

GLOBALISATION, ECOLOGICAL CRISIS AND CAPITALIST DEVELOPMENT

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DRAFT 2, January 2019

Text = 8200 words plus references

In their contribution here Gills and Hosseini (xxxx) argue that since both globalisation and development have reached impasses as knowledge fields, as economic projects and as physical processes, ways out of these impasses require 'critiques of critique' as a practical project since even critique is locked in 'capital's discursive lexicon'. Yet their post-capitalist alternatives confront a contradiction. They require not just an imaginative vision unlocked from discursive constraints but also grounding and sequencing in the politics of science and technology and the pathways of political economy. It seems the first steps towards what Richard Smith has called post-capitalist ecological democracy (Smith 2010), cannot be achieved without engaging with capital.

For over half a century, fossil fuel-based industrialisation - under communism as well as capitalism, but now under global capitalism - has been understood to generate bio-geo-chemical breakdowns in the balances of planetary sub-systems (Stavis 2005, p 324-5; Oosthoek and Gills 2005). Nine such subsystem have been identified by Rockstrom et al (2009). While in a depoliticised and aspirational discourse the matter of better or worse kinds of capitalism is debated (even by the UK's Conservative Environment Minister: Gove 2018), it is the logic and dynamic of capitalism that are currently pushing the planet towards what looks like proliferating but specific manifestations of global ecological crisis (Saito 2017). The planet's capacity to process gaseous, liquid and

solid wastes from the global economy is being destabilised while its capacity to provide material resources is increasingly compromised. Post capitalist development must start with the question of what is being done prior to that of what is to be done. This requires a universalist approach to development studies first advocated in 1977 by the economist Dudley Seers (Seers 2017). A universalist approach to development studies must start with the globally engaged political responses of states. We then offer a critical analysis of the developmental responses to the ecological crisis by globally operational exponents of capital's discursive lexicon, some of which – labour organisations - are contained contradictorily within national boundaries. Only after assessing their significance to the global economy, their diagnoses, stated intentions and actions can we reflect on political trajectories towards ecologically less destructive development.

HEGEMONIC DISCOURSE AND THE GLOBAL RESPONSES OF STATES

The focus on climate change by global environmental politics is a reductionist response to ecological crisis. Global warming is only one of multiple major ecosystem threats; and the factors causing global warming also contribute to other dimensions of ecological crisis - both directly and through causing global warming. Many parts of this complex interactive system are being damaged, in some cases irreparably, by activities which policy-makers and publics have often not even identified as a problem – for instance possible non-linear changes in future parameters for standards of resilience.

Urgency and Catastrophism: a critique of the critique

How time is conceived and treated is fundamental to the political economy of climate change. Time has been conceived by UN agencies metaphorically in terms of an open 'window of opportunity' in which action needs to happen (Prins et al, 2010). If this window was between 7 and 20 years wide in 2008 (NTUI 2008) in 2015 it had to be down to between 0 and 13 years. But in 2018 it has opened again to 2-12 years

(IPCC 2018) until the planet's atmospheric 'budget' for CO₂ is full. Targets are imagined – for example, targets for atmospheric decarbonisation or developing renewable energy (ibid; Harriss-White and Harriss 2007) - and dates are set, but as the targets multiply they become ever more draconian and the deadlines recede into the future when the windows have closed. A discursive field has developed about targets, technological fixes and global deals that is ever less connected to political reality.

Urgency has been dismissed as 'catastrophism' (Lilley et al 2012). For catastrophists, it is a matter of urgency that the dire science generates a radical political mobilising response, one driven by anxiety. For radical catastrophists, capitalism will shortly collapse through the combined weight of its internal contradictions and its rift with nature.

Anti-catastrophist critics respond that catastrophism is a counsel of despair on several counts.¹ First: anxiety is a weak driver of radical social change. Second: the crisis revealed by science is not natural, not a crisis of nature, not even of humanity versus nature (Royal Society 2012), it is produced by capital's relations of production, distribution, consumption and waste. Nature is not independent of capitalism: the two co-evolve (Martinez-Alier 2009). Capital constantly internalises constraints even in crisis and dynamically reinvents itself: – wartime planning, carbon trading, bio-engineering and dematerialisation being oft-cited examples.² Despite the evident limits to migration and to resource availability, '(t)he idea of the limit is aesthetic' (Harvey and Panitch, 2014). The only limit of consequence is that to social alienation (ibid). However, as the ecological sociologist John Bellamy Foster has observed, 'The very fact that capitalism is not likely to collapse of itself and may 'prevail' for some time to come is precisely why the planet is in such absolute peril...(T)he advent of a more barbaric [form of capital-BHW] is no longer the worst of our worries. It is the threat to the planet itself that constitutes our most dire challenge' (Foster 2007).

Terms and the Politics of the Response to Urgency

¹ See Henwood in Lilley et al, quoting Engels.

² As in (eds) Panitch and Leys, 2007

Couched in terms of 'challenge', the least solvable problem has not been the depth, complexity and unknowns of the ecological crisis, not its reduction to climate change, not the role of time, but the absence of national political boundaries to causes and effects and thus the need for global deals and collective global action. Behind this collective politics lies the epistemological question of how the damage to nature is being discursively constructed because this both drives and reflects political action.

Sources of pollution are doubly simplified - to GHGs and then to Carbon Equivalents. Their origins have been classified in several ways. They are attributed to economic sectors in yet others. For the USA (with the best data), they are as follows: electricity (23%) transport (28%) industry (20%) agriculture (10%) and residential pollution (10%) (EPA 2014). Or they are attributed to combustion sources: liquid (36%), solid (35%); cement (3%) and gas (20%) (Raupach et al 2007). Or to people and 'consumption': some 1 billion people are responsible for 50% of greenhouse gas emissions; a further 3 billion people for 45%; while the bottom 3 billion, who do not have access to affordable fossil fuels, are responsible for a mere 5% (Dasgupta and Ramanathan 2014). On the other hand if pollution is classified in terms of its immediate toxicity to people the problem looks very different: mercury poisoning and lead and sulphur dioxide pollution from mining and ore-processing, pesticides pollution from agriculture, groundwater arsenic from the over-extraction of water, chromium from dyeing and tanning, and lead-acid battery recycling (Landrigan et al 2018).

Each kind of classification drives a different kind of political project focussed on combatting the specific harm involved.

But for the reduced conception of the ecological crisis, in terms of the units for which evidence is adduced and policy responses are proposed, first and foremost there are *countries*: 196 of them including Taiwan. In terms of current emissions the leading countries are China, the USA, India and Europe including the former USSR. In terms of their historical contribution to today's stocks of atmospheric carbon, North America, Europe, Russia/USSR and China top the list. In terms of current per caput pollution (discounting the oil-producing sheikhdoms) USA-Canada,

Australia, Korea and China are dirtiest, with Japan close behind.³ At the most disaggregated count inside the dirtiest country, it is a band of central states in the USA which maximise CO2 emissions per megawatt hour of power produced.⁴

For the world's states, the dominant, quasi- market policy instrument combines cap and trade in administered carbon markets with financial transfers for clean development in places where its costs are lowest (CDM/REDD). This works in theory but over its 30 year life it has been singularly unsuccessful (Gloaguen and Alberola 2013). GHG emissions continue to rise and coal persists as a major source (Lynch 2018). As of 'Katovice 2018', in full retreat from the protocols of Kyoto, 1992, states are free to make decisions on action and on reporting their action. Their current pledges will cause a catastrophic average temperature increase above 3 degrees by 2100 (IPCC 2018).

Many reasons have been invoked for this destructive failure of theory and of 'agency'. The cap and trade policy's very inventors, Thomas Crocker and the late John Dales, have cautioned against it as inappropriate for conditions with myriad sources of pollution, when the kind of evidence needed to administer the price of carbon and to quantify the damage of climate change on production is imprecise when the cap is hard to adjust and the price of carbon is highly volatile and often too low to incentivise new technology; and when the carbon market currency – the permit system – has no 'governance institutions' either within or above states with sufficient authority to enforce them (Hilsenrath 2009).⁵ Given the variations in the predicted impact of climate change, in attitudes to scientific uncertainty, and no incentives for equity between generations, there are incentives only to free ride (Gardiner 2011). And modern representative government, with its short-term electoral cycles which privilege the rights of the present of those of the future, seems unfit for this particular purpose (Bull 2012).

³ <http://www.citylab.com/work/2014/03/map-historys-biggest-greenhouse-gas-polluters/8657/>
China recently overtook the EU in per capita emissions

⁴ <http://www.cerews.org/airemissions>

⁵ Crocker and Dales favour taxes for their flexibility and lower enforcement costs (Hilsenrath 2009)

In relying on markets, the cap and trade model ignores the market-driven politics that has penetrated states worldwide (Leys 2003), sabotaging every stage of implementation of carbon trading, incentivising pollution and dis-incentivising low carbon investment. Missing from the literature are the historical, economic and environmental logics of capital and its waste. If alluded to at all, they are shrouded in euphemism: while the ecological crisis is 'climate change', capitalism becomes 'markets', the private sector, 'the economy', 'growth'. The Belgian environmental sociologist Daniel Tanuro has warned (2008) '(t)hose who don't want to hear about capitalism should not talk about global warming'.

So it may be useful to examine what is thought to be being done – and why - by capital, labour and civil society. Identifying these interests is not a precise science because they are constantly being restructured (Panitch et al 2014). Despite the public currency of 'consumer capitalism' (Hamilton 2007) it is maintaining the production system that requires increased consumption and infrastructural path-dependence and creates pollution hotspots. Space constraints enforce a selective approach, confined to published resources. The argument we develop is therefore an indicative one. Principles of selection follow the focus on the significance of urgency and time, on the relation of the cases to ecological crises and on their discursive and actual responses. Within productive capitalism we consider the military industrial complex and corporate capital, and within finance capital the insurance industry. We then juxtapose the responses of labour through trades unions and civil society, where the biggest global entity is currently the Roman Catholic Church

CAPITAL

The US Military and the Ecological Crisis

The sword is currently mightier than the pen.

Why choose the US military? Simply because its military industrial complex is known to be the world's largest institutional consumer of fossil fuels and a major polluter of soil and water. It has an annual

budget estimated at between 6-800 \$bn, 40% of the global total and more than the next seven largest budgets combined. It operates in 160 countries.⁶ The Pentagon is also enmeshed in a structure of irresponsibility: military emissions are exempt from reporting requirements and while actively engaging in rounds of climate talks, the Pentagon enjoys legal protection against engagement in any mitigation outcomes (Mowbray 2018).⁷

The Pentagon considers the ecological crisis in reduced form as climate change, on which its position is publicly explained with exemplary clarity. 'Rising global temperatures, changing precipitation patterns, climbing sea-levels, and more extreme weather events will intensify the challenges of global political instability. Climate change is expected to generate 'food and water shortages, diseases, disputes over refugees and resources, and destruction by natural disasters in regions across the globe' (DoD 2014). Despite President Trump's climate change denial in 2018 the Pentagon reaffirmed that militarily, climate change is a 'threat multiplier'.⁸

What is being done? In 2014, then Defence Secretary Chuck Hagel, launching a conference of 30 defence ministers, prior to the international climate change meeting in Peru, announced a flexible approach to *adaptation*. Climate change was affecting the deployment of 'weapons systems, training exercises, and military installations'. The climate-change proofing of more than 7,000 bases, installations, and other facilities is in hand.⁹ The navy tests sonar and other systems under the changing ocean chemistry. And the melting Arctic ice is being securitised in face of competition for sea lanes and under-sea minerals. Climate change has long been mainstreamed in defence planning

⁶ <https://www.defense.gov/our-story/>;

<https://www.nationalpriorities.org/campaigns/us-military-spending-vs-world/>

⁷ In 1998, the House of Representatives prohibited the restriction of armed forces under the Kyoto Protocol. <http://www.ipsnews.net/1998/05/climate-us-exempts-military-from-kyoto-treaty/>. See also <http://www.defense.gov/Speeches/Speech.aspx?SpeechID=1893>.

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<https://climateandsecurity.org/2018/06/05/defense-department-reaffirms-that-climate-change-is-a-national-security-issue/>

⁹ <http://www.defense.gov/Speeches/Speech.aspx?SpeechID=1893>.

scenarios. To date, despite Presidential opposition, its policy roadmap is substantially unchanged.¹⁰

The Pentagon's treatment of time and urgency is immediate and fast. Vestigial scientific uncertainty 'cannot be an excuse for delaying action'. While Presidential denial may incentivise euphemisms, '(p)olitics or ideology must not get in the way of sound planning' for America's security (DoD 2014). Adaptation is the priority, not mitigation. A new case for the military-industrial complex is being built and vast financial and scientific resources have already been commandeered. The already 'blurred boundary' between military action and development – visible in the deployment of military resources for humanitarian relief and 'support for civil authorities' – is further meshed.¹¹

Most ecologically significant industrial companies

After 8 years of research the climate researcher and geographer Richard Heede discovered that climate change is not a global collective action problem of 196 countries but one of controlling the behaviour of some 90 companies. '(T)he decision makers, the CEOs, or the ministers of coal and oil if you narrow it down to just one person', he commented, 'could all fit on a Greyhound bus or two.'¹²

These companies have produced 63% of all gaseous pollution from 1751¹³ to 2010. Half was produced in 25 years from 1985 to 2010 – in the era of cap and trade. The top 20 companies are responsible for 30% of world-historical emissions and they also control most of the estimated 2,800 billion tonnes of CO₂ locked in known fossil fuel reserves.¹⁴ All but 7 of the 90 produce coal, oil and gas; the other 7 produce cement. Fifty companies are owned by private investors, but 30 are owned by states, and a further 9 are both owned and run directly by governments. The most polluting 'entities' have been government-owned

¹⁰

<https://www.nrdc.org/onearth/military-takes-climate-change-seriously-why-wont-commander-chief>

¹¹ <https://www.e-ir.info/2011/08/19/u-s-military-aid-and-development/>

¹² Attributed to Heede as interviewed by Goldenberg, in *The Guardian* 20th Nov 2013.

¹³ Heede's statistics proxy this as the the start of the industrial revolution. The IPCC however uses 1850-1900 as its pre-industrial benchmark.

¹⁴ About 4.5 times the atmosphere's remaining absorptive capacity.

coal and oil companies in USSR-Russia and China; together they are equally responsible for 18% of global emissions. Among private companies Chevron-Texaco emitted most – at 3.5%. While five of the top twenty polluters are headquartered in the USA, as a set, the top 90 are HQd in 43 countries and extract and sell carbon world-wide (Heede 2014).

Faced with this most inconvenient truth, Al Gore responded: ‘(t)hose who are historically responsible for polluting our atmosphere have a clear obligation to be part of the solution’ (quoted in Heede 2014).

Are these companies on track for carbon neutrality within a generation? We have space here to examine two using internet evidence: BP (the world’s 4th largest cumulative polluter according to Heede) and Coal India (11th).

British Petroleum (BP)

BP is the UK’s largest corporation, with a gross revenue equal to about half of India’s entire GDP. An archetype of the globalised MNC, BP produces and sells oil and gas in 80 countries. It sources goods and services from 60,000 companies. Its global workforce has contracted from 84,000 to 74,000 from 2014-18, but is concentrated in Europe and North America. In 2013, 54% of the 373 million hours worked by BP were carried out by sub-contractors’ labour.¹⁵ Increased subcontracting upstream and downstream will reduce the GHG emissions of BP’s core competences.

Its board combines global experience, perspectives and contacts from top global banks and MNCs in energy, mining, metals, aerospace, technology, electronics, pharmaceuticals, health, agri-business, and

¹⁵ <https://www.sourcewatch.org/index.php/BP>; BP,2017, p76

management consultancy; global think tanks, apex corporate lobbies, and advisers to Jeff Sach's Earth Institute, Columbia University.¹⁶

BP has ongoing rounds of investments in deep water oil and gas (OnG) worldwide, in 'advantaged' OnG which minimises the length and costs of the extraction cycle; in fracking (shale) gas in Algeria, Indonesia, Oman and the US (BP 2017); and, through BP Canada, in the steam-assisted gravity drainage technique of exploiting the Canadian oil-sands.¹⁷

The company produces an annual Energy Outlook which is a global reference point. The latest (2018), looking forward to 2040, expects China (in which BP is investing heavily) India, and other non-OECD Asian countries to be responsible for most of a predicted 40% increase in energy demand, mostly based on fossil sources, while the OECD and BP move towards gas and renewables.¹⁸ 'Gas' includes fracked shale gas. In BP's sustainability report for 2014, the company describes shale gas first as a new energy form (along with renewables), then in 2015 as an 'unconventional fuel' (along with tar sands and biofuel), also as 'natural gas'.¹⁹ Widely cited for projecting 'carbon-free' energy 'demand' to reach 37% of total demand by 2035 (now 28% by 2040), BP actually expects just 11% of global energy demand to be from renewable energy including biofuels²⁰, since its definition of carbon-free includes large-scale hydro and nuclear energy.²¹

BP has in-house lobbying staff and also employs several prestigious lobbying companies and individuals. It sponsors both Democrats and Republicans, but in the ratio of 1:2. Active in the American Legal Exchange Council, 'more powerful than a lobby', a 'bill-mill', BP has the

¹⁶ <https://www.sourcewatch.org/index.php/BP>. BP exemplifies the interlocking interests of major MNCs early explored in van der Pijl 2005. Sophisticated organisations exist whereby these capitalist interests can and do hammer out common lines of strategy. The American Legislative Exchange Council is one mechanism, Bilderberg is another, Davos a third.

¹⁷ https://www.bp.com/en_ca/canada/who-we-are/oil-sands.html

¹⁸ BP 2014; BP 2018

¹⁹ BP 2014, p4; BP 2015 p 30.p13; BP2017 P63,p3 respectively.

²⁰ Renewables are wind, solar, geothermal, biomass, and biofuels. BP2018, p12

²¹ Nuclear energy is not carbon-free. Schneider (2000), costing the carbon dioxide generated by France's nuclear industry estimated it at 10% of France's total. A thousand nuclear reactors worldwide would also deplete all known uranium sources.

means to dictate demands to state legislators.²² BP publicly opposes limits to GHG emissions and advocates tax breaks for oil and gas.

Until 1995, as part of Global Climate Coalition BP ridiculed climate science and undermined Kyoto. Then CEO Lord Browne famously rebranded BP, even partnering with ‘moderate’ environmental groups, for which BP won a major award for PR in 2002.²³ In 2005 an Alternative Energy company was established and by 2013 had invested \$8bn in British feed wheat, Brazilian cane and 16 US windfarms. From 2008 the parent company ‘recarbonised’ and has tried to sell off its windfarms (BP 2-14, p19). Its current strategy is to ‘venture’ start-ups in low carbon technology (BP 2017)

BP co-produces ecological threats through fires, explosions²⁴, spills²⁵, venting and flaring.²⁶ These ‘process safety events’ occur mainly in wells and fuel transport.²⁷ Between 2009 and 2017 however the company reported a decline in spills and fines, and raised environmental expenditure (BP 2017).

Threading through its own accounts of company activity are three aspects of the ecological crisis. First, water – for cooling, steam, manufacturing and Brazilian irrigation: ‘(h)alf BP’s operating sites withdraw fresh water in areas of water stress or scarcity’(BP 2014, p3, p37) such as Oman, Algeria and Libya. Second, BP makes attempts to limit its acknowledged harm to biodiversity. It researches biodiversity where it prospects, e.g. in the Great Australian Bight; it looks at natural hydrocarbon seepage in the NE Mississippi Canyon of the Gulf of Mexico; it studies Arctic whaling communities and their livelihoods as well as oil dispersants in the deep ocean.²⁸ It screens and monitors biodiversity, conserves marine turtles in Angola and has preserved a

²² <https://www.sourcewatch.org/index.php/BP>

²³ <https://www.sourcewatch.org/index.php/BP>

²⁴ Deepwater Horizon in April 2010 was the US’s largest ever environmental disaster in which millions of tonnes of oil poured into the Gulf of Mexico - 200,000 tonnes every day for 3 months. For criticism of BP’s responses see <https://www.sourcewatch.org/index.php/BP> and <https://www.corp-research.org/BP>

²⁵ BP 2017 p82; <https://www.sourcewatch.org/index.php/BP>

²⁶ <https://www.corp-research.org/BP>; BP2017.

²⁷ BP 2014. BP employees alone travel 800 million kms/yr (p33)

²⁸ BP 2014, p37-9; BP 2017, p62

wetland habitat in Washington state.²⁹ In the many protected areas in which it operates it says it treads with care, avoiding or minimising local impact.³⁰ Third, waste outputs: BP shows its emissions as having dropped from 65mteCO₂e in 2009 to 50 in 2013 which it plans to approximately stabilise to 2025.³¹ These achievements result in part from subcontracting and from having sold off two US oil refineries: Texas City and Carson.³² BP continues to set no company-wide GHG target.

The company treats the ecological crisis as climate change and treats it 'like any other physical and ecological hazard' (BP 2014, p15). Accepting that the 'warming of the climate system is now unequivocal'³³, due to GHGs, it blames 'human activity' (BP 2014, p14). It is obvious to BP that the 2-degree target temperature rise will be exceeded (BP 2018, p5); it expects the GHG intensity of ONG production to increase (ibid).

BP's response to climate change involves doing less about it in practice than its discursive attention in annual reports might suggest. In lobbying governments, BP follows the principle that low carbon technology must be low cost, incentivising a stable high carbon price. Low carbon technology is accepted to exist; BP favours nuclear energy, electric cars and carbon capture and storage (CCS) in which it invested in a prototype and stored 4m tonnes of CO₂, but has now 'scaled back'.³⁴ It will commit itself at best to 'lower carbon' expansion, through physical efficiencies, offsetting and technological 'venturing' amounting to 3% of its capital expenditure (BP 2018).

Coal India

Coal India (CI) is the world's largest coal-producing company, commanding with its subsidiaries 80% of India's coal market and 75% of its power generation. Among the world's purely coal-producing

²⁹ BP 2014, p38

³⁰ BP 2018, p53-58

³¹ Thereby achieving a 3.5m (7%) GHG saving in operations (BP2017, p 6)

³² <https://www.sourcewatch.org/index.php/BP>

³³ referencing the fourth IPCC Assessment Report. See for corroboration

<https://unchronicle.un.org/article/warming-climate-system-unequivocal-highlights-fourth-ipcc-assessment-report>

³⁴ BP 2014, p14

companies over the last 150 years, it has been the largest GHG emitter.³⁵ In 2010 it emitted 50% more GHGs than BP. A multinational state corporation, CI is 90% owned by the Government of India, with 10% controlled by foreign, private institutional finance.³⁶ CI is globalised through coal imports and international investments in mines.³⁷ Labour intensive, it employs four times more people than BP: in 2017 it had 310,016 employees³⁸ – and many more both as casual labour and working for contracted out companies.³⁹

It has no plans not to press on with the low-cost open-cast mining of low quality coal for power generation - at which it is regarded as relatively efficient.⁴⁰

Coal India has weathered sustained criticism of both the environmental and some non-environmental elements of its business model. In 2011, two-thirds of its 471 mines lacked environmental permits and were operating illegally (Economic Times 2011). It mines open-cast with disregard for reserved forests and endangered species, and encourages subterranean fires in order to fast-track the very open-cast extraction that maximises profit, devastates landscapes and perpetuates these fires (Gupta 2019). It evicts eligible victims of mining and underground fires instead of compensating them. It provides dangerous working conditions.⁴¹ It has stood accused of anti-competitive practices and untransparent contracts (Menon 2013) and has subcontracted and casualised its labour to contain costs. Unsurprisingly it suffers sufficient pilferage to affect profit realisations. It has broken the labour and

³⁵ <http://www.facing-finance.org/en/database/cases/coal-india-carbon-emissions/> Coal consumption comprises 70% of India's CO2 emissions.

³⁶ <http://www.morningstar.in/stocks/Op0000rq96/bse-coal-india-ltd/equity-research.aspx> ; [http://www.facing-finance.org/en/database/companies/coal-india-ltd-coal-india-ltd/Coal India Ltd](http://www.facing-finance.org/en/database/companies/coal-india-ltd-coal-india-ltd/Coal%20India%20Ltd/); UN Global Compact 2014.

³⁷ Importing from Indonesia and Australia and with mines in Mocambique

³⁸ <https://www.statista.com/statistics/244518/number-of-employees-at-coal-india-limited/>

³⁹ <http://www.morningstar.in/stocks/Op0000rq96/bse-coal-india-ltd/equity-research.aspx>

⁴⁰ CI is required by Government of India to sell coal to energy utilities at below global prices. So its highest single cost element is not in extraction but in transport: Indian Railway rakes and rail-links - themselves costed at state-controlled prices – are often obstacles to efficient coal supplies.

⁴¹ in 2010 for instance 210 miners died and 183 were recorded seriously injured in CI mines. <http://www.facing-finance.org/en/database/cases/coal-india-failing-occupational-safety/>

environmental norms and standards of 7 international / UN agencies (Varadhan 2018).⁴²

Despite or because of this business model, the *Financial Times* recommended it as a 'high quality investment' with double digit returns on capital. Dividends have been sustained until 2018.⁴³

Recently, climate change was absorbed discursively into CI's business. 'CIL leverages business opportunities to minimize risk and address social and business challenges such as scarcity of resources and climate change at an early stage.' 'CIL continuously invests in establishing state of the art eco-friendly mining operations' (CCI 2018, p22, p7). Apart from such aspirational commitments, under pressure from the Government of India's Ministry of New and Renewable Energy which through a WTO loophole offers subsidies⁴⁴ for solar energy to CI (also to the Indian military and Indian Railways), CI plans to invest \$1.2bn⁴⁵ Two million saplings were also planted in 2017-18.⁴⁶

In sum: BP's 'Beyond Petroleum' slogan and its green sunflower logo are masking devices. BP is not beyond petroleum. Both BP and Coal India are far from being on track to carbon neutrality within a generation – quite the opposite. In procedurally and discursively impeccable templates, BP develops strategy through which it can allow a modicum of investment in renewable energy, biodiversity, remediation etc into its portfolio on condition that it does not affect either BP's 'core competences' in oil and gas, or its profit. The dash for gas does not reflect the urgency needed to prevent the ecological crisis developing further. Coal India emits no sense of urgency and is effectively committed to deepening the crisis.

Aggregate data on polluting industries compiled by the Benchmarking Air Emissions organisation shows that globalised state- and

⁴² https://www.sourcewatch.org/index.php/Coal_India

⁴³ <https://markets.ft.com/data/equities/tearsheet/summary?s=COALINDIA:NSI>;
<http://markets.ft.com/research/Markets/Tearsheets/Forecasts?s=COALINDIA:NSI>

⁴⁴ financed by channelling taxes on imported coal through a Clean Energy Fund.

⁴⁵ BP invested about this amount annually between 2005-13.

⁴⁶ See Chadha 2014; CCI 2018 p7

private-corporate capital is indeed investing in renewable energy technology and detoxifying its gaseous and solid emissions.⁴⁷ 'At the brink of a systems breakdown' (WEF 2018, p5), Davos' Annual *Global Risk Report* for leading MNCs acknowledges stress in all of Rockstrom's planetary subsystems (ibid, pp 18-22). But 'changing climate' and 'degraded environment' are analytically on a par with 11 other risks including 'ageing'. Business has yet to seize the reputed \$6tn opportunity required to tackle climate change (Whiting 2018). Compared with the physical need of the planet this activity is at the pace of the snail.

The Insurance Industry and the Ecological Crisis

Despite no mention in the 2017 McKinsey review of global insurance⁴⁸, insurance claims triggered by extreme weather events are continually expanding (Wihbey 2012, IAIS 2018). Whereas the Pentagon has a direct interest in adaptation, the insurance industry has a direct interest not in mitigation per se but rather in managing and mitigating risk (Paterson 2001). The industry has failed to direct investment into reducing GHGs. Rather it engages with the ecological crisis through reducing its exposure to extreme events with social impacts and by limiting the insurability of industry. It attempts to convert uncertainty to risk and then reduce responsibility for climate-change-related liabilities.

Insurance is protection for unforeseen risks. Climate change has now become a foreseeable risk⁴⁹ and thus factorable into actuarial tables of the big re-insurers Swiss Re and Munich Re. In 2015 at Davos, John Nelson, chairman of the Lloyds Market also confirmed: '(w)e take (climate change) in to all our underwriting and modelling... We expect to see our syndicates modelling climate change when they are looking at...

⁴⁷ <https://www.nrdc.org/sites/default/files/benchmarking-2015.pdf>

⁴⁸ See Binder and Musshoff 2017 for McKinsey; perhaps still influenced by the view of climate change as a marginal threat in the USA (Paterson 2001).

⁴⁹

<http://www.natureworldnews.com/articles/7216/20140523/lawsuit-warns-politicians-climate-change-cost.htm>

property risk.’⁵⁰ This approach is not confined to droughts in the southern plains of America but extends to fossil fuel assets at risk of devaluation if exploitation is prevented by global deals (Baron and Fischer 2015).

In their reactive capacities, the industry is deeply divided however. The top re-insurers employ in-house meteorologists, climatologists and catastrophe modellers and already incorporate climate change (along with property values) into drivers of the balance between their insurers’ risk holdings and their re-insurance payments. While the risk analysis of climate change by re-insurers is dynamic and constantly changing, insurance companies themselves are slower on the science front – reactive not proactive - unable to invest in scientific competence, and caught in their own paradox of asymmetric information and risk. The credibility of companies is called into question on their purported core competency: risk assessment and management (Wihbey 2012). As for the most profligate corporates, there is much activity at the discursive level – e.g. the London-based ‘Climatewise’, investing in – and reporting – standards of stewardship for resilience (Lloyds 2017). Companies are encouraged to factor-in material risk and material impact to their business accounts – affecting the ratings of their competitive position, capital adequacy, earnings and enterprise risk management. Some invest in flood modelling. There is a growing risk of big diverse financial institutions sharing their risk data with their own investment practices (in breach of regulations on conflicts of interest).

As with the Pentagon, the re-insurance industry is acting with urgency. Its politics are also immediate, within system, day to day - shifting risk onto the uninsured, reducing the protection of the incompletely insured and increasingly underinsured ‘consumers’, and requiring physical data as well as economic data for insurance ratings .

Yet negotiating the trade-offs between market saturation and the compulsion to find new markets threatened by unpredictable events in developing countries, the ‘balance between the policyholder and shareholder is increasingly volatile (and at present adverse to shareholder) – the industry is financially unstable. Last but not least the

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<http://www.theguardian.com/business/2015/jan/21/davos-world-bank-chief-climate-change-al-gore-pharrell-williams>

industry is secret and opaque about its reaction to the ecological crisis. In all but the 6 least carbon intensive states of US for instance, demands for the disclosure of modes of incorporation of climate risk policy into insurance practices have been successfully resisted (Wihbey 2012).

LABOUR

In the last three decades the global labour force has been increased by over 1.1 billion to 3.4 bn (ILO 2018). These new working classes are as yet singularly immobilised and fractured by nation, sector, relations of control and rights from work status and citizenship, by race, ethnicity caste and religion and gender and by the degree of precarity of life outside work as well as at work (de los Reyes 2017). They are in immediate contention with rising ethnic and religious proto-fascist / 'populist' mobilisations (eds Panitch and Albo 2015). These are unpropitious conditions for concerted class action. As Andre Gorz put it in 1968, the mobilisation of working classes involves effectively challenging current policies, defining. and mobilising around alternatives reflecting a new balance of forces. The inherent opposition of labour to capital constantly generates class movements and organisations. The predatory relations of capital to nature have both immediate and long term consequences for workers. In 2006, the global federation INTUC, convened a movement to tackle climate change, albeit recognizing the cleavage between a just transition through less polluting livelihoods and one transcending capitalism (Barca 2016). To test the responses of working classes to the ecological crisis, we examine two national components and outline here the activities of significant working class organisations that have addressed the issue so far - the British TUC and the Indian NTUI.

The British Trades Union Congress

The apex Trades Union Congress (TUC) recognises the relation between the energy economy and climate change and the immediacy of the need for action, and has a longstanding commitment to a 'just transition to a low carbon economy' (Barca 2016; TUC 2015).

The TUC identifies underinvestment by the energy majors in renewable energy and energy efficiency (EE) while their profits are un/undertaxed, fossil fuel subsidies are highest in the EU, and yet consumers' energy bills soar at four times inflation rates. It criticises the British government as lacking appropriate urgency. 'The crash, the recession and tensions within the coalition - in different ways, all have deflected us [trades unionists – BHW] from the critical task of greening our economy' (O'Grady, 2013).

The TUC calls for binding GHG reduction targets and aligns with the British government's target of a 50% reduction by 2025.⁵¹ It advocates a coordinated 'smart, active low-carbon industrial strategy' comprising (g)reen apprenticeships and skills, (state-governed) R&D, a revitalised innovation system and support for science. Such ambitious investments for the future need a 'proper Green Bank and the Business Investment Bank' (O'Grady 2013). The state should support 'strategically important low-carbon sectors' (ibid) prioritising renewable energy and electric vehicles. The TUC opposes shale-gas fracking but supports 'clean' coal and sees (widely criticised) carbon capture and storage technology as the means to revitalise the coal industry. To this end the TUC works with the CCA lobby - the Carbon Capture and Storage Association (CCSA) (TUC 2014).

Four conclusions can be drawn about the TUC's climate change politics. First it reduces the ecological crisis to climate change. Second, it recognises the urgency of climate change, yet its GHG reduction targets are merely those of the government whose lack of urgency it criticises. Third, its project is discursive and despite emphasising that the new economy will be created by workers, it requires the cooperation of capital. Last, its project also assumes a powerful state driven by the public interest in the present and future - at the least to co-ordinate the displacement of the fossil fuel workforce . It would certainly be a mistake to underestimate the value of the TUC's engagement, but its limitations are clear.

India's New Trades Union Initiative

⁵¹ <https://www.gov.uk/guidance/carbon-budgets>

The New Trade Union Initiative (NTUI) came into existence after the World Social Forum of 2004 to bring together unaffiliated workers' organisations (trades unions in India being owned and fractured by many political parties, by locality, by plant-level confinement, and by the huge size of the informal sector, which accounts for 93% of all jobs) and to unite hundreds of social movements (which NTUI has theorised as reflecting class struggle).⁵² It rapidly gained a membership of 1.5 million workers and 300 affiliated organisations⁵³, many of whom mobilise workers with only informal contracts. The NTUI and SEWA (for self-employed women⁵⁴) are the only Indian trade unions which have no party political allegiance. In its Assembly of Working People in 2008 the NTUI addressed the implications of climate change for workers (NTUI 2008). Its analysis recognised the urgency of the science but, like the TUC's, its activism is in argument and education. It sees state engagement with the response to climate change as essential because, it argues, addressing climate change cannot be divorced from addressing social distributional inequities for which the state must be responsible, for reallocating workers displaced by measures to reduce carbon output, for championing green technology and prioritising decentralised renewable energy (NTUI 2008; Mathews et al 2016).⁵⁵

The NTUI adds to its support for GHG reduction targets and national climate budgets fierce attacks on the destructive Military Industrial Complex and on the two redistributive wings of Cap and Trade policy - the Clean Development Mechanism (CDM) and the scheme of investments and transfers Reducing Emissions from Deforestation and Degradation in Developing Countries (REDD). In the NTUI's view the CDM prevents the physical and verifiable cuts in emissions by the developed countries that are urgently needed and the REDD incentivises the forced takeover of forest lands from tribal societies who are already facing massive forced displacement (Carbon Market Watch 2014).

⁵² <http://www.wiego.org/content/national-trade-union-initiative-ntui>

⁵³ The membership of each in turn ranging from 80 to 120,000 members (Gautam Mody, General Secretary, Pers. Comm. February 2015)

⁵⁴ <http://www.sewa.org/>

⁵⁵ This approach is aligned with British Trade Unions' project for a Million Climate Change Jobs (CACC 2014).

In short, the positions of the TUC in the UK and the NTUI in India are similar in recognising the needs for urgency and for the state-led development of a socially just low-carbon transition. But their reasoned analyses are weakened by two further factors: divergent interests within the labour movements – not least the dependence of so many workers on jobs in the energy industries - and what they see as the need for capital to collaborate in the changes they spell out as necessary. Armed with a critique of capital, unionised labour has to work with capital. Capable of defining alternatives, organized working classes are not yet Gorz's countervailing force in mitigating climate change, let alone in dealing with the ecological crisis in all its range and complexity.

CIVIL SOCIETY AND THE POWER OF NUMBERS

In the UK, NGOs like Oxfam and Greenpeace, social movements like the Campaign against Climate Change with its active Trade Union branch and Fossil Fuel Divestment, Trade Unions collaborating with NGOs as does the TUC with Greenpeace, neighbourhood action groups under the 'low carbon' banner, and environmental communication organisations like COIN mobilise public opinion. They have aims that none can achieve single-handedly; yet they also have to protect their brands and funding sources. Despite herculean efforts by organisations like Climate Justice Now, 350.org and Fight Inequality Alliance they are generally reluctant to form alliances, and are often restrained legally from alignments with political parties. What about the largest single civil society organisation with 1.2bn members globally – the Roman Catholic Church? Is its stance - are its actions – a countervailing force to capital?

The Roman Catholic Church (RCC)

From 2000, growing threats to the ecosphere have been the subject of increasingly urgent Papal pronouncements.⁵⁶ By 2007 Pope Benedict 16 saw that '(h)umans could destroy the foundations of our existence, the earth'. By 2009, paraphrasing Marx, he told the Copenhagen summit on climate change that 'matters concerning the environment and its

⁵⁶ The sub-fields of Catholic Ecology and of Eco-spirituality are expanding (Hrynkow 2017).

protection are intimately linked with integral human development'.⁵⁷ In 2010, he explained how religious communities exemplified self-denial. An apex was reached in 2015: when after issuing the Encyclical on climate change Pope Francis addressed the UN general assembly⁵⁸ and convened an ecological summit of the world's main religions. Like the military-industrial-complex, the RCC spans advanced and developing societies, polluters and victims. Like the Pentagon, Pope Francis participated in the 2015 UN climate meeting in Paris, but like the Pentagon the RCC is itself exempt from binding treaties⁵⁹ and like the Pentagon its GHG emissions are unknown, though they will be greatly less.

The RCC has a growing interest in planetary sciences. Its Pontifical Academies of Science and Social Sciences have held a series of international multi-religious and secular meetings to discuss the global 'nexus of poverty, population, consumption, and environment' (Dasgupta and Ramanathan 2014). The Vatican's authoritative deliberations attribute the slow social response to climate change to opposing perspectives to environmental change, epistemological confusion, fuzzy concepts with multiple meanings, inter-related problems appearing in separate scientific fields, in disciplines and paradigms. Given this Tower of Babel, the Academies proposed a programme of research into the impact of climate change on the substantive fields of food, health and energy (ed Dasgupta et al 2014).

Laudato Si, the 2015 Encyclical, addresses the ecological crisis in its complexity. It includes a substantial critique of the antagonisms between material finitude and greed-driven infinite growth, between cultural diversity and the globalisation of indifference, between the common good and individual interest. In a moral language of justice, it calls for solidarist reorientations of technology against the impact of climate change, against poverty and for human dignity and the rapid development of renewable energy (Francis 2015).

⁵⁷ <https://catholicclimatemovement.global/statements-on-climate-change-from-the-popes/>

⁵⁸ <https://www.un.org/sustainabledevelopment/blog/tag/pope-francis/>

⁵⁹ The Vatican City has been an observer.

The RCC's critique of capital disguises it as markets.

'Socio-environmental processes are not self-correcting. Market forces alone, bereft of ethics and collective action, cannot solve the intertwined crises of poverty, exclusion, and the environment.'⁶⁰ Summarised in *Science* by two Indian experts, P.S. Dasgupta, a Cambridge economist and V. Ramanathan, a climate scientist from California's Scripps Institute, '(s)tudies on resource allocation in nonlinear systems have shown that Adam Smith's famous invisible hand' cannot, even in theory, be expected to come to the rescue'(Dasgupta and Ramanathan 2014). None the less a case is made for conceiving nature as natural capital and paying for its services.⁶¹

In this series of most advanced and secular expressions of the Church's concern the driver of climate change is not capitalism but inequality, global injustice, violence and corruption which undermine ethical values, human dignity and human rights and create a moral and spiritual crisis (Francis 2015).

The RCC expects more than a transformational mobilization of public opinion. The Vatican and other global religions have vast networks of voluntary organizations that can have a major impact on distribution of clean technologies in rural areas of Asia, Africa, and South America (Dasgupta and Ramanathan 2014). But an alliance with other relevant civil society organisations and NGOs was not proposed. Despite widespread conscientisation, opposition to *Laudato Si* has been mobilised from Catholic climate change sceptics in the Vatican's budget office and from the 2015 Republican speaker in the US Congress.⁶²

⁶⁰<http://www.casinapioiv.va/content/accademia/en/events/2014/sustainable/statement.html>

⁶¹ Plus this. 'Social inequalities can be reduced through the defense of human rights, the rule of law, participatory democracy, universal access to public services, the recognition of personal dignity, a significant improvement in the effectiveness of fiscal and social policies, an ethical finance reform (the pope's favourite), large scale decent work creation policies, integration of the informal and popular economic sectors, and national and international collaboration to eradicate the new forms of slavery such as forced labor and sexual exploitation'
<http://www.casinapioiv.va/content/accademia/en/events/2014/sustainable/statement.html>.

⁶² Australian Cardinal George Pell,
<https://www.theguardian.com/australia-news/2018/may/11/george-pell-met-us-environment-chief-scott-pruitt-to-discuss-climate-change-debate>; and John Boehner,

In an exceptional position to set an agenda for civil society, the Roman Catholic Church's formal sense of urgency is clear. The analysis and action is less clear, since this secular advance in mobilisation reflects a number of analytical and practical tensions: between reducing the problem to climate change and expanding it to nature, between secular materialism and spiritual /moral trusteeship, between the critique and the advocacy of markets, between global and individual action (joyful austerity),⁶³ and between the causes (lapsed and greedy) 'humans'⁶⁴ versus (the absent) capitalism, proxied by markets.

CONCLUSIONS

The context of this analysis of the behaviour of global capitalist and social forces is the complexity and the irreversibility of elements of the ecological crisis, the speed of its deepening, and the urgency with which the science says action is needed.

When we consider the interests of countries, and those of capital and labour, we find a glaring contrast. On the one hand we see the well-focussed adaptive action to respond to the accelerating crisis being taken by some major state and corporate actors to defend private or sectional interests or meet what they see as their responsibilities (as in the case of the military). On the other we find the failure to act, or lethargic and demonstrably inadequate, action by political elites responsible for their populations, and action by some global companies which either ignore or aggravate the crisis. None of what any of these actors do is easily held to account. National politicians have failed to defend the global collective interest with actions to mitigate the processes unleashed by capital, let alone to reverse them. As Arnold Toynbee concluded in 1976, so now, 'sovereign states cannot save the biosphere from man-made pollution' (cited in Oosthoek and Gills 2005).

Organised labour and actors in the well-populated world of civil society have developed a moral discourse of justice in relation to the

<https://thehill.com/policy/energy-environment/229689-boehner-ill-let-scientists-handle-climate-change>

⁶³ Themes of the *Episcopal Commission for Social Affairs* 2008

⁶⁴ Ensnared in 'structures of sin' (ibid p5)

environmental crisis. However, they lack both the material foundations for practical action and the appetite for adequately significant alliances, are compromised by their pension fund investments in companies that are part of problem, and hampered by the inescapable need for jobs.

What is to be done? The journal *Globalisations* has published a range of differently framed answers to this question, including calls for an environmental new deal (George 2008); paradigms of environmental (and social) justice (Paavola 2005; Houston 2013); new paradigms of political economy for such approaches as eliminating over-production and consumption through the democratic management of planetary resources, the development of low/zero growth/ steady state economics, changed behaviour and social justice (Oosthoek and Gills 2005); and a renewed global bio-civilisation (Goodman and Marshall 2013).

Elsewhere, trajectories for eco-socialist transformation have been developed by scholars such as Michael Lowy (2017), responding to the Marxist concept of the metabolic rift and involving revolutionary change, and Andreas Malm (2017), in a manifesto developed from an ecological analysis of current revolutionary politics. Many of these calls combine boldness with fragility, involving rather high levels of abstraction and a focus on strategic ends while neglecting the political means by which the needed combination of social and technical forces might start to be assembled (Mitchell 2013, p 241). All too often the conclusions arrived at lack further analysis of the immediate predisposing political or institutional conditions, of the required dynamic sequences and trade-offs, the identification of the key sources of opposition and the means whereby they might be overcome.

This paper cannot avoid these common and all too understandable limitations of much of the existing literature. What it suggests, rather, is that the physical problem is becoming well understood, but the political problem much less so. We need to start focussing on the practical problems of local, national and collective global action. Not every aspect of the problem is inherently insuperable. The preliminary analysis of the institutions of global capital suggests that some dimensions of global environmental politics look less intractable than when framed through states. For example if there are many fewer companies than countries

that need to cut back pollution, then the size of the collective action problem is reduced.

However, in what Lowy calls the ‘perverse dynamics of the system’ (2017, p19), many of the companies and sectors of capital examined here are revealed as pursuing a battery of short-term tactics and long-term strategies of exemption, pre-emption, exit and masking activity – i.e. of adaptation, not mitigation; while organised labour, despite its understanding of the problem, has found it hard to act on the ecological crisis in ways other than subservient. The case of BP exposes capital-state politics at work to displace the mitigation agenda. Elsewhere, as with Coal India, fossil energy corporates form integral parts of the state.

The range of reactions to the (more or less reductive) interpretations of the ecological crisis exemplified here suggests several different possible paths towards establishing the preconditions for ecological democracy. The limitations of the case study method mean that these suggestions are merely indicative, not comprehensive, confined to the immediate, and not revolutionary. But we need to start somewhere.

At the level of nation states, it is, first, urgent to win recognition of the fact that the ecological crisis and global war machines are connected. Politicians have to be induced to see it as valuable to acknowledge, measure, and, through the creation of a support base, incorporate war machines openly into the international relations of ecological planning – with a view to eliminating them. Second, pressures for fossil fuel divestment need intensifying and co-ordinating with incentives for very fast-track labour-intensive re-industrialisation, using renewable energy and energy-efficient technology. Third, in the absence of private insurance, states must develop new policies to protect people from environmental hazards, focussed on vulnerable populations. Meanwhile organised labour – both producers and consumers - need to develop the capacity to force the state to co-ordinate and improve livelihoods in the material transformations to come, and to identify and tax carbon-profligacy. There is also much work for civil society: in B.R. Ambedkar’s famous phrase, it must educate, organise and agitate.

At the international level it is clear that the dominant, orthodox 'deal-making' approach of collective action among nations offers too many incentives for destructive free riding, by both nation-states and capital. It does not allow for the realities of competition which force companies to ignore collective action. The required transformative regulation of global capital will need the development of a political pincer strategy that combines local enforcement, social and fiscal accountability with a global jurisdiction. For this, political alliances will have to form at different scales to hold political representatives to account. Like all effective global action it will depend on public demand for them being first achieved in a large number of key countries.

The ecological crisis is the greatest and most urgent political and developmental problem of the 21st century, a threat to human life on earth. There is no indication yet that capital will do other than exacerbate the crisis, or that publics or political elites have begun to recognise its severity and imminence.

Acknowledgements.

This is an updated, considerably abridged and referenced version of my SOAS Globalisation Lecture of 2015, whose full text is here:

https://www.southasia.ox.ac.uk/sites/default/files/southasia/documents/media/general-south_asia_wp21_soas_globalisation_lecture.pdf

I am grateful to Gilbert Achcar for that privilege and to audiences at SOAS, and subsequently the LSE, Oxford, BITS Pilani, Goa and JNU, India for their responses.

APPENDIX 1

Table 3 Top twenty investor- & state-owned entities and attributed CO₂ & CH₄ emissions 2010, cumulative emissions (1751–2010) and percent of global emissions

Entity	Country	MtCO ₂ e	MtCO ₂ e 1751–2010	Percent of global
Chevron	USA	423	51,096	3.52
Exxon Mobil	USA	655	46,672	3.22
Saudi Aramco	Saudi Arabia	1,550	46,033	3.17
BP	UK	554	35,837	2.47
Gazprom	Russian Fedn	1371	32,136	2.2
Royal Dutch/Shell	Netherlands	478	30,751	2.12
Nat Iranian Oil Co	Iran	867	29,084	2.01
Pemex	Mexico	602	20,025	1.38
ConocoPhillips	USA	359	16,866	1.16
Petroleos de Venezuela	Venezuela	485	16,157	1.11
Coal India	India	830	15,493	1.07
Peabody Energy	USA	519	12,432	0.86
Total	France	398	11,911	0.82
PetroChina	China	614	10,564	0.73
Kuwait Petroleum Corp	Kuwait	323	10,503	0.73
Abu Dhabi NOC	UAE	387	9,672	0.67
Sonatrach	Algeria	386	9,263	0.64
Consol Energy Inc	USA	160	9,096	0.63
BHP-Billiton	Australia	320	7,606	0.52
Anglo-American	UK	242	7,242	0.50
Top 20 IOCs and SOEs	11,523	428,439		29.54
Top 40 IOCs and SOEs		546,767		37.70
All 81 IOCs and SOEs	18,524	602,491		41.54
Total 90 carbon majors	27,946	914,251		63.04
Total Global Emissions	36,026	1,450,332		100.00

Notes:

1.Right column compares each entity's cumulative emissions to CDIAC's global emissions 1751–2010.

2.Excludes British Coal, whose production and assets have not been attributed to extant companies, and five of nine nation-states (FSU, China, Poland, Russian Federation, and Czechoslovakia, in that order)

3. IOC: investor-owned companies; SOE: state-owned enterprises

Source: Heede R. 2014, p237

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