

GLOBALISATION, DEVELOPMENT AND THE METABOLIC RIFT

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Abstract

The metabolic rift describes the relation between the relatively short extractive cycles of the economy and the very long cycles involved in the creation and restitution of natural resources. This rift is now globalised and so acute that nature is failing in both its long-cycle roles. Responses that focus on politically chosen goals for limiting climate change ('2 degrees') reduce to one dimension a set of processes that has many dimensions and calls for a far wider set of changes. The main political response – international 'deals' for collective action by countries to limit the output of greenhouse gases - is shown to be not only reductionist but also a discursive tower of babel involving more procrastination than serious will to act. The lecture will outline the (sometimes surprising) responses not so much of countries as of the most powerful economic actors on the planet in terms of the way they see the crisis, how urgent they are, and what they are doing or proposing to do.

What is the metabolic rift? It is a concept which originated with the German soil chemist Justus von Liebig and was developed to describe the relation between society and the planet it lives on. To call human activity 'development', to speak of growth, the market, the business economy, or just 'humans'¹, and not also name what we do as capitalism, is irresponsible. It is true that fossil-fuel-based

¹ ref catholic church if nought else

industrialisation under communism –recall Lenin’s dictum that ‘communism equals soviet power plus electricity’- played its part in widening the metabolic rift, but it is the empire of capital² that now embraces the globe. If the metabolic rift is not solely due to capitalist development, its present and future certainly are.

1. DEVELOPMENT AND THE METABOLIC RIFT

But when Engels and Marx - who both closely followed the science of the mid-19th century³ – addressed the question of the metabolic rift they did not start with the planet, they started with the individual, ‘Man/the Human’. One of humankind’s distinctive evolutionary niches is the capacity to develop and use external tools and technology to modify nature.⁴ It fell to Engels and Marx to see the significance of this: humans exist in a dialogue with nature involving flows and stocks not only of materials but also of energy – together with their conversion.⁵ In letters to Marx Engels explained that ‘Metabolic interaction’, the process of material exchanges in which nature is appropriated ‘for the satisfaction of human needs’⁶... ‘is regulated from the side of nature by natural laws governing the various physical processes involved, and from the side of society by institutionalised norms governing the division of labour and distribution of wealth etc’.⁷ And under the institutionalised norms of capitalism the full costs of the reproduction of exhaustible

² Panitch and Gindin

³ They reasoned that while living non-human organisms had through evolution, ‘accumulated’ internal organs or tools (‘organ’ being derived from the Greek for tool) that made each species uniquely equipped with a ‘natural technology’.

⁴ The physiologist Jared Diamond has argued that specifically *human* potentials include the capacity for addiction, the capacity to kill our own kind and the capacity to destroy the material base of civilisation as well as the capacity to make tools, to think abstractly and creatively, to live long beyond our capacities for physical reproduction and to anticipate our own deaths (Diamond 2003). Diamond, Jared. (2003). *The Rise and Fall of the Third Chimpanzee: How Our Animal Heritage Affects the Way We Live*, London: Vintage.

⁵ Engels (1974, p. 328) cited in Foster (1999, p. 381)

⁶ Marx, in Theories of Surplus Value, 1861-63 and Capital 1, p. 283, 290, cited in Foster (1999).

⁷ Foster (1999, p. 381).

resources do not enter the calculation. The result is that nature is 'alienated', and physical and biological balances are violated.⁸

Although Marx applied this insight to agriculture, the logic of the metabolic rift is relevant to the agro-industrial system and to global industrial capitalism generally. Agriculture, Marx wrote, can be commodified only by forfeiting the 'whole gamut of permanent conditions of life required by the generations', and which should not be commodified if they are to remain in balance.⁹ As mid-19th century yields stagnated, farmers' attempts to keep soil nutrients in balance had contradictory and unexpected outcomes.¹⁰ Soil 'fertility is not so natural a quality as might be thought [Marx added]; it is closely bound up with the social relations of the time'¹¹. Increased soil fertility through improvements to land and labour productivity could support growing non-agricultural populations.¹² But Liebig had shown that through the application of chemical fertiliser and by not recycling wastes from consumption, soil could be exhausted and ruined as well as improved. Marx therefore widened Liebig's concept of metabolism to 'social-ecological metabolism'.¹³ *Capital*, Marx concluded, gives rise to an 'irreparable rift' in the 'interdependent process of social metabolism, a metabolism prescribed by the natural laws of life itself'¹⁴. 'Capitalist production ... only develops the techniques and ... the social process of production by simultaneously undermining the original sources of all wealth – the soil and the worker'¹⁵.

The archetypical expression of this 'metabolic rift' is an antagonistic relationship between town and country. The US economist Henry Carey, who also influenced Liebig, called it a 'robbery system'¹⁶, generating several contradictory outcomes. Towns concentrate the 'political drivers of social progress' but also break several nutrient cycles.

⁸ Burkett (1999). This is not to argue that balances have ever been achieved by human societies but that the balances of relevance are now being created under capitalism.

⁹ Marx, *Capital* 3, p. 754

¹⁰ Foster (1999) p. 375

¹¹ Marx in 1847, 1963, pp. 162-3, cited in Foster (1999, p. 375

¹² Marx, *Capital* 1, p. 283.

¹³ Foster (1999, p. 381, footnote 5

¹⁴ Marx, *Capital* 3, 1981, pp. 949-50 ; *Capital* 1, pp. 636-9;pp . 948-59.

¹⁵ Marx, *Capital* 1, 1976, pp. 637-38, cited in Foster (1999, p. 379

¹⁶ Marx, *Capital* 1, p638

Minerals and nutrients in food, fibres and agro-industrial raw materials are 'exported' from farms through (the terms of) trade, unequal exchange and seizure, over ever-increasing distances and with ever-increasing intensities of energy consumption, making the maintenance of soil fertility more and more difficult. Commodities are consumed in cities but waste resources and animal waste are not returned to the soil. In Marx's day, waste choked the towns – as it does in India today - and polluted the rivers and sea. Now some is re-processed (and this too has become a field of capital accumulation), but is still not returned to the soil, even in organic agriculture.

The spatial appropriation and dislocation of metabolic flows has been a key aspect of capitalist accumulation. We can read into the concepts, or metaphors, of 'town' and 'country', the relations between industry and agriculture today, the extreme dislocations between food production and the consumption of resources by food producers, and between the general reproduction of human society and that of its resource base – which now includes the atmosphere and the biosphere: the hydrosphere, the lithosphere. Though the planet is energetically an open system and part of the solar system, the physical degradation and dissipation of energy and materials after the processes of production and consumption, and their reconstitution in forms potentially capable of entering into production again, is at a pace so completely at variance with the scale and pace of capitalist production cycles that the waste process is 'irreversible'.¹⁷ Waste is that which is useless to capital. The depletion of energy and materials due to this irreversibility has been accepted because it has not been an immediate obstacle to the production of surplus value.

Even if few 19th century philosophers foresaw that the global ecological crisis would be driven by constraints in the metabolism of sinks (notably

¹⁷ Ref: Hahnel 2012 RRPE on growth. The second law of thermodynamics 'states that the amount of energy available for work in a closed system necessarily decreases with use. This law is also known as the "entropy law": in a closed system if work is done entropy necessarily increases. However, not only is the Earth an open, not a closed system, since we get inputs of entropy decreasing energy from the sun, death by entropy could only take place so far in the future that we should be so lucky to last long enough to die from too much entropy!' (Hahnel 2012) Nicholas Georgescu-Roegen and Herman Daly provide an interpretation which, unlike the end of our solar system, is relevant to the growth debate. We are on track to render the biosphere uninhabitable long before entropy and the second law of thermodynamics engulfs us.

– but not confined to - the atmosphere) as well as the exhaustion of taps, we now understand that Nature is not just a resource ‘tap’ but also a ‘sink’ of used materials and spent energy.¹⁸

1.1. *Comments*

Four thorny aspects of this argument drive what follows in this lecture/essay.

1.1.1. ‘Generalised human development’¹⁹, Marx’s term, cannot be achieved through the production of commodities alone. Generalised human development also requires the preservation of the non-commodifiable realms essential for both social reproduction and commodity production. By means of privatisation and commodification, these are currently being plundered, encroached on, degraded and destroyed.²⁰ Capitalism has ‘brake failure’.

1.1.2. Restitution. Since capitalist production does not reconstitute to nature either stocks or flows of matter and energy,²¹ a rational ‘human metabolism with nature’²² has to be achieved by other means : by the systematic application of science to govern metabolic processes ‘with the least expenditure of energy ... and the re-use of waste ... under collective (social) control ... as associated producers’ (ibid). That it is not clear how we are to do this does not mean that the theory and practice of development can ignore it.²³

¹⁸ Hahnel 2012 on growth: ‘we are exhausting the ability of the planet to absorb different kinds of physical wastes sooner than we are exhausting the ability of the planet to continue to provide natural resources’.

¹⁹ Approached using various conceptual tools. Sen capabilities. Alkire multidimensional poverty reduction. Stewart human devt. UN basic needs. MDGs list.

²⁰ Harvey accn by dispossession. Adnan on primitive accn. umar salam on knowledge; narpat jodha on Indian ‘wasteland’ and commons.

²¹ Nature does not absorb or regenerate at a pace to renew the resources it uses, hence they are non-renewable..

²² Marx, *Capital* 3, pp. 195-7, p 959 (1863-5) 1981 *Capital volume 3* NY Vintage

²³ Malcolm Bull 2012, [Steven Gardiner 2012, LRB on climate change] Not just physically ignore it but also politically and morally. ‘It is not only immoral to do more harm now that we know we do harm – but also immoral not to recognise responsibility for perpetration as it is to rationalise obligations to suit our inclinations.’

3. Dematerialisation. Just as there are limits to growth ²⁴(and the imperative of profit-driven growth is ignored in much thinking about economic goals and zero-growth²⁵) the ideas that the energy and materials intensity of growth can be reduced, that the economy can be de-materialised through the de-coupling of physical and economic materiality face physical and social limits. The kind of materials efficiency required for generalised human development faces constraints due to the actually existing forms of global capital. ²⁶

4. Capital. It is not a matter of better or worse kinds of capitalism (Gindin on Klein etc); it is the logic and dynamic of all forms of capitalism that are currently pushing the metabolic rift towards what looks like a catastrophic break. Nonetheless the immediate future, and even the first steps towards what Richard Smith has called 'post-capitalist ecological democracy' (Smith 2010), cannot be achieved without engaging with capital.

The next section lays out why the immediate future is so important.

2. SCIENCE AND THE ECOLOGICAL CRISIS

Science is not organised around the concept of the metabolic rift. In science, nature is conceived as a complexly interconnected set of bio-physical sub-systems which provide the conditions of existence for our species. Overwhelming evidence points to their approaching collapse.

²⁴ See the solid critique of the various critiques of the Club of Rome's original *Limits to Growth* in M.R. Simmons 2000 *An Energy White Paper*

²⁵ Altvater, 1993 points to the engine of interest repayment as well as profit that must drive growth.

²⁶ Currently 'the rate of growth of the value of production ... outstrip(s) the rate of growth of throughput efficiency' (Hahnel 2012, p29). For Marx, capital must expand - firstly, [though] quantitative expansion of existing consumption; secondly: creation of new needs by propagating existing ones in a wide circle; thirdly: production of needs and the discovery of new values" (Marx, 1973, p. 408) in Surak nd. Hahnel argues convincingly that it is the manufacturing of desire/preferences intrinsic to capitalism, the bias to private goods (creating efficiency losses) and the tension due to private ownership of property between future energy and materials efficiency from technological change and present rates of extraction in excess of regeneration capacities that limits dematerialization. Also: 'Since two of the most salient features of the global economy over the past thirty years are the escalating degradation of the natural environment, reducing an equitable social rate of time discount, and the increasing power of capitalists *vis-a-vis* workers on a world scale, increasing the private rate of return on investment, the gap between private and social discount rates has increased dramatically during the neoliberal era' (op cit p 36).

Unless physically revolutionary measures are taken now, the physical conditions of existence of many human beings are liable or even likely to be destroyed within the lifetime of anyone under the age of 20. In the view of one distinguished scientific team, human society has quite likely already exhausted our 'safe operating space' in at least four major components of the set - 'eating away at our own life support systems" in their words. Alongside anthropogenic climate change, there is loss of biodiversity and biospheric damage and gigantic additions of nitrogen and phosphorus to the oceans from fertilizer run-off. ²⁷

2.1. Climate change and global warming.

The temperature of the Earth depends on the amounts of several gases in the atmosphere: CO₂, methane, nitrous oxide, CFCs and many others including water. ²⁸ Radiative forcing – defined as the change per unit area of the globe in the difference between energy/sunlight absorbed by the atmosphere and that radiated back - is affected by the presence and combination of these gases. It is heating the oceans and the atmosphere. ²⁹ The main causes have been deforestation and the exploitation of fossil fuels. Climate scientists treat just one component, atmospheric carbon dioxide, as the 'canary in the mine'. ³⁰ The increases of CO₂ that are inevitable under assumed business as usual (BAU) scenarios generate estimates of temperature rises of 4-6 degrees by 2100. ³¹ At this temperature the earth is highly unlikely to sustain projected human populations. According to Paul Kingsnorth in the LRB, , 'Four degrees of warming ... is likely to bring heatwaves of magnitudes never experienced before, and temperatures not seen on Earth in the last five million years. Forty per cent of plant and animal species would

²⁷ See Steffen et al, Science 2015

²⁸ Only 15 of these are measured by the IPCC: CFC-113, tetrachloromethane (CCl₄), trichloromethane (CH₃CCl₃); hydrochlorofluorocarbons (HCFCs) 22, 141b and 142b; hydrofluorocarbons (HFCs) 134a, 152a, 23, 143a, and 125; sulfur hexafluoride (SF₆), and halons 1211, 1301 and 2402) (IPCC glossary <http://www.ipcc.ch/pdf/glossary/ar4-wg1.pdf>)

²⁹ By 2009, '(c)urrent CO₂ concentration (stood) at 387 p.p.m.v. and the change in radiative forcing (was) 1.5 W m⁻²'. ²⁹

³⁰ This is because it is responsible for the largest portion of warming, and it stays in the atmosphere for many centuries (there is a long lag time from when emissions stop to when concentrations reduce.

³¹ <http://grist.org/article/bau-fd/> Romm J 2008, Hadley Center study warns of 'catastrophic' 5-7°C warming by 2100 on current emissions path, GRIST, Dec 23rd <http://grist.org/article/bau-fd/>

be at risk of extinction, a third of Asian rainforests would be under threat and most of the Amazon would be at high risk of burning down. Crop yields would collapse, possibly by a third in Africa. US production of corn, soy beans and cotton would fall by up to 82 per cent. Four degrees guarantees the total melting of the Greenland ice sheet and probably the Western Antarctic ice sheet, which would raise sea levels by more than thirty feet. Two-thirds of the world's major cities would end up underwater. And we aren't looking at a multigenerational timescale: we may see a four-degree rise over the next sixty years'.³²

Even if this threat were to be addressed immediately on a war footing³³, many severe adverse consequences that we are already beginning to experience - such as the loss of agricultural land, livelihoods and forced migration due to sea level rise, in the Sunderbans and elsewhere³⁴, and increasingly frequent extreme weather events like New York's Hurricane Sandy³⁵ - will persist on the planet for unknown period. Estimates range from hundreds to thousands of years.³⁶

2.2. Biodiversity loss.

We are living amidst a very rare event in the planet's history which may even be more immediately dangerous to human life than global warming. The current rate of extinctions is estimated at 100-1000 times what it was before the industrial revolution – the highest rate since the Cretaceous-Tertiary boundary event, 65 million years ago.³⁷ Amphibians

³² Paul Kingsnorth, 'The Four Degrees', *London Review of Books*, 23 Oct 2014, p. 18, review of George Marshall's *Don't Even Think About it: Why our brains are wired to ignore climate change*. (2014, Bloomsbury)

but also see Nandan Nawn critiquing the scenarios and modelling on which such predictions are made <http://www.nujs.edu/workingpapers/juxtaposing-scientific-uncertainty-with-legal-certainty-the-carbon-conundrum.pdf>. And note that the effects of a 4 degrees rise would be lagged (eg through the melting of ice).

³³ Ref. Mark Harrison on war-time planning of capitalist economies.

³⁴ Revealed by satellite Gravity Recovery Measurements (Stephen Chu, Romanes lecture, Oxford, October, 2014)

³⁵ <http://www.businessweek.com/articles/2014-11-11/deceptive-peer-reviews-affected-hundreds-of-hurricane-sandy-insurance-claims>

³⁶ Stephen Chu, Oct 2014, Romanes Lecture, Oxford

³⁷ Wake and Vrengenburg 2008 Are We in the Midst of the Sixth Mass Extinction? A View from the World of Amphibians *Proceedings of the National Academy of Sciences of the United States of*

are a canary here, with a current extinction rate estimated at 45,000 times the background rate.³⁸ Between 40-50% of all species are heading for extinction as early as 2050.³⁹ The evidence suggests that most contemporary extinctions are due to our material interventions including, increasingly, those that are also driving climate change.⁴⁰ While we have very poor scientific knowledge of the extinctions to come, or of their impact on each other and on human society, there is a high probability that we will suffer serious adverse consequences: ‘apparent redundancy is required to maintain an ecosystem’s resilience’ (Rockstrom et al 2009 p 474). A single example makes the point: we are currently facing drastic declines in bees and other insects on which the pollination of 70% of the world’s agricultural crop species depends.⁴¹

2.3. The *Nitrogen cycle* .

The fixing of nitrogen in fertilisers and through the cultivation of legumes⁴² is now thought to be putting into the ecosystem about four times as much nitrogen as it would otherwise absorb.⁴³ Nitrogen fertiliser boosts plant growth and yields and is essential to industrialised agriculture – to the tune of 100 million tonnes of fertiliser per year.⁴⁴ But nitrogen not taken up by plants in agriculture can become an

America, Vol. 105, In the Light of Evolution II: Biodiversity and Extinction (Aug. 12, 2008), pp. 11466-11473

³⁸ Wake and Vrengenburg 2008

³⁹ Elizabeth Kolbert 2013 *The Sixth Extinction* , London, Bloomsbury

⁴⁰ For example overfishing. <http://www.globaloceancommission.org/issue/overfishing/>

⁴¹ This has been estimated at 70 trillion \$.

<http://www.endangeredspeciesinternational.org/insects6.html>. NB bulk crops are nearly always wind-pollinated.

⁴² The family of peas, beans, peanuts, lentils, alfalfa etc which ‘fix’ nitrogen as they grow.

⁴³ By a factor of about 4 times, according to Rockstrom et al 2009

⁴⁴ Cassman, Kenneth G.; Dobermann, Achim R.; and Walters, Daniel T., 2002 Agroecosystems, Nitrogen-use Efficiency, and Nitrogen Management *Ambio* Vol. 31 No. 2, March 2002 © Royal Swedish Academy of Sciences 2002 <http://www.ambio.kva.se>

http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1356&context=agronomyfacpub&sei-redir=1&referer=http%3A%2F%2Fscholar.google.co.uk%2Fscholar_url%3Fhl%3Den%26q%3Dhttp%3A%2F%2Fdigitalcommons.unl.edu%2Fcgi%2Fviewcontent.cgi%253Farticle%253D1356%2526context%253Dagronomyfacpub%26sa%3DX%26scisig%3DAAGBfm1lmgoiKhyF_Z_PRUnJkBi-HjgE0w%26oi%3Dscholarr%26ei%3DmxxqVJGBHrLdsATxnoBA%26ved%3D0CCEQgAMoAJAA#search=%22http%3A%2F%2Fdigitalcommons.unl.edu%2Fcgi%2Fviewcontent.cgi%3Farticle%3D1356%26context%3Dagronomyfacpub%22

atmospheric GHG, or can pollute - and erode the resilience of - soil and water subsystems.⁴⁵

2.4. *The phosphorus cycle*

From fertilisers to toothpastes, humans are dumping an estimated 8 times the phosphorus in the ocean than entered it before the industrial revolution. We are at risk of running out of phosphate. Current scientific knowledge suggests that mass extinctions of marine life caused by phosphorus-induced anoxic events occurred in the geological past; there is now a risk of this happening again.⁴⁶

This summary of unsafe trends in physical materiality shows that most writing about climate change and global warming is highly reductionist. Global warming is only one of multiple major ecosystem threats, and the factors causing global warming also contribute to other threats - 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. Other subsystems currently approaching dangerous destabilisation include:

2.5. *Ocean acidification*

The dissolving of atmospheric CO₂ into carbonic acid in oceans is the largest sink for atmospheric CO₂ (although there is evidence that the effectiveness of this sink is weakening). The oceans are now 26% less neutral and more acidic than they were before the industrial revolution – and this acidity threatens all ocean life forms that metabolise calcium. Here the warning signal is the mean saturation state of aragonite in surface sea water.⁴⁷ This is approaching ‘threshold levels’ of danger to shellfish, molluscs, reef fish, and the other fish that feed on these, and which in turn feed some 40m people per year. Acidification is also damaging coral, which fixes CO₂ (so that without coral the acidification of the oceans will advance even faster).⁴⁸

⁴⁵ Rockstrom et al 2009

⁴⁶ Rockstrom et al 2009

⁴⁷ http://iprc.soest.hawaii.edu/users/tobiasf/Outreach/OA/Ocean_Acidification.html

⁴⁸ Brown A. 2013, Aragonite shell damage *Nature Geosci.* 5, pp 881–885

2.6. Freshwater loss.

About half the run-off from rainfall is now diverted and consumed by agriculture, industry and domestic activity, including sanitation; and the proportion is increasing. While statistics for water use show nothing but increases, scientists are concerned about two dangerous outcomes. Most 'consumed' water is also discharged as polluted water into rivers, lakes and the sea. It is destroying a wide range of eco-subsystems by causing pollution in some areas and terrestrial drought and water stress in others.⁴⁹

7. Land use change

The conversion of natural ecosystems/forests to agriculture, the intensification of agriculture, mining, and the expansion of cities and towns, all directly reduce biodiversity and generate or release greenhouse gases (GHGs). Land use change is also threatening ecosystems through the impact of more frequent, longer and bigger wildfires, floods, storms and other disasters.⁵⁰ So is the introduction of alien species into new environments, extinguishing some species and redistributing others, with unpredictable and sometimes disastrous consequences (e.g. the Diffuse Knapweed which has spread from E. Europe to West coast states of the US and whose chemical root secretions poison the local vegetation).⁵¹

In addition to these, many other economic activities threaten natural eco-systems in ways which are less well measured – known unknowns.

⁴⁹ Rockstrom et al 2009. The two outcomes are directly related – much pollution is concentration-dependent.

⁵⁰ The 'European Union has become a showcase for how the world will be transformed by climate change, including tragic fires in Greece and the Canary Islands, dramatic floods in England, and heat

⁵¹ http://www.ipcc-nggip.iges.or.jp/public/gp/bgp/3_9_Global_Sources_Industrial_Processes_SF6.pdf; Sheley, R., J.

Jacobs and M. Carpinelli, 1998,

Distribution, Biology, and Management of Diffuse Knapweed (*Centaurea diffusa*) and Spotted Knapweed (*Centaurea maculosa*) *Weed Technology*, Vol. 12, No. 2 pp. 353-362 Rockstrom et al, 2009, p 473 . The importing of young ash trees from Denmark for gardens in Britain has introduced a fungus now thought likely to kill off 20% of the country's tree cover with extensive knock-on effects of loss of cover for animals and plants, not to mention 27 species of invertebrates for which ash is food, which in turn affect the capacity of soil to sequester carbon, timber markets and woodland management. **Other examples: in the UK**, *rodhodenrum ponticum* is the obvious plant example, (or Himalayan balsam, Japanese knotweed). *lantana* in India (and globally). See also the cases of rats and goats in every continent (apart Antarctica), snails in Hawaii, cane-toads in Australia, harlequin ladybird in UK.

2.8. Chemical pollution

The economy produces waste: 'persistent organic pollutants, plastics, endocrine disruptors (such as oestrogen-mimicking chemicals), heavy metals and nuclear waste' (Rockstrom et al, 2009, p 473) all of which have impacts on ecosystems.

2.9. Aerosol atmospheric loading

Aerosols are a complex range of solid or liquid particles suspended in the air, including fine particles which are manufactured by man. These can affect the climate (and cool the earth), re-distribute pollution, and potentially bring pollutants deep into lungs and other plant/animal pores, resulting in declines in human health (aerosols are associated with the asthma epidemic and with lung cancer).⁵²

10. Stratospheric ozone depletion

Ozone reduces the quantity of harmful ultra-violet light-waves from entering the atmosphere and damaging plants, plankton, ocean species like whales (epidermal damage) and humans (cancers and cataracts). Under the Montreal Protocol (which started to be implemented in 1989) restricting ozone-depleting propellants, refrigerants and foam-blowing agents, the rate of ozone depletion has declined rapidly (in geological terms) and the polar ozone holes are slowly re-filling. While ozone is a special case, it shows global society can take action when it decides to do so; and effective political action can regulate environmental threats.⁵³

2.11 Comments

⁵² file:///C:/Users/Barbara/Downloads/CORDIS_report_46541_en.pdf ;

<http://www.epa.gov/research/airscience/air-blackcarbon.htm>

⁵³ The Montreal Protocol is by far the most successful environmental treaty to date, ratified by all 197 countries of UN, and the conditions making it possible deserve attention from anyone looking to other discrete or piecemeal measures of international action. It involved leadership and preparation in small groups with scientists and single issue science fed into CFC phase-out targets. The causes of ozone depletion were easy to identify. The treaty is flexible and stricter controls were added as the science firmed up the danger. Trade provisions (the stick) limited trade to other signatories – so the treaty rapidly went viral. A multilateral fund (the carrot) financed technological innovations with no ozone depleting implications. There were no penalties for non-compliance but instead there were plans to ease non-compliant countries into line. '...all 142 developing countries were able to meet the 100% phase-out mark for CFCs, halons and other ODS in 2010...The ozone layer is expected to return to 1980 levels between 2045 and 2060' (<http://theconversation.com/saving-the-ozone-layer-why-the-montreal-protocol-worked-9249>)

To sum up what has been said so far: the present human population may survive on this planet only as long as it allows them to. Now science tells us that the lease is very short. Fossil fuel-based industrialisation - under communism as well as capitalism, but now under capitalism - is leading to a bio-geo-chemical breakdown and opening an unprecedentedly dangerous new era being called the Anthropocene.⁵⁴

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Many of the interactions between the dimensions of the ecological crisis listed above are 'known unknowns' – things that we know will happen, but which we lack information about. But there are also 'unknown unknowns', things we don't know we don't know, but which are sure to happen because the ecosphere is so complex. A recent development in neoliberal economics which promises to generate a minefield of unknown unknowns is treating nature as a set of potential commodities, as providing 'ecological services' to be quantified, valued and even traded, services existing solely for the benefit of humankind – completely ignoring the dependence of other, non-human species on that same nature⁵⁶, and our dependence in turn on them.

Much else about the consequences of and responses to the metabolic rift will also not be discussed here – the inequality, injustice and ethics of the impacts⁵⁷; trade-offs between climate change responses and development⁵⁸; growth versus zero- or de- growth⁵⁹; the handling of

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http://www.hkw.de/en/programm/projekte/2014/anthropozoenprojekt_ein_bericht/anthropocene_working_group_1/anthropocene_working_group_forum.php

⁵⁵ The international Energy Agency (IEA) now reports that "the current state of affairs is unacceptable. ... Energy-related CO₂ emissions are at historic highs" and emission trends are "perfectly in line with a temperature increase of 6 degrees Celsius, which would have devastating consequences for the planet. quoted in Richard Smith Jan 15 2014 <http://www.truth-out.org/news/item/21215-beyond-growth-or-beyond-capitalism>

⁵⁶ Larry Lohmann 2014 on Financialisation of Nature

⁵⁷ Bull LRB 2012; Kiribati essay

⁵⁸ See Amartya Sen: 2014:,http://www.newrepublic.com/article/118969/environmentalists-obsess-about-global-warming-ignore-poor-countries?utm_content=buffer7b49b&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

⁵⁹ Daly; Li 2014 Brit Acad China-India; Richard Smith 2010 *real-world economics review*, issue no. 53; Brownhill Turner and Kaara CNS 2012

causes by science⁶⁰; the public communication of science; problem-solving and the feasibility of technological ‘solutions’; the handling of policy by science⁶¹; the handling of science by the media⁶²; the political roles of scientific uncertainty and of denial⁶³; politicisation by de-politicisation⁶⁴ ... All these are very important aspects of the deepening metabolic rift but my focus moves elsewhere – towards the time frame for action, the conceptual frames driving the action we have, and proposals for action.

2.11.1. Urgency and Catastrophism: a critique of the critique

Time is of the essence, yet as it runs out it is treated in peculiar ways. It has been conceived in terms of a (probably) open ‘window of opportunity’ in which action needs to happen (Rayner, 2009).⁶⁵ If the window has not already closed, it has become a narrow slit. If it was between 7 and 20 years wide in 2008⁶⁶, in 2015 it must be down to between 0 and 13 years. Targets are imagined – for example, targets for developing renewable energy⁶⁷ - and set, but as the targets multiply they become ever more draconian and the deadlines recede into the future. A field of rhetoric has developed about targets, summits, deals and technological fixes that is ever less connected to political reality⁶⁸. There’s another rift - that between scientific understanding and political action.⁶⁹

The urgency has also been dismissed as ‘catastrophism’.⁷⁰ 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-

⁶⁰ e.g. Sulston People and Planet

⁶¹ e.g. rejection of ‘ideology’; engineers and valley of death; assessment of biodiversity loss

⁶² From Hermann and Chomsky; to Oreskes and Conway 2011

⁶³ Kari Norgaard 2003; Marshall 2014 ‘Don’t even think about it’

⁶⁴ Lohmann neoliberal climate change policy

⁶⁵ To do : find science quotes

⁶⁶ NTUI, 2008

⁶⁷ e.g. Million Jobs; Wood /EU on nuclear

⁶⁸ Harriss-White and Harriss, 2007

⁶⁹ policy policy HW and H| soc reg 2007

⁷⁰ critiqued in *Catastrophism: The Apocalyptic Politics of Collapse and Rebirth*

catastrophist critics respond that catastrophism is a counsel of despair.

⁷¹ 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 nature⁷², it is produced by capital's relations of production, distribution, consumption and waste. Nature is not independent of capitalism: the two co-evolve. ⁷³Capital constantly internalises constraints even in crisis and dynamically reinvents itself: – wartime planning, carbon trading, bio-engineering and dematerialisation being oft-cited examples. ⁷⁴ Despite the evident limits to migration and to resource availability, '(t)he idea of the limit is aesthetic' (Harvey, 2014). The only limit of consequence is that to social alienation (ibid). However, as the ecological sociologist JB 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'⁷⁵

So insofar as ideas matter, how time is treated is vitally important.

2.11.2. What is to be done? Terms and the Politics of the Response

For the relatively few actively concerned⁷⁶ and for the most part, the problem is not the depth, complexity and unknowns of the metabolic rift, 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 the collective politics however lies the epistemological question of how the 'reduced form' of the rift, the damage to nature, is being discursively constructed because this drives and reflects political action.

Sources of pollution are doubly simplified - to GHGs and then to Carbon Equivalents. Their origins are then classified in several ways. They are

⁷¹ Henwood in 'Catastrophism ' quoting Engels.

⁷² Royal Socy 'People versus planet'

⁷³ Harvey and Panitch 2014 <http://vimeo.com/115366001>

⁷⁴ Socialist Register 2007

⁷⁵ Monthly Review; Editorial March 2007 (Volume 58, Number 10)

⁷⁶ Bull LRB 2012, Marshall, 2014

attributed to economic sectors where in turn various types of classification are at play. For the second biggest polluter (with the best data), the USA,⁷⁷ they are as follows: electricity (23%) transport (28%) industry (20%) agriculture (10%) and residential pollution (10%)⁷⁸. Or they are attributed to combustion sources: liquid (36%), solid (35%); cement (3%) and gas (20%).⁷⁹ 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%.⁸⁰ 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.⁸¹

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 metabolic rift, in terms of the units for which evidence is adduced and policy responses are proposed, first and foremost there are *countries* - aka nations - aka *states*. 196 of them including Taiwan⁸². In this conceptual and practical framework the leading countries in terms of current flows are China, the USA, India and Europe including the former USSR. In terms of their historical contribution to today's stocks of atmospheric carbon, it is North America, Europe, Russia/USSR and China. In terms of current per caput pollution (discounting the oil-producing sheikhdoms) USA-Canada, Australia,

⁷⁷ China is by some distance now the biggest polluter – 8.7 Gt compared to US' 5.7 Gt, 2011 data, latest available

⁷⁸ *Inventary of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012*.

<http://epa.gov/climatechange/ghgemissions/sources/industry.html> Note for later in this essay the masking and likely absence of the mitliary industrial complex.

⁷⁹ http://en.wikipedia.org/wiki/Greenhouse_gas

⁸⁰ Dasgupta and Ramanathan 2014, *Science*

⁸¹ FIND REFERENCE HERE

⁸² www.infoplease.com › World › World Statistics

Korea and China are dirtiest, with Japan close behind.⁸³ 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.⁸⁴

For the world's countries and their states, the dominant policy tool is a combination of cap and trade in administered carbon markets together with financial transfers for clean development in places where its costs are lowest (CDM/REDD).⁸⁵ This works in theory but over its 25 year life it has been singularly unsuccessful.⁸⁶ As of 'Lima', in full retreat from the protocols of Kyoto, 1992, states are free to make decisions on action and on reporting their action.

Many reasons have been invoked for this 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 (the latter currently wavering between 5-20% of global production) ; 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.⁸⁷ Given wide variations in the predicted impact of climate change, and in attitudes to scientific uncertainty, and no incentives for equity between generations, there are incentives only to free ride.⁸⁸ And modern representative government,

⁸³ <http://www.citylab.com/work/2014/03/map-historys-biggest-greenhouse-gas-polluters/8657/>
China recently overtook EU in per capita emissions

⁸⁴ <http://www.cerefs.org/airemissions>

⁸⁵ At the Lima Climate change conference of December 2014 while the scale of transfers needed for the CDM were estimated at \$100bn / year by 2020, actual 'pledges' amounted to an inadequate total of \$10bn over the 5 year run-up between 2015-20. S Farnelo 2015 'A good climate for business' *Red Pepper* Feb-March p10

⁸⁶ Monbiot 2013 on death of European carbon trading system ; CALIFORNIA FUEL LOBBY RESPONSE TO CAP AND TRADE Understanding the Impact of AB32, Boston Consulting Group (BCG) Report

⁸⁷ They favour taxes for their flexibility and lower enforcement costs (Hilsenrath 2009 Cap and trade's unlikely critics: its creators' *Wall Street Journal*.)

⁸⁸ S Gardiner 2011 A Perfect Moral Storm: the Ethical Tragedy of Climate Change, OUP

with its short-term electoral cycles which privilege the rights of the present of those of the future, seems unfit for this particular purpose.⁸⁹

These are powerful reasons. But more important than any of them is the fact that the whole cap and trade model ignores the market-driven politics that has penetrated states worldwide, sabotaging every stage of implementation of carbon trading, incentivising pollution and disincentivising low carbon investment.⁹⁰ Missing from all the literature are the categories of the metabolic rift: the historical, economic and environmental logics of capital and its waste. If alluded to at all this is shrouded in euphemism: the ecological crisis is only 'climate change', capitalism becomes 'markets', the private sector, 'the economy' etc. The Belgian environmental sociologist Daniel Tanuro has warned '(t)hose who don't want to hear about capitalism should not talk about global warming'.⁹¹

So in the rest of this essay a first attempt is made to examine what is to be done – and why - by capital, labour and civil society. Identifying these interests is not a precise science because they are constantly changing. 'The major shifts in capitalism's financial, industrial and occupational profile, as the last quarter century has unleashed a profound restructuring of accumulation both technologically and geographically, has entailed a major restructuring of capitalist classes themselves'.

⁹²Despite the public currency of 'consumer capitalism'⁹³, 'it is maintaining the production system that requires increased consumption'(Surak (nd).⁹⁴

⁸⁹ M Bull 2012 What is the Rational response? LRB

⁹⁰ Leys, 2001, 2007

⁹¹ D Tanuro 2008 [Humanity, Society and Ecology: Global Warming and the Ecosocialist Alternative](#)

Socialist Forum Uppsala

⁹² Soc Reg Preface 2013-14 Global Ruling Classes

⁹⁴ Despite the necessity of consumption, calling it neoliberal, 'consumer capitalism' (in which advertising and marketing to create desires and preferences consumes an estimated 40% of costs (CHECK with Ben Fine/Des McNeill)) does little but mask the system's dynamics. D North on 40% cop and distribution being for advertising – creation of desire and conversion to need. CF A Prakash Can consumption, in whatever form, be altered or scientifically improved to meet the demands of sustainability?

This approach to capitalism must be selective and the argument from it is an indicative one. Principles of selection here differ from those of others'⁹⁵ because this exploration focusses on the significance of urgency and time, of the relation of the cases to the metabolic rift and of their discursive and actual responses.

3. CAPITAL

Within productive capitalism we consider the military industrial complex and cases of corporate capital, and within finance capital the insurance industry. We then juxtapose the responses of labour through Trades Unions and of the biggest single organisation in civil society, the Roman Catholic Church

3.1. *The US Military and the Metabolic Rift*⁹⁶

The sword is mightier than the pen⁹⁷

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 800 \$bn and 1.3 \$tn (the latter is the size of India's GDP and equal to the combined total of defence budgets for China, Russia, UK, France, Japan, India, Saudi Arabia, Germany, Brazil, Italy, Australia S Korea and Canada).⁹⁸ Yet Republicans in Congress have cut funds for research into low carbon jet fighter fuel.⁹⁹ Military emissions are exempt from reporting requirements and the Pentagon has a blanket exemption in all climate change agreements.^{100 101}

⁹⁵ N Klein; Kolbert; Oreskes and Conway

⁹⁶ US dept of defense cl change roadmap 2014 <http://www.acq.osd.mil/ie/download/CCARprint.pdf>

⁹⁷ <http://www.telegraph.co.uk/news/worldnews/middleeast/iraq/11046039/When-the-sword-is-mightier-than-the-pen.html>

⁹⁸ <http://www.washingtonpost.com/blogs/wonkblog/wp/2013/01/07/everything-chuck-hagel-needs-to-know-about-the-defense-budget-in-charts/> <http://costsofwar.org/article/pentagon-budget>

⁹⁹ Goldenberge October 2014 Guardian

¹⁰⁰ *Inter Press Service reported on May 21, 1998: "U.S. law makers, in the latest blow to international efforts to halt global warming, today exempted U.S. military operations from the Kyoto agreement which lays out binding commitments to reduce 'greenhouse gas' emissions. The House of Representatives passed an amendment to next year's military authorization bill that 'prohibits the restriction of armed forces under the Kyoto Protocol.'"*

The Pentagon's position on the metabolic rift has been explained with exemplary clarity.¹⁰² 'Rising global temperatures, changing precipitation patterns, climbing sea-levels, and more extreme weather events¹⁰³ 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' (Kelly 2014¹⁰⁴). The rift is reduced to climate change. Militarily, climate change is a 'threat multiplier'.¹⁰⁵

What is being done? Defence Secretary Chuck Hagel, launching a conference of 30 defence ministers of the Americas and EU in Peru on October 13th 2014, a meeting prior to the main international climate change meeting, argued for a 'flexible approach to *adaptation*'. Already existing climate change affects 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.¹⁰⁶ The navy will have to test sonar and other systems under the changing ocean chemistry. And the melting Arctic ice is to be securitised in face of competition for sea lanes and under-sea minerals. Climate change has already been mainstreamed in defence planning scenarios (aka war games).

The Pentagon's treatment of time and urgency is immediate and fast. Vestigial scientific uncertainty 'cannot be an excuse for delaying action'.

Its treatment of politics is upfront – there is no conspiracy. 'Politics or ideology must not get in the way of sound planning' for America's security (Hagel, Foreword). 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. Further, the already 'blurred boundary' between military action and development – visible in the deployment of military resources for

¹⁰¹ <http://www.washingtonsblog.com/2009/12/removing-war-from-global-warming.html> Sara Flounders See also <http://climateandcapitalism.com/2015/02/08/pentagon-pollution-7-military-assault-global-climate/>

¹⁰² Republicans in Congress have closed down the CIA's climate intelligence center. <http://www.eenews.net/stories/1059972724>

¹⁰³ natural disasters inc infectious diseases

¹⁰⁴ <http://www.counterpunch.org/2014/12/02/support-the-environment-or-the-u-s-military/>

¹⁰⁵ <http://www.defense.gov/Speeches/Speech.aspx?SpeechID=1893>.

¹⁰⁶ <http://www.defense.gov/Speeches/Speech.aspx?SpeechID=1893>.

humanitarian relief and ‘support for civil authorities’ – is further meshed. The Pentagon is also enmeshed in a structure of irresponsibility: actively engaged in the Peruvian climate talks but enjoying legal protection against engagement in any mitigation outcomes!¹⁰⁷

3.2. *Most significant companies*

The climate researcher Richard Heede, has discovered after 8 years of exhaustive research 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.’¹⁰⁸

These companies have produced 63% of all gaseous pollution from 1751¹⁰⁹ to 2010. Half of it was produced in the 25 years from 1985 – in the era of cap and trade.¹¹⁰ The top 20 companies (Appendix 1) are responsible for 30% of global emissions and they also control most of the reserves. 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 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 USA¹¹¹, as a set the top 90 are HQd in 43 countries and extract and sell carbon all over the world.

Faced with this most inconvenient truth, Al Gore responded ‘Those who are historically responsible for polluting our atmosphere have a clear obligation to be part of the solution.’(ibid).

¹⁰⁷ <http://www.defense.gov/Speeches/Speech.aspx?SpeechID=1893>.

¹⁰⁸ Quote attributed to Heede by S Goldenberg, 20th Nov 2013, ‘Just 90 companies caused two-thirds of man-made global warming emissions’ *The Guardian*

¹⁰⁹ which his statistics proxy as the the start of the industrial revolution (Heede, 2013)

¹¹⁰ Heede, R. Climate Mitigation Services (2013): [Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854- 2010, *Journal of Climatic Change* \(vol 22\) \(issue 1-2/01\), pp 229- 241; accessed 7.10.2014 \[↔\]](#)

¹¹¹ Heede op cit

Are these companies on track for carbon neutrality within a generation? We have space here to examine just two: BP (the world's 4th largest cumulative polluter) and Coal India (11th) using evidence available on the net.¹¹²

3.2.1. British Petroleum

BP is the UK's largest corporation, with a gross revenue equal to about half of India's entire GDP. It produces and sells oil and gas in 80 countries¹¹³, and ranks 4th in Heede's list of the all-time largest gaseous polluters. Its workforce numbers 84,000 worldwide¹¹⁴, but is concentrated in the Europe and N America. In 2013, 54% of the 373 million hours worked by BP were carried out by contractors.¹¹⁵ In 2010, the DeepwaterHorizon oil-well was being operated by a contractor called Transocean..

Its board combines experience and contacts from top banks (including Goldman Sachs, RBS and HSBC), and MNCs in energy, mining, metals, aerospace, technology, electronics, pharmaceuticals, health, agri-business, and management consultancy; think tanks like Chatham House and Wellcome and advisers to Jeff Sach's Earth Institute, Columbia University.¹¹⁶

BP has an ongoing and massive round of investments in deep water oil and gas (OnG) worldwide; in fracking in Algeria, Indonesia, Oman and the US; and in the steam-assisted gravity drainage technique of exploiting the Canadian oil-sands.¹¹⁷

The company produces an annual Energy Outlook which is a global reference point. The latest, looking forward to 2035, expects China (in which BP is busy investing¹¹⁸) and other non-OECD countries to be

¹¹² *ibid.*

¹¹³ BP2014 Susatinability Review (SR); SourceWatch of the US Centre for Media and Democracy

¹¹⁴ SR p5

¹¹⁵ SR P27

¹¹⁶ SourceWatch

¹¹⁷ though it openly admits these are 7-17% more GHG intensive than average US crude SR p18.

¹¹⁸ BP is quite coy about its own operations in China which have to be pieced together: Among others: a gas supply chain p15 SR. Water efficiency in petrochemical plants. Sourcewatch: a huge coal-bed methane find in Xinjiang in NW.Advisors to GoC.

responsible for most of a predicted 41% increase in energy demand, mostly coal-based, while the OECD and BP move towards gas.¹¹⁹ 'Gas' includes fracked shale gas. In BP's annual report, called a 'sustainability review', the company describes shale gas first as a 'new energy form' (along with renewables), then as an 'unconventional fuel' (along with tar sands and biofuel), and finally as a 'natural gas'.¹²⁰ Widely cited for projecting 'carbon-free' energy 'demand' to reach 37% of total demand by 2035, BP actually expects just 7% of global energy demand to be from renewable energy including biofuels¹²¹, since its in-house definition of carbon-free includes large-scale hydro and nuclear.¹²²

BP publicly opposes limits to GHG emissions and advocates tax breaks for oil and gas. In the recent past it was charged with manipulating gas and propane prices.¹²³ 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 means to dictate demands to state legislators.¹²⁴

Until 1995, as part of Global Climate Coalition BP ridiculed climate science and undermined Kyoto. But Lord Browne famously rebranded BP, even partnering with 'moderate' environmental groups, for which BP won a major award for PR in 2002.¹²⁵ In 2005 an Alternative Energy company was established and by 2013 had invested \$8bn in British feed wheat, Brazilian cane and 16 US windfarms; but from 2008 the parent company 'recarbonised' and has tried to sell off its windfarms.¹²⁶

¹¹⁹ BP, 2014 Energy Outlook 2035 (EO

¹²⁰ SR p15, p59, p54 respectively.

¹²¹ SR p13

¹²² Nuclear energy is not carbon-free. Carbon dioxide is generated by mining increasingly poor grades of uranium ; through the logistics of managing radioactive tailings and of extracting fissile uranium isotopes; the CO₂ generated in the construction, maintenance and decommissioning of plants and the removal of spent fuel. In 2000, Schneider's attempt to cost the carbon dioxide generated by France's nuclear industry puts it at 10% of France's total (2000, *L'Ecologiste*, vol 1, no 2). A thousand nuclear reactors worldwide would deplete all known uranium sources. So it is not a long term generalisable solution either. (New Economics Foundation. *Mirage and Oasis*. 2005.p.31-2, 37, 42)

¹²³ SW: BP had to reach a private settlement of \$303 m in 2007

¹²⁴ SourceWatch

¹²⁵ SourceWatch

¹²⁶ SR p19

BP co-produces the environment through fires, explosions (criminal charges in Texas; Deepwater Horizon in April 2010 – the US’s largest ever environmental disaster¹²⁷); fairly constant spills (criminal charges in Alaska¹²⁸); and venting and flaring.¹²⁹ These ‘process safety events’ occur mainly in wells and fuel transport.¹³⁰ Between 2009 and 2013 however the company has reported a decline in spills and fines, and raised environmental expenditure.¹³¹

Threading through its own account of company activity are three aspects of the metabolic rift. 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’(SRp34) such as Oman, Algeria and Libya.¹³² Second, attempts to limit 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.¹³³ It screens and monitors biodiversity and even preserved a wetland habitat.¹³⁴ In the many protected areas in which it operates it says it treads with care, avoiding or minimising local impact.¹³⁵ Third, waste outputs: BP shows its emissions as having dropped from 65mteCO₂e in 2009 to 50 in 2013.¹³⁶ In fact these achievements resulted largely from

¹²⁷ SW in which millions of tonnes of oil poured into the GoM - 200,000 tonnes every day for 3 months,.

BP is alleged to have blocked information and access by journalists, created a no fly zone over the spill, resisted independent research, refused at first to co-op with US government and poured inadequately tested dispersants. Deepwater Horizon has cost the company reputation and \$29bn in compensation, rehabilitation monitoring. It reports the restored consumability of Gulf seafood – within 5 years (p10)

¹²⁸ SR p20,36, 80; SourceWatch

¹²⁹ SR p36

¹³⁰ BP employees alone travel 800 million kms/yr (p33)

¹³¹ SR Table p8

¹³² SR p37

¹³³ SR p37-9

¹³⁴ At the ‘Cherry Point refinery in Washington state, in the US, we have created 220 acres of wetlands on unused areas of the site, which have become habitats for bird and amphibian species.

SRp38

¹³⁵ SR p38

¹³⁶ SR p8

having sold off two US oil refineries: Texas City and Carson.¹³⁷ It continues to set no company-wide GHG target.

The company treats climate change ‘like any other physical and ecological hazard’ (SRp15). Accepting that the ‘warming of the climate system is now unequivocal’¹³⁸, due to GHGs, it blames ‘human activity’ (SRp14). It is obvious to BP that the 2-degree target temperature rise will not be achieved; it thinks the GHG intensity of OnG production will even increase (ibid). BP’s response to climate change involves doing little about it. BP follows the principle – low carbon must be low cost. Its steer to governments is that low carbon technology requires a stable high carbon price. Low C technology exists; 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’.¹³⁹ It will commit itself at best to ‘lower carbon’ expansion.¹⁴⁰

3.2.2. Coal India

Coal India (CI) is the world’s largest coal-producing company, commanding 80% of India’s coal market and 70% of its power generation. Among the world’s purely coal-producing companies over the last 150 years, it has been the largest emitter.¹⁴¹ In 2010 it emitted 50% more than BP (see Appendix). It is 90% owned by the Government of India - with 10% controlled by (foreign, blue chip) private institutional finance.¹⁴² CI imports coal and also invests internationally.¹⁴³ It employs four times more people than BP: in 2014 it had ‘about 352,282’

¹³⁷ referencing the IPCC

¹³⁸ referencing the IPCC

¹³⁹ SR, p14

¹⁴⁰ SR,pp4-5

¹⁴¹ <http://www.facing-finance.org/en/database/cases/coal-india-carbon-emissions/>

¹⁴² <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): Participants & Stakeholders: Coal India

¹⁴³ Importing from Indonesia and Australia and with mines in Mocambique

employees – and many more both as casual labour and working for contracted out companies.¹⁴⁴

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.¹⁴⁵

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.¹⁴⁶ 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.¹⁴⁷ It evicts eligible victims of mining and underground fires instead of compensating them.¹⁴⁸ It provides dangerous working conditions.¹⁴⁹ It has stood accused of anti-competitive practices and untransparent contracts¹⁵⁰, 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 environmental norms and standards of 7 international / UN agencies.

Despite or because of this business model the FT recommends it as a 'high quality investment' with double digit returns on capital. It expects dividends to rise.¹⁵¹

¹⁴⁴ <http://www.morningstar.in/stocks/Op0000rq96/bse-coal-india-ltd/equity-research.aspx>

¹⁴⁵ CI is closely state-regulated - 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

¹⁴⁶ The Economic Times (2011): [Coal India operating 239 mines without environmental clearance](#); 9 September (accessed 27.10.2014)

¹⁴⁷ <http://www.facing-finance.org/en/database/companies/coal-india-ltd-coal-india-ltd/>

Coal India Ltd.

¹⁴⁸ Amnesty International has reported an arbitrary 5000 evictions at Gevra: Amnesty International (2014): [Indigenous and Dalit communities at risk of forced evictions in Chhattisgarh](#); 4

¹⁴⁹ in 2010 for instance 210 miners died and 183 were seriously injured in CI mines. Greenpeace (2013): [High risk, low return](#)

¹⁵⁰ Menon, B. (2013): [Coal India faces Rs 1,773 crore fine for abuse of dominant position](#); The Hindu Times, 10 December

¹⁵¹ <http://markets.ft.com/research/Markets/Tearsheets/Forecasts?s=COALINDIA:NSI>

Under pressure from the Government of India's Ministry of New and Renewable Energy which offers subsidies¹⁵² (through a WTO loophole) for solar energy to CI (also to the military and Indian Railways), CI plans to invest \$1.2bn¹⁵³ in 1000MW solar plants: number and end date currently unknown.¹⁵⁴

In sum: BP's 'Beyond Petroleum' slogan and its green sunflower logo are comfort blankets for the credulous. 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. Procedurally impeccable BP speaks with a strategically vague precision in which it can allow a modicum of investment in renewable energy, biodiversity, remediation etc into its portfolio but only on condition that it does not affect BP's 'core competences' in oil and gas, or profit. The dash for gas does not reflect the urgency needed to prevent the metabolic rift developing further. CI emits no sense of urgency and is committed to deepening the rift.

Data on polluting industries compiled by the Benchmarking Air Emissions organisation shows that State and private corporate capital is investing in renewable energy and detoxifying its gaseous and solid emissions. But compared with the need of the planet it is at the pace of the snail.

*3.3. The Insurance Industry and the Metabolic Rift*¹⁵⁵

P Jain Aug 2014 Coal India's low-cost advantage allows for higher margins, and a high dividend yield.

<http://www.morningstar.in/stocks/0p0000rq96/bse-coal-india-ltd/equity-research.aspx>

¹⁵² financed by channelling taxes on imported coal through a Clean Energy Fund.

¹⁵³ BP invested about this amount annually between 2005-13

¹⁵⁴ M. Chadha 2014 World's Largest Coal Miner To Invest \$1.2 Billion In Solar Power

<http://cleantechnica.com/2014/09/24/worlds-largest-coal-miner-invest-1-2-billion-solar-power/>

¹⁵⁵ The issue of climate change is also being addressed by the Lloyd's of London insurance market. John Nelson, chairman of the Lloyd's of London, said: "We take in to all our underwriting and modelling climate change. We expect to see our syndicates modelling climate change when they are looking at this sort of property risk."

Reference

Insurance claims are both vast and rocketing.¹⁵⁶ Whereas the Pentagon has a direct interest in adaptation, the insurance industry has a direct interest not in mitigation per se but in *managing risk* and *mitigation*. It engages with the metabolic rift through its reactions to extreme events with social impacts and the urgent need to set limits to the insurability of industry. It needs to convert uncertainty to risk and then reduce responsibility for climate-change-related liabilities.

Insurance is protection for unforeseen risks. 'We're now at a point with the science where climate change is now a foreseeable risk'¹⁵⁷ and thus factorable into actuarial tables of the big re-insurers Swiss Re and Munich Re. John Nelson, chairman of the Lloyd's of London, said at Davos in January 2015: "We take (climate change) in to all our underwriting and modelling... We expect to see our syndicates modelling climate change when they are looking at... property risk."¹⁵⁸ 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.¹⁵⁹

In their reactive activity, the industry is deeply divided however. The top re-insurers have 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

¹⁵⁶ US crop insurance alone is reckoned at **\$99 billion - sine qua non for agriculture in southern plains..**
<http://www.dailykos.com/story/2014/05/15/1299512/-An-Act-Of-God-Nope-It-s-Climate-Change-And-Insurance-CO-s-Don-t-Want-To-Pay#> **In 2011** Incurred losses for the entire industry **totaled \$345 billion**, with total revenue generated through premiums at \$434 billion (Wihbey 2012 Yale) . In 2011 the U.S. industry alone has \$5.9 trillion in investments, of some \$23 trillion worldwide. Wihbey 2012 Yale In March 2014, General Mills" CEO Ken Powell, said that in the previous fiscal quarter, extreme weather had dampened sales and cost his company 62 days of production, or the equivalent of 3–4 percent of production, "which hasn't happened in a long time to us, think decades".⁵ Unilever says it now loses €300 million (\$415 million) a year due to extreme weather events such as flooding and extreme colds. Yeo (2014) "Climate action is „only way" to grow economy – Unilever CEO", Responding to Climate Change, <http://www.rtcc.org/2014/04/08/climate-action-is-only-way-to-grow-economy-unilever-ceo/>

¹⁵⁷ <http://www.natureworldnews.com/articles/7216/20140523/lawsuit-warns-politicians-climate-change-cost.htm>

¹⁵⁸ <http://www.theguardian.com/business/2015/jan/21/davos-world-bank-chief-climate-change-al-gore-pharrell-williams>

¹⁵⁹ with caps on emissions recycled as incentives for renewable energy

and their re-insurance payments.¹⁶⁰ While the risk analysis of climate change by re-insurers is dynamic and constantly changing (improving¹⁶¹), 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. ‘(T)he credibility of companies is called into question on their purported core competency: risk assessment and management’ (Wihbey 2012 Yale). There is much activity at the discursive level – e.g. the London-based Climatewise ‘leading stewardship for resilience’.¹⁶² 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 (Standard and Poors). 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).

Like the Pentagon the insurance industry is acting with immediacy. 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.¹⁶³ Last but not least the 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.

¹⁶⁰ Wihbey 2012 Yale

¹⁶¹ Carly Chynoweth *Guardian* Monday 1 July 2013

¹⁶² Katharine Thoday, head of the ClimateWise secretariat at the [University of Cambridge Programme for Sustainability Leadership](#) informing public policy, incorporating climate change into members' investment strategies and reducing the environmental impacts of their business. It would seem that resilience in the real world is conflated with resilience for the insurance industry.

¹⁶³ Wihbey 2012 Yale

4. Labour

In the last three decades the global labour force has been increased by over 1.1 billion.¹⁶⁴ These new working classes are as yet singularly 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;¹⁶⁵ and they are in immediate contention with rising ethnic and religious proto-fascist mobilisations. These are not propitious conditions for effective 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.¹⁶⁶ The inherent opposition of labour to capital constantly generates class movements and organisations, and the predatory relations of capital to nature have both immediate and long term consequences for workers.¹⁶⁷ To see what potential impact the global working class might have on the environmental crisis, we look in a provisional way at the activities of two significant working class organisations that have addressed the issue so far, the British TUC and the Indian NTUI.¹⁶⁸

4.1. *The British TUC*

¹⁶⁴ Steven Kapsos, *Economic and Labour Market Papers: World and regional trends in labour force participation: Methodologies and key results* International Labour Office
http://ilo.org/wcmsp5/groups/public/---ed_emp/---emp_elm/---trends/documents/publication/wcms_113900.pdf

¹⁶⁵ Standing The Precariat; see also his response to critics in D and C 2014

¹⁶⁶ Gorz 1968 Reform and Revolution' Socialist Register cited in the SR 2013 Preface Panitch and Albo

¹⁶⁷ Preface SR 2013

¹⁶⁸ Several sclaes – UN and Eu missed out here. UN UNEP green jobs.to read and include? .EU <http://www.greeneuropeanjournal.eu/deal-climate-crisis-everything-must-change/>'The Socio-Ecological Transition: A New Climate for the EU's Sustainability Transition, equity a) bec of responsibility for stocks of GHGs b) inequality drives cl change c) because without fairness Dcs won't mitigate]Conspicuous consns of rich = predatory on envt - > active hitting poor through pollution. Debasement of need for collective action.

The Trades Union Congress 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'.

It points to the underinvestment of the energy majors in green energy and energy efficiency (EE) while their profits are un/undertaxed and consumers' energy bills soar at four times inflation rates,¹⁶⁹ and notes that the British Coalition government is not seized by 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).¹⁷⁰

The TUC calls for binding GHG reduction targets but aligns with the British Coalition government's modest of a 50% reduction by 2025.¹⁷¹ 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 is against shale-gas fracking but supports 'clean' coal and sees carbon capture and storage as the sole means to revitalise the coal industry. To this end the TUC works with the CCA lobby - the Carbon Capture and Storage Association (CCSA).

Four conclusions can be drawn from the TUC's climate change politics. First it senses the urgency of the situation, yet its GHG reduction targets are merely those of the Coalition government whose lack of urgency it criticises. Second, it reduces the metabolic rift to climate change alone. Third, its project is discursive, not active; and despite recognising that the new economy will be created by workers, it needs the cooperation of capital. Last, its project also assumes a powerful state driven by the

¹⁶⁹ OGrady 2013.

¹⁷⁰ Major tension is between the Treasury: Osborne/Patterson (conservatives which procrastinates on responses to climate change) and DECC: Ed Davey (lib dems which wishes to accelerate) HW and H 2007 on long standing history of divergent discursive interests

¹⁷¹ O Grady – another document from 2013 speech

public interest in the present and future. It would certainly be a mistake to underestimate the value of the TUC's engagement, but its limitations are clear

4.2. *India's NTUI*

The New Trade Union Initiative came into existence after the World Social Forum in 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).¹⁷² It rapidly gained a membership of 1.5 million workers and 300 affiliated organisations¹⁷³, many of whom mobilise workers with only informal contracts. The NTUI and SEWA (for self-employed women¹⁷⁴) are the only Indian trade unions that have no party political allegiance.¹⁷⁵ In its Assembly of Working People in 2008¹⁷⁶ it addressed the implications of climate change for workers. Its analysis recognised the urgency of the science but, like the TUC's, its action is at the level of discourse. It sees state engagement with the response as essential because addressing climate change cannot be divorced from addressing social inequity. The state must be responsible for taxing and regulating the consumption of 'the rich' and redressing the massive deprivation of 'the poor', for reallocating workers displaced by measures to reduce carbon output, for championing green technology and prioritising decentralised renewable energy.¹⁷⁷

¹⁷² See Breman and van der Linden 2014 for a gloomy scholarly discussion of the significance of informality for labour politics globally Critique of working class politics - ec fractured, at best compassion but no solidarity of interests, exptl rebuilding of TU power = need of hour. Problem is class rather than country based antagonisms . irresponsibility of capitalist class.Panitch and Leys ruling class.

¹⁷³ The membership of each in turn ranging from 80 to 120,000 members (Gautam Mody, General Secretary, Pers. Comm. February 2015)

¹⁷⁴ <http://www.sewa.org/>

¹⁷⁶ ASSEMBLY OF THE WORKING PEOPLE 2008 WORKSHOP ON GLOBAL WARMING NTUI

¹⁷⁷ This approach is aligned with British CACC Trade Unions' project for a Million Climate Change Jobs.

The NTUI adds to its support for GHG reduction targets and national climate budgets fierce attacks on the Military Industrial Complex and the redistributive side of Cap and Trade; 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 so urgently needed' and the REDD 'will aggressively push for a forced takeover of forest lands from communities who are already facing massive forced displacement'.¹⁷⁸

In short, the positions of the TUC in the UK and the NTUI in India are similar in recognising the need for urgency and the role of the state but both their analyses stay at the level of discourse and are further weakened by divergent interests within the labour movements – not least the dependence of so many workers on jobs in the energy industries – and by what they see as the need for capital to collaborate in the changes they spell out as necessary. The global organized working class is not yet Gorz's countervailing force in mitigating climate change, let alone in dealing with the ecological crisis in all its range and complexity.

5. Civil Society and the power of numbers

NGOs like Oxfam, Friends of the Earth and Greenpeace, movements like the Campaign against Climate Change with its active Trade Union branch and Fossil Fuel Divestment, neighbourhood action groups under the 'low carbon' banner and communicating organisations like George Marshall's COIN lead international as well as British public opinion. They have aims that none can achieve single-handedly; yet they protect their brands and funding sources and despite herculean efforts by

¹⁷⁸ ASSEMBLY OF THE WORKING PEOPLE 2008 WORKSHOP ON GLOBAL WARMING NTUI In recent months, sections within NTUI have also been engaging with the issue of an 'energy transition', away from fossil fuels, and the need to dialogue on this issue with their union constituents among coal workers. Towards which end, a meeting on 'Electricity for All' was organized in Delhi in July 2013, which included trade unions, electricity worker unions, energy experts, and there was a plan to have such meetings in different regions of India. NTUI representatives have also been to such meetings at an international level, at which unions from different countries have participated

organisations like Climate Justice Now and 350.org they do not usually seek to form alliances, let alone parties. What about the largest single civil society organisation with 1.2bn members globally – the Roman Catholic church? Its stance - are its actions – an exception?

5.1 *The Roman Catholic Church*

The growing threat to the ecosphere has been the subject of increasingly urgent Papal pronouncements¹⁷⁹: in 2000 John Paul II declared that '(w)ithin the movement of nature, tranquil and silent but rich in life, there continues to palpitate the original delight of the Creator'¹⁸⁰ but in the following year he thought that 'humanity has disappointed God's expectation'. By 2007 Pope Benedict 16 saw that '(h)umans could destroy the foundations of our existence, the earth'; in 2008 he reached out to Buddhists and in 2009, paraphrasing Marx, he told the Copenhagen summit on climate change that 'matters concerning the environment and its protection are intimately linked with integral human development'. By 2010, in conversation, he said: 'one sees too few models of what self-denial could look like concretely. In this respect the religious communities are important as examples'. An apex will be reached in 2015: when after issuing an Encyclical on climate change in February (now delayed until the end of March) Pope Francis will address the UN general assembly in September and also convene an ecological summit of the world's main religions. Like the Pentagon Pope Francis will participate in the 2015 UN climate meeting in Paris, but like the Pentagon the Catholic church is itself exempt from binding treaties¹⁸¹ and like the Pentagon its emissions are unknown, though they will surely be less.¹⁸²

At a slightly lower level, in May 2014 the Pontifical Academies of Science and Social Sciences met at the Vatican under Bishop Marcelo Sorondo, chancellor of the Vatican's Pontifical Academy of Sciences to discuss questions such as 'What is a good relationship between Humanity and Nature'? The meeting was framed around the need for urgency. In the Academies' view, opposing perspectives (that of long-

¹⁷⁹ and there are growing fields of Catholic Ecology and Eco-spirituality ref Canadian bishops.

¹⁸⁰ Ecospirituality file,

¹⁸¹ The Vatican City has been an observer.

¹⁸² Although local environmental impact research is underway.

term scientific predictions versus the short term lack of immediate effects) have slowed the social response to climate change. In Pope Francis' phrase indifference has been globalised. The church's scientists see the inadequately slow response as resulting from a multiplicity of approaches to the explanation of environmental change, from key concepts that are fuzzy (amenable to many meanings) (e.g. Sustainable Development), from problems appearing both as separate fields of science and multiple and inter-related, developing over a range of time scales. Disciplines and paradigms also prevent communication. And no current measures have succeeded in curbing gaseous pollution. In view of this tower of babel, the Apostolic Academies proposed to undertake work on the impact of climate change on the substantive fields of food, health and energy.

Given 'the secular nature of the issues and the requisite solutions,... religious beliefs were not a criterion for participation' and distinguished experts - 'Hindus, Muslims, Protestants, Jews, atheists, and agnostics' - were called.¹⁸³

The conference accepted the concept of the Anthropocene, skewered inequality, and criticised capital in its euphemism of 'markets', paraphrasing Marx's concept of the metabolic rift: '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. However, the failure of the market has been accompanied by the failure of institutions, which have not always aimed at the common good.'¹⁸⁴ And reporting on it later in the journal *Science*, Dasgupta and Ramanathan wrote that '(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'. None the less a case is made for conceiving nature as natural capital and paying for its services.

¹⁸³ Science editorial as above

¹⁸⁴Statement of Vatican Workshop on 'Sustainable Humanity, Sustainable Nature: Our Responsibility' Meeting Took Place at the Pontifical Academy of Sciences, May 2-6

Despite this analysis, there follows a wish list of Sustainable Development goals using technologies which are available. ‘We have the innovative and technological capability to be good stewards of Creation’ ... ‘we must counteract the forces that resist change’.¹⁸⁵

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 favourite¹⁸⁶) , 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’.

For this most advanced expression of the Church’s concern the driver of climate change is not capitalism but ‘inequality, global injustice, and corruption’..which ‘are undermining our ethical values, personal dignity and human rights’ and creating a moral and spiritual crisis.

Action in the form of a ‘transformational step may well be a massive mobilization of public opinion’. ‘The Vatican and other 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’.¹⁸⁷ But an alliance with other relevant civil society organisations and NGOs was not proposed.

The report of the meeting closely resembles an editorial and policy forum in *Science* for September 2014.¹⁸⁸ ¹⁸⁹ The concept paper ex ante and the policy forum ex post both signed off by two Indian experts: P.S. Dasgupta, a Cambridge economist and V. Ramanathan, a climate scientist from the Scripps Institute in California and TERI, New Delhi.

¹⁸⁵M. Mc nutt’s editorial in science 19 SEPTEMBER 2014 • VOL 345 ISSUE 6203 p 1429

¹⁸⁶[The Guardian](#), Friday 17 May 2013 pope francis attacks file

¹⁸⁷ Dasupta and Ramanathan science sep 2014

¹⁸⁸ M. Mc nutt science editorial as above

¹⁸⁹Science 19 September 2014: Vol. 345 no. 6203 pp. 1457-1458 DOI: 10.1126/science.1259406

Major opposition is expected from Catholic climate change sceptics in the Vatican's budget office and from the House Speaker and Republican Leader of the US Congress.¹⁹⁰

At the apex of the Roman Catholic Church a 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 trusteeship¹⁹¹, between the critique and the advocacy of markets, between global and individual action ('joyful austerity'¹⁹²), and between the causes – (lapsed and greedy) 'humans'¹⁹³ versus (the absent) capitalism.

The church has become concerned, with leadership from the Pope; it has absorbed the science; but it balks at identifying capitalism as the driver and it proposes no forms of organised action other than preaching to influence opinion and spiritual eco-conversion. In particular it does not seek to pool other than scientific resources with secular organisations committed to the same advocacy, let alone counsel its huge flock to join Green parties or demand pledges on action from all party candidates at every democratic election.

6. Conclusions

In this lecture we have outlined the complexity and the irreversibility of elements of the metabolic rift, the speed of its deepening and the urgency with which the science says action is needed.

Politicians have failed to defend our collective interest with serious action to mitigate the process, let alone reverse it. When we look at sectors and units of capital, instead of countries, we find a glaring contrast between the focussed adaptive action being taken by key

¹⁹⁰ Cardinal George Pell and John Boehner

¹⁹¹ The latter is the theme of *Episcopal Commission for Social Affairs 2008 Our Relationship with the Environment: The Need for Conversion* © Concacan Inc., Canada.

¹⁹² op cit p4

¹⁹³ snared in 'structures of sin' (op cit p5)

players to defend their private or sectional interests, or (in the case of the military, for example) their responsibilities, and the abnegation of action by other global companies along with those who are responsible for populations as a whole. And when we look at organised labour and the well populated world of civil society we find coherent analyses and discourse, but little prospect, or hope, of practical action, and seemingly little appetite for alliances.

Some things look, in principle, less intractable to resolve: for example the fact that the number of companies that must rein back pollution is far smaller than that of the planet's countries. But others look much more intractable. The problem for the orthodox 'deal-making' approach of collective action among nations assumes that at the worst they will free ride. Global deal making does not allow for the realities of competition, the compulsions of profit, and the scramble for state support. These force companies to ignore collective action altogether as a means to transform the relations between production, distribution, consumption, waste – and nature.

The metabolic rift is a political problem. At all levels the world's political representatives need holding to account. To have a chance of keeping space on the planet for 'generalised human development' new political alliances will be necessary. To this end, the Pope's coming Encyclical could prove very important.

APPENDIX 1

Table 3 Top twenty investor- & state-owned entities and attributed CO₂ & CH₄ emissions 2010, cumulative emissions (1854–2010) 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)

Source: Heede R. 2013,

<http://download.springer.com/static/pdf/371/art%253A10.1007%252Fs10584-013-0986->

y.pdf?auth66=1421255265_158d6cab032d2bc5e88947cacd562754&ext=.pdf

Q and A WHAT IS TO BE DONE? Ambedkar's enduring mantra for dalit politics in India: 'educate, organise, agitate' : an organising framework for action.

Education

1. Environment as separate expert field. Just as gender has been mainstreamed so *environment* has to be mainstreamed; across all disciplines and from cradle to grave.

2. New skills will be needed through-out society – see the Million Jobs Project

<http://www.campaigncc.org/sites/data/files/sites/data/files/Docs/one%20million%20climate%20jobs%202014.pdf>

Organisation

1. Alliances of single issue movements – see

<http://www.campaigncc.org/climatemarchlondon>

for an example.

2. Stern Rayner and Prins: 'silver buckshot' rather than state-led 'silver bullet' approach: all aspects of life no stone unturned – see the early statement by Rayner and Prins [now taken up by Stern (LSE) Dubash and Khosla (CPR)]

http://eprints.lse.ac.uk/27939/1/HartwellPaper_English_version.pdf

Agitation

1. Commodification of state, defeat of public interest. Public interest as the sum of private interests but private interest = capital. So decommodify the state. see

<https://www.opendemocracy.net/ourkingdom/colin-leys-barbara-harriss-white/commodification-essence-of-our-time>

2. Address state intention and capacity. Crispin Tickell: 'We have lost the ability to plan' Lessons from wartime economies. Massive research project.

3. Clarification of political demands at times of elections.

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