentration. Headed 'Here's how we can break up Big Tech', it advanced two major proposals. Firstly, existing anti-competitive mergers and acquisitions, typified by Facebook's purchase of potential competitors, WhatsApp and Instagram, should be reversed. Secondly, companies with global annual revenues of $25 billion or more which offer "to the public an online marketplace, an exchange, or a platform for connecting third parties [should] be designated as 'platform utilities' and be prohibited from owning any firms that participated on that platform" (Warren, 2019).

Whether current anti-monopoly provisions are sufficient is open to question. They were designed to prevent monopolists from excluding new entrants to the market and harming consumers by setting prices at artificially high levels. The operations of the Big Tech companies pose problems for both these criteria since consumers are not charged directly for using services and unlike classic utilities like water, new entrants to digital markets face only minimal costs in establishing a business. The barriers arise from the 'network effects' enjoyed by incumbents as users gravitate to the most widely used sites (Giles, 2019). The inquiry into the 'Rise and Use of Market Power Online' launched by the US House Committee on the Judiciary in June 2019 seeks to address these problems by "assessing whether existing antitrust laws, competitive polices and current enforcement levels are adequate" (US House Committee on the Judiciary, 2019). As the Committee Chair, Jerrod Nader, noted, the inquiry was a response to mounting concern over:

> …[the] growing evidence that a handful of gatekeepers have come to capture control over key arteries of online commerce, content, and communications. The Committee has a rich tradition of conducting studies and investigations to assess the threat of monopoly power in the U.S. economy. Given the growing tide of concentration and consolidation across our economy, it is vital that we investigate the current state of competition in digital markets and the health of the antitrust laws (US House Committee on the Judiciary, 2019).

Official scrutiny was extended in July 2019 when the US Department of Justice announced a wide-ranging inquiry into potential anti-competitive behaviour of "leading online platforms' in "search, social media and some retail services online" (US Department of Justice, 2019).

Proposals to limit market concentration assume that introducing greater competition into markets will lead to more diversity of provision and improved service to consumers. Bitter historical experience confirms that these gains are unlikely to be delivered if new entrants operate the same organisational and business models as incumbents and the dominant market players continue to dictate the terms of competition. This is why the critical political economy of communication has always advocated expanding forms of organisation that operate outside the price system, do not rely on advertising revenues, and are based on alternative moral economies. Historically, the major counter to profit seeking enterprises that address people primarily as consumers fuelling an ethos of hyper-consumerism, has come from public cultural organisations, funded out of taxation, and charged with providing the full range of communication resources required to support citizenship's central promise of full and equal participation in social life. The

various experiments with not-for-profit structures outlined earlier offer a second alternative source of provision. A third is provided by the multiple ventures in collaborative production anchored in gift economies organised around reciprocity. Contemporary examples such as Wikipedia build on the long tradition of defending the commons as an essential bulwark against commercial enclosure.

What separates these interventions from privately owned, profit seeking communications corporations is not simply their forms of organisation and operation but their animating moral philosophies. Emphases differ, public service organisations foreground equality of access and ventures in commoning celebrate solidarity. But both seek revivified and inclusive opportunities that will contribute to a communal pool of essential resources for self-realisation and social membership. The challenge is to develop organisational forms that interconnect these various alternatives to commercial provision in order to create a comprehensive, freely accessible public network of resources and spaces for collaboration: a digital commons (Murdock, 2016). This project, in turn, inevitably raises wider questions about the fundamental constitution of the internet.

A viable alternative cannot simply piggy-back on existing structures. The first challenge is to develop a public service search engine that does not mobilise user data in the service of advertising and marketing and ranks links by reliability and social value rather than popularity. One recent proposal argues for not collecting any personal data. Instead it favours an independent organisation to ensure that the algorithmic sorting of sites is conducted transparently and accountably (Phillips, 2018). An alternative proposal allows for the collection of personal data but recommends that rather than treating it as a personal possession users may choose to sell on if they wish, as market-oriented solutions to restoring user control have advocated. Such data would be deposited in a data commons that can be accessed to develop positive social interventions in health, pollution, mobility and other areas of shared concern and impact (Bria, 2018).

As we argued earlier, however, there is a major blind spot in most discussions of alternative media. Extended consideration is rightly given to questions of diversity of representation and democratic control, but comparatively little attention is paid to their consumption of energy and materials and the associated impacts on ecological sustainability and social justice. We need now, as a matter of urgency, to campaign for all public media and cultural institutions to divest completely from fossil fuel companies across the entire range of their investments, to refuse to accept sponsorship for projects and events from coal, oil and gas companies, and to embrace renewable energy sources in their everyday operations. The latter should occur not simply at the end points where information and cultural materials are generated but across the entire chain of supply and distribution.

The materials employed in constructing media infrastructures and devices and the labour process entailed in their production and distribution also pose urgent questions. Critical political economists need to be at the forefront of mobilisations for alternative materials for batteries and other vital components. They need to support struggles around the labour conditions under which communications devices are manufactured and transported, and around concerns of reuse, recycling and reducing waste. Arresting the acceleration of the planned obsolescence which is driving hyper-consumption requires concerted efforts to revivify systems of repair while replacing plastics, most of which are made from petrochemicals. These are by-products of the oil industry, which provide them with a substantial additional source of profits. Stopping this profit stream is an essential step in reducing avoidable waste and pollution. Additionally, the construction and packaging of communications devices needs to move rapidly to renewable and biodegradable materials.

Foregrounding the material bases of communication systems propels debate around their future constitution and governance some way beyond the established concerns of media research and policy. The need for this extended focus is further underlined by Google's acquisition of the major artificial intelligence corporation, Deep Mind, and Facebook's decision to launch a proprietary crypto-currency, Libra. These moves compound two developments we pointed to earlier as posing major problems of environmental impact. Firstly, the expansion of 'smart' machines and the 'internet of things' will lead to significantly increased calls on materials and on energy. Secondly, creating a new source of finance outside the banking system, with access to Facebook's massive user base, will reinforce hyper-consumerism by boosting instantaneous purchases of commodities displayed online and expanding personal debt. As critical researchers we have two choices. Either we say these developments and their consequences are beyond the bounds of our expertise. Or we match the ambition of the leading digital players and look to forge new collaborative alliances across all the relevant specialisms as a basis for building a comprehensive analysis and programme of intervention.

We have argued here that the Capitalocene presents us with a double crisis: an accelerating climate and environmental catastrophe caused by intensified capitalist interventions in the earth system; and a deepening social crisis of widening inequalities of wealth and income combined with sustained processes of exploitation and dispossession set in motion by the aggressive pursuit of neo-liberal economic policies. As a consequence, any proposal for radical change must guarantee as a minimum, both an equitable allocation of the resources that support well-being and social agency and an insistence that ecological ceilings for sustainability are not exceeded (Raworth, 2017).

The recent revival of proposals for a Green New Deal, popularised particularly by Democratic US congresswoman Alexandria Ocasio-Cortez, have taken arguments about the economic and social preconditions for an alternative planetary future beyond the ranks of engaged economists (see for example New Economics Foundation, 2019) and inserted them into the mainstream of political debate. Some see the Green New Deal as a force for renewing capitalism, while others view it as the basis for developing a viable eco-socialist alternative.

The original idea was first introduced in 2007 by the committed free marketeer, Thomas Friedman. Writing in his *New York Times* column he argued that combating global warming by moving energy generation from "dirty coal and oil" to renewables required a "range of programs and industrial projects" comparable in scale to those introduced by President Roosevelt in his New Deal to address the Great Depression of the 1930s (Friedman, 2007). Prompted by congresswoman Ocasio-Cortez's intervention he returned to the argument in 2019, presenting "clean power, clean cars, clean manufacturing, clean water and energy efficiency "as the bases for "global industries" that would provide a renewed basis for sustaining both domestic US growth and overseas earnings. However, Friedman maintained that these latter objectives could only be met if innovation was driven by "free market competition". He declared: "there is only one thing as big as Mother Nature, and that is Father Greed - a.k.a, the market. I am a green capitalist" (Friedman, 2019). In this scenario, the government's role is restricted to setting yearly targets for progress towards zero emissions and zero waste. Polluter pays penalties would be introduced for those who failed to meet the targets. As Friedman (2019) puts it: "may the best company win".

There are three major problems with this argument. Firstly, by focussing so single-mindedly on reducing carbon emissions it leaves aside other major challenges. The original New Deal was developed against the background of the ecological devastation of the Dust Bowl and the irresponsible lending and speculation of the banks, as well as the mass unemployment and

immiseration caused by the 1929 Wall Street crash. All three of these dynamics are still in motion. As we have noted, the current ecological crisis is not confined to carbon emissions, with accelerating deforestation and soil degradation having major negative interventions on the earth system. These need to be addressed in any proposal for change. Secondly, in the absence of effective sanctions the return to irresponsibility on the part of the banks in the wake of the 2007-8 financial crisis which they had precipitated has allowed levels of household debt to continue rising. At the same time, neo-liberal responses to the crash have sanctioned the continuing transfer of wealth to the already advantaged while imposing a regime of austerity on the those at the bottom of the income scale. Thirdly, while moving to renewable energy may create more jobs in emerging 'green' economic sectors than are lost from those reliant on fossil fuels, debate in this area fails to factor in the impact of artificial intelligence on employment levels and the possibility of a permanent increase in structural unemployment, particularly among unskilled and semi- skilled workers (Frey and Osborne, 2013). Congresswoman Ocasio-Cortez's program for a Green New Deal is a case in point. She notes that the original New Deal of the 1930s "created the greatest middle class that the United States has ever seen, but many members of frontline and vulnerable communities were excluded from many of the economic and social benefits" (US Congress 2019: 4). Her proposed program of change calls for both rapid movement towards net-zero greenhouse gas emissions and an Economic Bill of Rights to ensure that every citizen of working age benefits from the creation of "millions of good, high wage jobs" (5). Nothing is said about the possible impact of artificial intelligence driven automation on the ability to meet this promise.

The net scale of job losses is disputed yet, if even the more cautious estimates are correct, they pose urgent questions. Optimistic observers see workers released from repetitive and health sapping jobs as free to realise their full potential through personal projects and social participation. This enticing vision requires two conditions to be met: an alternative source of income to waged or salaried work and a conception of individual worth that uncouples it from market employment and earnings and valorises care and social contribution. Meeting the first condition has sparked increasing interest in granting everyone a minimum basic income and revivified debate on the role of government in organising the distribution of resources for well-being and control over their generation. Some commentators, including a number in the high-tech sector who are rolling out new commercialised personal services, see the introduction of a minimum basic income as an opportunity to dismantle public welfare provision and to consign access to resources for well-being entirely to the market. This argument deliberately ignores the wealth of historical evidence demonstrating that a core of public cultural provision is essential to ensure universal and equal access. A universal basic income does, however, provide a potential basis for supporting personal projects and enhanced social participation. The growth of self-organised peer-to-peer networks has prompted renewed interest in the histories and practices of commoning as a basis for organising these potentials (Bauwens, Kostakis and Pazactis, 2019).

The economies of public goods and commoning are sometimes presented as either/or choices, between centralised and localised organisation and between top-down and bottom-up control. This is an unproductive dualism. Concerted government intervention is essential to guarantee the operating conditions that allow grass roots initiatives to develop and thrive (Murdock 2018). Guaranteeing a universal basic income at a level above the minimum living wage requires a radical rebalancing of taxation to restore high rates for corporations and high wealth individuals, to address inheritance anomalies and to close off opportunities for tax evasion and avoidance (it is important to insist on the declaration of beneficial ownership for all holdings in tax havens). Similarly, providing

accessible spaces for personal projects and social enterprises requires concerted intervention in the property market to ensure affordable housing and working environments. The commercial appropriation of public space must be reversed.

One pointer toward a rethinking of the relations between commoning and government is provided by Germany's well-established scheme for encouraging local co-operatives to develop wind farms. Any excess capacity can be fed into the national grid with payment returned to the community to support social and cultural projects (German Wind Energy Association, 2012). The idea of the digital commons considered earlier could employ some of the same principles, with self-organised initiatives producing material for general circulation. They would benefit from the distributional reach provided by the core publicly funded node in the network and could use open access to the full range of resources provided by other participants in that network to develop new projects and collaborations.

Capitalism's relentless drive for ever-expanding accumulation is presented in official discourse as the indispensable precondition for economic stability and social 'progress'. This key ideological support for business as usual needs to be vigorously contested. By critical analysis that demonstrates its ecological destructiveness and inability to deliver security and dignity on a basis of equality, and by an alternative ethical vison that places custodianship and care for the natural world and collective responsibly for the well-being of strangers at the centre of economic and social organisation.

The critical political economy of communication has an indispensable contribution to make in devising and pursuing this conception of a sustainable future by demonstrating the foundational roles played by communications systems in organising the economic and social relations that impact on the earth system, by rethinking the relations between economies of public goods and commoning as the basis for viable alternatives to commodification, and by pressing for practical changes to prevailing structures that will advance both ecological sustainability and economic and social justice. It is a formidable challenge but also an unprecedented opportunity.

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