The Myth of a Green Economy and Green Jobs:

What Strategy for Labour?[1]

By Eddie Cottle[2]

Paper presented at the XI Global Labour University Conference,

28 - 30 Sept. 2016, Johannesburg, South Africa

The Just Transition and the Role of Labour:

Our Ecological, Social, and Economic Future

Abstract

This paper seeks to analyse the policy position of the International Trade Union Confederation (ITUC) to that of the United Nations Environment Programme (UNEP) in relation to the green economy and green jobs. It is argued that the ITUC position is consistent with the paradigm of the UNEP that the source of the ecological and jobs crisis lays within the problem of a lack of investment in appropriate alternative technologies and not that of capital accumulation and the nature of material production itself. It is further argued that both the ITUC and the UNEP's paradigm is flawed on the basis of a confusion that technological efficiencies based upon alternative technologies would reduce the carbon footprint of countries. On the contrary this paper argues that the ITUC and UNEP failed to locate their perspective on a historical understanding of the contradiction of technological efficiencies as part of capital accumulation itself and the continuous expansion of production and secondly, that alternative energy production is still reliant of fossil fuels which will not lead to a reduction of greenhouse gas emissions. Finally, this paper argues that the ITUC does not have an alternative position as the notion of the Just Transition is trapped within the existing social democratic, sustainable development paradigm which is committed to a system of capitalist growth. The paper argues that the only viable alternative is for labour to develop and struggle for an alternative eco-socialist society.

Keywords: green growth, green jobs, alternative technologies, eco-socialism, trade union strategy

[1] This is a revised and updated version of the paper published by the Rosa Luxemburg Foundation in *Sustainable development*,
2/ 2015.

[2] Eddie Cottle is a PHD candidate at the Institute for Social and Economic Research (ISER) at Rhodes University, South Africa. He is currently employed by the Labour Research Service (LRS).

> "Across many of these sectors, we have found that greening the economy can generate consistent and positive outcomes for increased wealth, growth in economic output, decent employment, and reduced poverty."
>
> UNEP, Towards a Green Economy (2011)

> Green jobs" are defined as jobs that reduce the environmental impact of enterprises and economic sectors, ultimately to levels that are sustainable. This definition covers work in agriculture, industry, services and administration that contributes to preserving or restoring the quality of the environment while also meeting the criteria for decent work – adequate wages, safe conditions, workers' rights, social dialogue and social protection.
>
> UNEP, ILO, IOE, ITUC: Green jobs (2008)

A new mantra for ***economic growth*** has recently been discovered by environmental economists, because of the widespread disillusionment with the prevailing economic paradigm and it is called the *"Green Economy".* The key problem identified by these economists concerning the ecological crisis is the "gross misallocation of capital", whereby relatively little was invested in renewable energy and protecting and conserving the environment. The mechanisms for dealing with this "misallocation" are in short, better public policies, including pricing and regulatory measures (such as eco-taxes) to change the market which ignores social and environmental externalities. The state in particular will further redirect public investment to green investment and greening public procurement (UNEP, 2011).

The green economy as it is envisioned does not favour a state-led or a market-led economy and is applicable to both. But in the 2011 UNEP report, "Towards a Green Economy", it is no accident that there is no elaboration of what a state-led model can achieve comparably to a private-led model precisely because of the bias to the latter and hence the report's focus on "growth". The UNEP report insists "that the greening of economies is not generally a drag on growth but rather a new engine of growth". However, according to leading scientists at the Stockholm Resilience Centre at Stockholm University, in ecological terms, *the economy* has *already* grown to such a scale that we have already surpassed the boundaries of climate change, loss of biosphere integrity, land-system change and altered biogeochemical cycles (phosphorus and nitrogen) (SCRIPPS, 2015). Furthermore, by 1972 the environmental concerns relating to growth has already been well established with the Club of Rome book, *The Limits to Growth.* Is it not furthermore true that this ecological crisis has as its primary source, the accumulation of capital by the few at the expense of nature and society as a whole? Is it not common knowledge these

days that growth has led to increased inequality and a general decline in living standards and increased precarious forms of employment on a global scale?

It appears therefore, that not only is there climate change denialism but even more dangerous is the fact that those who do believe in climate change reduce the ecological crisis to a problem of a *"gross misallocation of capital".* In so doing the globalised system of capitalism as a system of continuous expansion and growth is pardoned. Thus there is an abstract focus on 'green growth' rather than a concrete analysis of capital accumulation and its "irresistible impulse to growth" (MANDEL, 1982). It is therefore not difficult to understand why the call for a Green Economy is universally accepted by business and governments alike precisely because it merely tinkers with the system and 'going green' is the new cash cow to be milked mostly through public funds for green subsidies for green investments, green procurements and green finance! (FOSTER, 2011).

Similarly, the International Trade Union Confederation (ITUC) calls for 'orienting financing towards investments generating green and decent jobs and transforming traditional sectors into "greener" ones' (ITUC, 2009). In fact, ITUC in its 2012 report, "Growing Green and Decent Jobs" demonstrated that investments of 2% of GDP in the green economy over each of the next 5 years in 12 countries could create up to 48 million new jobs. In this way, 'Investing in "green" measures during these times of economic crisis may deliver a "double-dividend" by providing jobs and revitalising the economy, while also contributing to the improvement of the environment'. The changes will require workers to be 'trained in new, sustainable processes and technologies' (ITUC, 2012).

The perspective of ITUC is consistent with the 'technological fix' approach which does not see a conflict between 'protecting jobs and protecting the environment' and that a low carbon economy can be realised through 'orienting financing' to ensure *growth* and *technological* innovation (RA¨THZEL and UZZELL, 2011). The ITUC position is therefore consistent with the "gross misallocation of capital" thesis of UNEP. However, the ITUC and UNEP position is based on a confusion concerning its demand for 'increased investments in green technologies and strategies' as a means for 'protecting jobs and protecting the environment'.

Technological Change and the Jevon's Paradox

> It is wholly a confusion of ideas to suppose that the economical use of fuel is equivalent to a diminished consumption. The very contrary is the truth…. It is the very economy of its use which leads to its extensive consumption. It has been so in the past, and it will be so in the future.

Stanley Jevon was a leading British economist and logician of the 19th century. In the *"The Coal Question: An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of Our Coal-Mines"* (1865), Jevon covered a breadth of concepts on energy depletion that have recently been revisited by writers covering the subject of peak oil (Frank Gottron, 2001). While studying the consumption of coal, he observed that every new technological innovation in the production of steam engines had resulted in a more thermodynamically efficient engine. However, every succeeding model that was more efficient actually led to a higher demand for coal since, the more coal's use became efficient the more its price dropped leading to increases in demand. The efficiency gains from technological development translated into a more economic use of coal in a blast furnace which allowed for increased iron production which, in turn, translated firstly, into an expansion of industrial production and secondly, improved capacity to 'capture more of the world market — hence more demand for coal' (FOSTER, CLARK and YORK, 2010).

Since the 1980's, in the United States, for example, the technological advancements in lowering motor vehicles' petrol consumption have increased the average miles per gallon used by 30 percent but have not reduced the overall energy consumed by motor vehicles (ibid). In other words, the reduction of fuel consumption per unit of use (gallon) at the same time leads to 'its extensive consumption'.

An empirical study, *The Weight of Nations* released by the World Resources Institute in 2000, on material outflows in recent decades in five industrial nations (Austria, Germany, the Netherlands, the United States, and Japan) showed that "efficiency gains brought by technology and new management practices have been offset by *increases* in the scale of economic growth" (emphasis added).

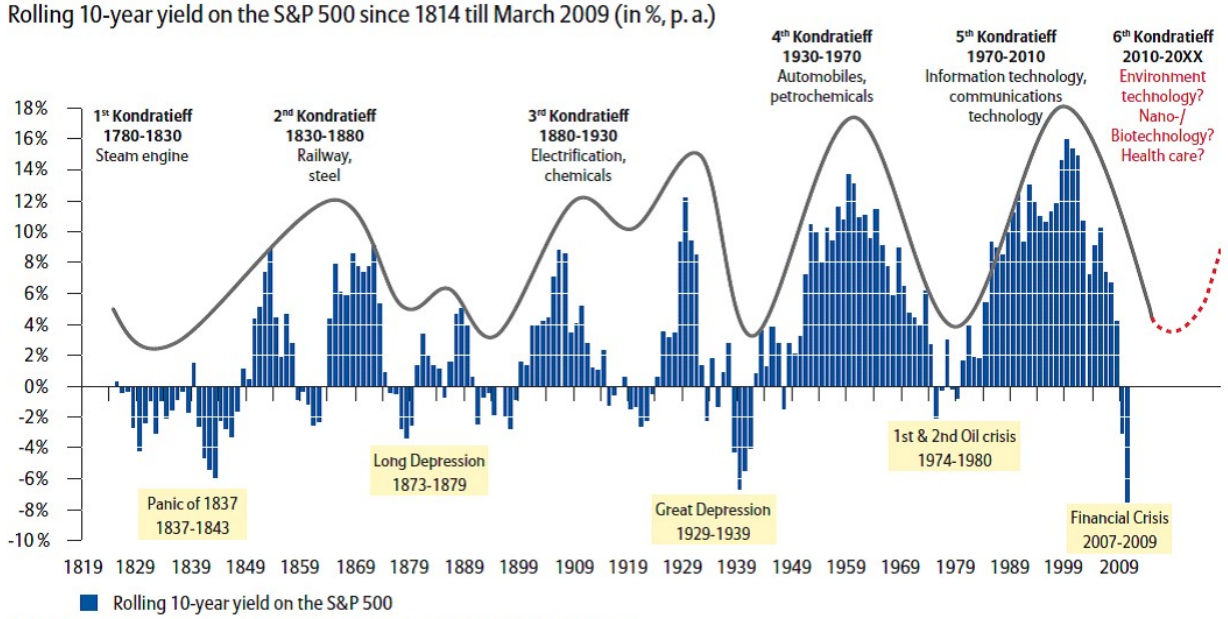
A closer look at alternative energy will show that it operates under the same paradox. Alternative energy is essentially a high-tech manufacturing process of which the full supply chain from raw materials to manufacturing is still very dependent on fossil-fuels. Alternative energy manufacture relies heavily on the exploitation of *rare-earth elements* such as platinum, palladium, gallium, indium and lithium (FRIDLEY, 2010). If we take the example of the ground-breaking thin-film solar panel invented by the University of Johannesburg (and manufactured by Bosch) which is more cost efficient and flexible than silicon panels, it is reliant on indium which is also widely used in flat-screen monitors (Lana, *South Africa web*, 2013). Also, the production process and recycling levels of solar panels still has a huge carbon footprint and the material waste of disposing of them are costly to the environment.

In order to move to an alternative high-tech energy society the demand for a range of metals would go well beyond the levels of world production today and the extraction and production of the minerals itself is reliant on fossil-fuel inputs. It takes up to twenty to twenty five years for the full commercialisation of new technologies to be marketed (FRIDLEY, 2010). As efficiencies of mass production produce cost savings, thereby lowering prices of the technologies, this leads to increased demand for those technologies which in turn will lead to increased resource extraction instead of conservation, thereby accelerating economic growth and carbon emissions. As Jevons's Paradox would have it, green growth and indeed green technology are dependent on increased fossil fuel consumption for the mining of raw materials, transport, manufacturing, construction, maintenance, and decommissioning.

Capitalism and Technological Development

It is important to note that savings in materials and energy per unit of output, in the context of a given process of production, are nothing new and are part of the history of capitalist development. The long waves of capitalist development known as the Kondratiev wave of more or less 50 years' duration have each brought about significant technological changes with each having its own techno-economic paradigm (DICKEN, 2011).

Figure 1: Kondratieff cycles – long waves of prosperity.
Rolling 10-year yield on the S&P 500 since 1814 till March 2009 (in %, p. a.)



Source: Datastream; Illustration: Allianz Global Investors Capital Market Analysis

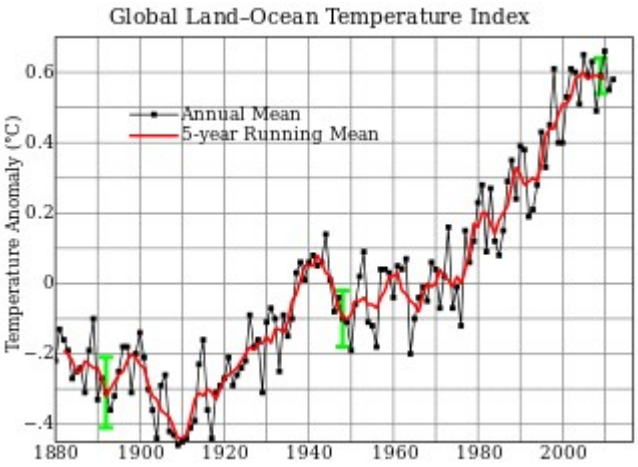
For example, the *first* Kondratieff was sparked by the textiles industry leading to the development of the steam engine. The *second* was steel manufacture which sped up the expansion of railways systems for mass transportation. The *third* to electricity and chemicals production on a mass scale. *Fourth*, we have the mass production of automobiles and petrochemicals to allow for individual mass transport. *Fifth,* there is the information and communications technology of today. There is now consideration that we may be entering a *sixth* Kondratieff based on new environmental technologies, nanotechnology and biotechnology. According to the World Energy Council, the market for renewable energy was estimated to be USD 635 billion in 2010. By 2020, it is expected to grow to USD 1.9 trillion (Alliance Global Investors, 2010).

According to the IPCC 5th Assessment Report "Climate Change 2013: The Physical Science Basis",

> It is certain that Global Mean Surface Temperature (GMST) has increased since the late 19th century… Each of the past three decades has been warmer than all the previous decades in the instrumental record, and the decade of the 2000's has been the warmest.

Each of the technological long waves or Kondratieff waves were dependant on the consumption and production of fossil fuel energy for economic growth and each of the waves brought about

greater amounts of carbon emissions as the capitalist system expanded and has contributed immensely to climate change. Will a 6th Kondratieff be able to develop technologies that are able to ensure growth, protect jobs and the environment?



Source: NASA GISS

The Montreal Protocol and Technological change

Indeed, the much heralded "success" case was the Montreal Protocol (1987) which provided for the regulation of chlorofluorocarbons (CFCs), where industries affected 'recognized that product and process improvements can often simultaneously enhance environmental performance, while improving quality and lowering costs'(ROTHENBERG & MAXWELL, 1998).

> Large multinational electronics firms considered the global restrictions a challenge, and moved swiftly to develop alternatives to CFC-based chemicals. Their counterparts in the automobile industry, however, delayed making a commitment to air-conditioning systems which run on CF substitutes. The differences between the two industries can only be explained by a complex mix of technical, organizational, and institutional factors. (ibid)

The electronics industry moved more easily over to the use of newer no-clean fluxes when soldering or using aqueous cleaning on printed circuit boards, printed wiring assemblies, and other electronic assemblies. The industry had used assemblies that are cleaned either by CFC-ll3 spray, immersion in liquid, or immersion in vapour. In this way production process not only reduces cleaning costs but meant that the electronics industry did not have to invest in new capital equipment. The South African company, Northern Telecom, led the electronics industry in 1998 to use substitutes, followed by the American AT&T and IBM (ibid).

Through investigations conducted by Swedish companies, Volvo and Saab, the automobile industry decided to use HFC-134a which has a zero ozone depleting potential (ODP). The downside was that it has a global warming potential for use as the alternative coolant in automobile air-conditioning systems. It was utilised because ozone depletion was an immediate threat, and there were no other alternatives at the time with a zero ODP. In 1988, two large chemical manufacturers, DuPont (American) and ICI (Dutch), began to accelerate their commercialization to meet the needs of the auto industry. Redesigning the air-conditioning system however took more time than the switch made by the electronics industry. Companies only started phasing out old technologies in 1992, and a complete phase-out was not achieved until 1995 due to the higher costs associated with introducing a new air-conditioning system (ibid).

The Montreal Protocol is a good example of how governments can ensure the implementation of *technology-forcing regulation* in reducing CFC's. On the other hand, the Montreal Protocol also demonstrates the limitations of leaving technological changes in the hands of the capitalist class, who, with even the most limited changes required in substance substitution and air-conditioning redesign, took about nine years to do so. This is despite the fact that in both industries the phase-out of CFC's did not require radical breakthroughs in technology or radical changes in workplace organisation. Despite all the efforts by government and business, the result has been that, although the HFCs are less damaging to the ozone layer than CFCs, they add significantly to global warming and are more than 11,700 times more powerful than CO2 (MORALES, 2013). According to UNEP, 'the closing of the hole in the world's stratospheric ozone layer is still many decades away and the effects and interactions of ozone depletion on climate change are just starting to be understood' (UNEP, 2011). The Montreal Protocol, while dealing successfully with CFC reduction, at the same time contributed to global warming.

The first lesson to draw from the Montreal Protocol is that it took the auto-industry nine years to adapt and phase-in the parallel condenser (radiator) already developed by Nissan to reduce costs. This was despite the fact that many governments had readily signed the Protocol, leading some commentators to argue that capitalism could indeed resolve serious ecological questions through social dialogue, technological change and innovation. In other words, the Montreal Protocol did not disrupt the imperative of capital accumulation, despite governments' *technology-forcing*

regulation. It is this factor that is key to the success of the Protocol. The second lesson is that it took considerably long for the auto-industry to phase-in a 'minor' technological adjustment to its cooling system due to the 'cost factor'. This demonstrates that capitalist accumulation cannot be managed in a sustainable manner merely through 'orienting financing' and 'technology-forcing regulation' if we are to contain global warming.

From a historical perspective the Montreal Protocol pales in significance as a technology-forcing regulation, when compared to making an industrial shift as in the war-time measures and conversion of production to that of armaments. In 1941, more than three million cars were manufactured in the United States. The government banned the production of cars, commercial trucks, or auto parts from February 1942 to October 1945 (PBS, 2007). To the resentment of the auto industry, they were also given one month's notice to ensure a full conversion of production to wartime manufacture (ZIMMERMAN, 2012). Furthermore, the US government had not only forced car manufacturers to comply and convert production in line with wartime manufacture but cooperate where much of the work took place in government-owned plants. A totally new kind of economic cooperation emerged to secure the 'planned' objectives of the government. Despite the change in the production processes the private industry profited immensely through wartime manufacture (GOODWIN, 2001).

Thus an entire automotive industry was completely transformed almost overnight with a complete change in the type and quality of goods manufactured, changes in the further development of new technologies, reorganisation of production processes, full employment and the increase in the number of manufacturing plants (ibid). The technological changes were dramatic as the state invested heavily in research in order to win the war. The most important of these were, 'jet engines, computers, navigation systems, microwave ovens, synthetic materials and the technology to put man on the moon'. All these innovations came from technology invented and developed for the war effort and gave great impetus to the Fordist mass production Kondratiev starting in the 1930's (Expert Review, 2011).

This scandalous examples demonstrates that under capitalism it is only possible to temporally ban a highly pollutant industry in times of war as long as it does not disrupt the profit motive. However, it does demonstrate that it is possible for governments to rapidly convert production

and move away from the highly pollutant private auto manufacturing and have in place a real substitution - a public transport system and research for alternatives, a full measure which will in itself dramatically reduce CO2 emissions. The key finding of the UNEP report (2013) is that, based upon current global emissions, it is now less likely that the climate change threshold of 2° C will be maintained until 2020. (UNEP, 2013)

Under capitalism, economic output normally tends to grow, except in periods of economic crisis. But if we take as our starting point that economic growth has already outstripped the capacity of the environment and it is at a dangerous crossroads, then surely, we should not even be slowing down economic growth but reversing it! Despite the new state-subsidies for green production (read private accumulation), green jobs or green technology under the current 'paradigm shift' will still be subject to the laws of the capitalist market – a case of 'business as usual'.

Labour and Just Transition

Labour's demand for a Just Transition (JT) is defined as a "tool the trade union movement shares with the international community, aimed at smoothing the shift towards a more sustainable society and providing hope for the capacity of a green economy to sustain decent jobs and livelihoods for all" (ROSEMBERG, 2010). The six enabling conditions for a JT to take place are:

- Investment – Reorientation of finance in the public and private sectors towards a low carbon future;
- Research and early assessment - to increase research on the social dimensions of climate change linked to environmental impacts and economic sectors;
- Consultation and social dialogue - which prioritises good governance to involvement of parties concerned with and deciding on appropriate policies for sustainable development;
- Education and training - in mitigation and adaptation skills of workers for the structural shift to greening the economy;
- Social protection and security – as the green transition will lead to job losses in areas which may shed jobs, social security is a condition for sustainable economic and social development;

- Economic diversification - to ensure a certain level of planning to ensure that the effects of adaptation and mitigation policies do not undermine social development goals.

The enabling condition merely builds on social aspects of the notion of 'sustainable development' (OLSEN, 2010). This is no accident since the six enabling conditions for the JT have their foundations in the combined report of UNEP, ILO, the International Organisation of Employers (IOE) and ITUC titled, "Green Jobs: Decent Work in a Low-Carbon World" published in 2008. The essence of the green jobs concept in UNEP, "Towards a Green Economy" (2011) is the endorsed position of labour. The most glaring omission from a Just Transition is the lack of a *strategy of de-commodification* which is the only realistic means to reduce greenhouse gas emissions.

While ITUC does provide a critique of the excesses of neo-liberal capitalism it offers a social democratic solution which itself is still bound by the hegemony of growth, the market and the instrument of class collaboration - social dialogue (ITUC, 2009). This 'social-democratic unionism' as Hyman described (2001) evolved from its genesis of anti-capitalist opposition which became a rival, 'as social democracy itself shifted –explicitly or implicitly – from the goal of revolutionary transformation to that of evolutionary reform". It is for these reasons that the ITUC position is trapped in the "gross misallocation of capital" thesis and offers no alternatives at a time when the private sector is openly producing a major jobs crisis as well as an environmental catastrophe.

So, what is the strategy for labour?

- Labour should start developing perspectives and struggle for a democratic-eco-socialist-state. The global crisis is not over and the private sector will therefore, increase its competition for the earth's resources despite lip service to sustainable development imperatives. Over the past 30 years the role of the state has been cut back as direct financier, energy developer, energy supplier, researcher and inventor of technology. The state should once again reclaim its position. Job creation should therefore depend on an expanded public sector and also extending the public sphere into high carbon emitting industries which are considered as traditionally private, such as auto manufacturing (GINDEN, 2013). An example of this is during WWII when the US closed car

manufacturing completely (as did Russia, Britain and Germany) and within three months started producing tanks and war planes (Campaign against Climate Change, 2010). In this case we should prioritise public transport only. Thus an active state-led *de-commodification strategy* is central for a low carbon future and only jobs that form part of this strategy will be called *climate-jobs* and counter-posed to the reformist concept of "green jobs".

- The financing of a renewable energy path cannot be led by the private sector or be left in the hands of the World Bank, IMF and other financial institutions who are committed to the market imperative and corporatisation of the public sector. Not only will this lead to the increased debt of countries, especially in the global South, but this will ensure that a public roll-out of renewable energy is hampered, delayed or unaffordable to citizens. The global crisis is a private sector crisis. There has to be an alternative, public sector driven financing arrangement in which the profit motive does not prevail but where there is an understanding of 'a shared but differentiated future'. The need for a publicly driven financial alternative is paramount and will make ecological reparations to the South realisable.

- Many economic sectors, including energy, were privatised and managed under expensive and wasteful public-private partnerships especially in the water and energy sectors where short-term shareholder interests dominate. The state should *(re)nationalise industry* in the public interest especially in the construction, water and energy sectors for the sake of the *common good*. The re-development of the building sector within government, especially at municipal level, is central to begin a programme of upgrading energy efficiency, and energy renovation of existing buildings. State investment programmes should therefore be to build and develop public capacity so that dependency on so-called green procurement from the private sector is dramatically reduced or eliminated. Countries of the North should not create new investments because of their ecological overshoot and instead only focus on low rates of maintenance, while countries of the South should be allowed to invest in socially necessary new investments and maintenance. Thus, in the North a strategy of planned rate of de-growth should be employed.

- *Eco-technology* development should in principle be for collective good and not for the market which seeks to make a profit, otherwise the price premium will not enable most countries to afford an alternative renewable energy path. Public sector production is necessary as an avenue to ensure sustainable roll-out of an alternative *planned* energy production and supply sector. In this situation the market based notion of intellectual property rights will have to be challenged and the state should resume its leading role in developing alternative research and development on renewable energy, renewable materials, energy-efficient facilities management, and waste management.

- The need to control carbon emissions and protect and regenerate our ecosystems implies a *democratic planned system* where all citizens are able to participate from the local community level to the international level. This will ensure effective planning of life's *basic needs* all over the world, sharing the resources equitably amongst different countries and embarking on a process of sustainable development for all. The global fetish with growth defined in gross domestic product (GDP) as a means for job creation should give way to a measurement of what I term, *'social de-commodified growth'* (SDG) in terms of targets for housing, health, education, access to services, and even in terms of leisure, happiness and well-being. It demands a transformational change in global production and consumption *systems* to make our societies and workplaces sustainable and to safeguard and promote *decent climate jobs for all*. The global South must be given the space to develop their productive forces in an environmentally sustainable way as many countries still lack adequate infrastructure for basic service provisions such as water and sanitation, roads, social housing, safe public transport and electricity generation based on renewable sources. This kind of *'social de-commodified growth'* will only happen if economic life is made much more democratic and more responsive to social and environmental needs. This clearly means that the labour movement should be working towards fashioning a democratic-eco-socialist-state.

- Eco-Socialist Education and Training. Central to this concept is the production for needs (use-value) rather than profit (exchange-value) and the labour process within the human-nature dynamic. This involves the overall transformation of the use-value structure of production and so too that of the transformation of all the sciences and educational

institutions so that they meet the objective of implementing a new production model that is more sustainable with the environment.

Instead of a Conclusion

A Guardian analysis (23 September 2015) suggests that Volkswagen's rigging of emissions tests for 11m cars means they may be responsible for nearly 1 million tonnes of air pollution every year, roughly the same as the UK's combined emissions for all power stations, vehicles, industry and agriculture. What is striking about this scandal is that it is linked directly to Germany, a leading industrial export orientated country which is a world leader in the use of renewable energy. Volkswagen suffered a net loss of €1.58 billion for 2015, compared with a net profit of €10.85 billion a year earlier. Unsurprisingly, a 2015 report by the German motoring organisation (Adac) found that the Volvo S60, Renault's Espace Energy, Jeep Renegade and Nissan X-Trail all exceeded legal European emission limits for nitrogen oxide by more than 10 times.

According to the OECD in just thirty years, the quantity of materials extracted for consumption has increased by 60% and that a fifth of these materials end up as waste. This problem has largely been pinned to planned obsolescence which is found in all industries. As *The Economist* (Mar 23 2009) noted, "Philip Kotler, a marketing guru, says: 'Much so-called planned obsolescence is the working of the competitive and technological forces in a free society'". The rationale behind the strategy is to generate long-term sales volume "so that in future the consumer feels a need to purchase new products and services that the manufacturer brings out as replacements for the old ones".

It is undeniable today that economic growth is the main driver of ecological catastrophe but it has to be recognised that it is at the same time underpinned by capitalist competition and the drive for private accumulation. The tragic irony is that even those progressives who believe in a green economy can imagine the collapse of our planet but cannot imagine a life without capitalism.

BIBLIOGRPAHY

ALLIANCE GLOBAL INVESTORS. 2010. 'The sixth Kondratieff – long waves of prosperity'. January

ROSEMBERG, A. 'Building a Just Transition: The linkages between climate change and employment'. In: ILO. 2010. Climate change and labour: The need for a "just transition". *International Journal of Labour Research*. Vol. 2. Issue 2.

CAMPAIGN AGAINST CLIMATE CHANGE. 2010. 'Climate Jobs: Solving the economic and environmental crises'. London, October. www.campaigncc.org

CONNETT, D. 2015. 'Volkswagen emissions scandal: More carmakers implicated as tests reveal pollution levels of popular diesels'. *Independent*, Wednesday 30 September 2015 http://www.independent.co.uk/news/business/news/volkswagen-emissions-scandal-more-carmakers-implicated-as-tests-reveal-pollution-levels-of-popular-a6674386.html (accessed 10 September 2016)

DICKEN, P. 2011. *The Global shift*. The Guilford Press. New York. P. 78

EXPERT REVIEWS STAFF. 2011. 'Top 10 technical innovations of World War 2'. *Expert Reviews*. 5 August. http://www.expertreviews.co.uk/general/1286401/top-10-technical-innovations-of-world-war-2

FOSTER, J.B. 2011. 'Capitalism and Degrowth: An Impossibility Theorem'. Monthly Review. http://monthlyreview.org/2011/01/01/capitalism-and-degrowth-an-impossibility-theorem (accessed 19 October 2013)

FOSTER, J.B., CLARK, B. and YORK, R. 2010. 'Capitalism and the Curse of Energy Efficiency: The Return of the Jevons Paradox'. Monthly Review. Volume 62, Issue 06 (November)

FRANK, G. 2001. "Energy Efficiency and the Rebound Effect: Does Increasing Efficiency Decrease Demand?" CRS Report for Congress. Congressional Research Service, the Library of Congress. July 30

FRIDLEY, D. 2010. 'Nine Challenges of Alternative Energy'. The Post Carbon Reader Series: Energy. Post Carbon Institute. California.

GINDIN Sam. 2013. 'Beyond the Economic Crisis: The Crisis in Trade Unionism'. *Socialist Project* • E-Bulletin No. 878, September 16

GOODWIN, D. 2001. 'The Way We Won: America's Economic Breakthrough During World War II'. December 19 http://prospect.org/article/way-we-won-americas-economic-breakthrough-during-world-war-ii

HYMAN, R. 2001. 'Understanding European Trade Unionism: Between Market', *Class and Society.* Sage, London

ITUC. 2009. "A Just Transition: a fair pathway to protect the climate". http://www.ituc-csi.org/IMG/pdf/01-Depliant-Transition5.pdf (accessed 19 October 2013)

ITUC. 2012. 'Green and Decent Jobs made Simple'. Rio+20.

ITUC. 2009. A Recipe for Hunger, How the World is Failing on Food, available at: http://www.ituc-csi.org/IMG/pdf/food_crisis_EN.pdf>

LANA. 'Thin solar panels from South Africa'. http://www.southafricaweb.co.za/article/thin-solar-panels-south-africa (accessed 20 October 2013).

MANDEL, E. 1982. Introduction in: MARX, K. *Capital.* vol. 1, Penguin Books. p11

MORALES, Alex. 2013. 'Ozone Treaty Offers Quicker Fix for Global Warming'. Bloomberg.com. 20 September http://www.bloomberg.com/news/2013-09-19/ozone-treaty-offers-quicker-fix-for-global-warming.html

OLSEN, L. 'supporting a just transition: The Role of Labour Standards'. In: ILO. 2010. Climate change and labour: The need for a "just transition". *International Journal of Labour Research.* Vol. 2. Issue 2.

PBS. 2007. 'War Production'. Washington DC. http://www.pbs.org/thewar/at_home_war_production.htm

RA¨THZEL N. and UZZELL, D. 2011. "Trade unions and climate change: The jobs versus environment dilemma". *Global Environmental Change 21*, p 1215–1223.

ROTHENBERG, S. and MAXWELL, J. 1998. 'Industrial Response to the Banning of CFCs: Mapping the Paths of Technical Change'. Massachusetts Institute of Technology (MIT), USA.

SCRIPPS INSTITUTION OF OCEANOGRAPHY. 2015. "Earth Has Crossed Several 'Planetary Boundaries,' Thresholds of Human-Induced Environmental Changes". Jan 15 https://scripps.ucsd.edu/news/earth-has-crossed-several-planetary-boundaries-thresholds-human-induced-environmental-changes

STANLEY, Jevon. 1965. *The Coal Question: An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of Our Coal-Mines*. (2nd ed.). London: Macmillan and Co.

The Economist. 2008. 'Planned obsolescence'. Mar 23 2009. http://www.economist.com/node/13354332 (accessed 10 September 2016)

UNEP. 2013. 'The Emissions Gap Report 2013'. United Nations Environnent Programme, Nairobi. http://www.unep.org/emissionsgapreport2013/

UNEP. 2011. Towards a Green Economy. 'Pathways to Sustainable Development and Poverty'. Eradication: A Synthesis for Policy Makers. France. P. 1, 13.

UNEP. 2011. "Has the Problem of the Ozone Hole Been Solved?" 16 September. http://www.unep.org/newscentre/default.aspx?DocumentID=2653&ArticleID=8864#sthash.LjMpHRSJ.dpuf

WALTER P. CHRYSLER MUSEUM. 2009. Chapter Seven – Chrysler Goes to War. http://www.chryslergroupllc.com/

WORLD WILDLIFE FUND. 2006. Living Planet Report.

ZIMMERMAN, D. J. 2012. 'Automobile Factories Switched to War Production As America Entered World War II'. *DefenseMediaNetwork.* http://www.defensemedianetwork.com/stories/automobile-factories-switched-to-war-production-as-america-entered-world-war-ii/