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THE METABOLIC RIFT,
ANACHRONISTIC INSTITUTIONS AND THE ANTHROPOCENE

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INTRODUCTION

IT IS NOW A CENTURY SINCE THE PUBLICATION BY Alfred Wegener of an important text on the origin of the continents and the oceans (1915). Whilst the idea of continental drift had been seeded 100 years ago, it would take decades before its confirmation as scientific fact and for the idea to become incorporated into our collective global knowledge commons. The year 2015 also commemorates the fiftieth anniversary of "Moore's Law," whereby Gordon E. Moore had famously hypothesised that within a decade "the number of components per integrated circuit for minimum cost will be 65,000"(1965: 83). This prediction would largely establish the relentless pace of innovation in the fields of information and communication technologies (ICTs) and whereby computing power has doubled every two years since. This essentially enabled the transition into the fifth Kondratiev long wave of capitalist development and the Techno-Economic Paradigm characterised as the era of ICTs. Each preceding long wave had historically been accompanied by innovations in energy systems and had utilised non-renewable fossil-fuels such as coal, oil, and gas. With fossil-fuels now assumed to have peaked, the next generation of energy provision may increasingly have to be sourced on a renewable basis. This poses a real and immanent threat to the political economy which requires privately appropriable commodities and wage-slaves for mass production and consumption of standardised items.

This essay reviews human and social history from the perspective of the political economy. It draws on recent research findings in the fields of palaeoanthropology and determines a *periodised* narrative of evolutionary change punctuated by revolutionary transformations. It is important to note that temporal-lags between expanding intellectual frontiers, scientific knowledge and technological capability-formation results in informational asymmetries. The emergent chasms are also resilient to modification due largely to the persistence of institutional anachronisms. The political economy of contemporary capitalism utilises structural and systemic forms to legitimise hegemonies and thereby curbs the possibility of didactic reasoning liberating people from their own entrapment.

The essay is elaborated through four sections. After this introduction, we turn briefly to exploring our long evolutionary history and the revolutionary transformations that have collectively shaped our common (albeit, combined and uneven) contemporary conjuncture. Section-three discusses the framework of *Planetary Boundaries* within the discourse on the *Anthropocene*. The fourth, and final section concludes the essay by considering the possibilities of transitioning towards a planetary-scale of civilisation through the agency of global citizenship, a Great Transition, and the commons paradigm. This essay supports the idea that agency and structure remain framed by dialectical relationships. Thus, whilst the resulting praxis will ultimately define our collective fate as human beings, our faith in each-other and our bonds of solidarity, cooperation, and collaboration, are indeed under stress.

Redressing our metabolic rift requires our advance beyond capitalism.

THE MAKING OF OUR CONTEMPORARY CONJUNCTURE

Our Linnaean[1] classification as the 'wise human being,' locates our sub-species within the Animal Kingdom. Animalia together with six other Kingdom's: Bacteria; Chromista; Fungi; Plantae; and Protozoa constitute the biodiversity which occupies the only terrestrial planet with an active hydrosphere (the Earth) and which circumnavigates a 'yellow dwarf' G-type main-sequence star (the Sun) approximately once every 365 days, 5 hours, 48 minutes, and 46 seconds. In the Common Era[2], we have truncated this into 365 day years with every fourth instance being a Leap-year of 366 days. It is reasonably estimated that the orbit of the Earth around the Sun was undertaken at least 4.55 billion times before the current cycle, designated as the 2,015th year of our Common Era. According to the geological record, our Moon formed approximately 4.527 billion years and *Prokaryotes*[3] began photosynthesising about 3.5 billion years ago. The atmosphere enveloping the Earth became Oxygen-rich nearly 2.3 billion years ago and Eukaryotes[4] appear in the fossil record from about 2.1 billion years ago (Knoll et al: 2006). According to the *endosymbiotic*[5] theory, the mitochondria inside every eukaryotic cell were once free-living bacteria.

Thus, after the geophysical formation of the planet, a further 3 billion years would pass before multicellular life emerged: "(c)ells organized themselves into new three-dimensional structures. They began to divide up the labour of life, so that some tissues were in charge of moving around, while others managed eating and digesting. They developed new ways for cells to communicate and share resources. These complex multicellular creatures were the first animals, and they were a major success" (McGowan: 2014). It is estimated that the first animals emerged approximately 800 million year ago and the oldest animal fossil found has been dated to ~650 million years ago (Maloof et al: 2010). According to McFall-Ngai et al, animals should rightly be considered host-microbe ecosystems (2013). A hundred million years later, or about 542 million years from now, the Earth experienced a 'Cambrian Explosion' with a profusion of animals with shells and skeleton now collated in the fossil record. According to Qing-Jin Meng and colleagues, the oldest tree-dwelling and subterranean *mammaliaform* fossils have been dated to ~165 and ~160 million years respectively (2015). These results are aligned with the finding by Shundong Bi and colleagues that dates the origins of mammals from ~208 million year ago (2014). It would take another 202 million years before the emergence of our hominid species.

The age of the oldest fossil from a member of our genus: Homo is dated at ~2.8 million years old (Villmoare: 2015). It is variously estimated that the hominid species separated from the other primates approximately seven million years ago (Palmer: 2005; amongst others). Other hominid sub-species such as *Homo habilis, Homo erectus, Homo sapiens,* and *Homo sapiens neanderthalenis* have variously been identified. *Homo sapiens sapiens* are therefore the only extant hominid sub-species and have occupied the planet Earth for at least 200,000 years. Genetic (analysis of Y chromosome DNA) and phenotypic evidence supports this contention and places the zone of human origin in an area ranging from southern to eastern Africa, with some minor boundary variations depending on whether we are considering the genetic or the phenotypic evidence (Manica et al: 2007). According to Marean, recent evidence suggests that complex cognition may have appeared between ~164,000 and 75,000 years ago (2010). Utilising data on language phonemic diversity[6], Perreault and Mathew have presented results that are "[…] consistent with the archaeological evidence suggesting that human behaviour became increasingly complex during the Middle Stone Age (MSA) in Africa, sometime between 350,000-150,000 years ago" (2012: 5).

According to archaeological and paleontological research, the anatomically modern human beings dispersed over wider territories of the planet over long periods of time. The literature concerning our dispersal across the surface of the planet may be grouped into three main schools: 1) a Regional (or Multi-Regional) Continuity Model suggests that we evolved independently out of Homo erectus in various territories; 2) a Replacement (or Recent Out of Africa) Model argues that Homo sapiens migrated from Africa and replaced the various regional populations of early Hominids; and 3) an Assimilation Model which synthesises the previous two models and contends that the human line can be traced to Africa but various human types sometimes interbred with each other, creating a human hybrid. This debate remains unresolved and is being updated as more data becomes available. Recent advances in genetic research shows that whilst modern humans have had some interrelations with other hominids, Homo sapiens sapiens have come to be the only sub-species to survive into our contemporary conjuncture.

Increasing fossil finds and improved paleo-anthropological capabilities are expanding our understanding of the long evolutionary interregnum. During this

time-span, we, like other life-forms, devoted a significant portion of our *pre-historic* day to the tasks of securing food for nutrition, safeguarding ourselves from predation, and seeking shelter from the elements especially during the night. The physical and chemical processes in our bodies that convert or use energy are referred to in the literature as our metabolism. For Marx, "(t)he life of the species, both in man and in animals, consists physically in the fact that man (like the animal) lives on organic nature; and the more universal man (or the animal) is, the more universal is the sphere of inorganic nature on which he lives. Just as plants, animals, stones, air, light, etc., constitute theoretically a part of human consciousness, partly as objects of natural science, partly as objects of art – his spiritual inorganic nature, spiritual nourishment which he must first prepare to make palatable and digestible – so also in the realm of practice they constitute a part of human life and human activity. Physically [humanity] lives only on these products of nature, whether they appear in the form of food, heating, clothes, a dwelling, etc. The universality of man appears in practice precisely in the universality which makes all nature his inorganic body – both inasmuch as nature is 1) his direct means of life, and 2) the material, the object, and the instrument of his life activity. Nature is man's inorganic body – nature, that is, insofar as it is not itself human body. Man lives on nature – means that nature is his body, with which he must remain in continuous interchange if he is not to die. That man's physical and spiritual life is linked to nature means simply that nature is linked to itself, for man is a part of nature." (Marx: 1844).

During the Palaeolithic era which spanned from ~2.5 million years ago until approximately 12,000 years ago, our sub-species became highly specialised in foraging, gathering and hunting for food for energy. Our apparent advantage included our capacity for creativity and adaptive versatility as our existence today is evidence for our various 'successful' adjustments to the uncertainties of environmental and climate change. From rather precarious existences amongst other sub-species, human beings have now expanded to a current scale of approximately ~7.2 billion people (UN: 2015). The expansion of our sub-species was accompanied by the sharing of knowledge and technology through culture and communication. With receding glaciers, climate change, social organisation and human ingenuity laid the basis for the establishment of agriculture. According to Richerson and Boyd, human society evolved from "a Pleistocene regime of hunting and gathering subsistence and low population density, [to a] a Holocene regime of increasingly agricultural subsistence and relatively high and rising population densities" (2000: 16). Climate changes and a rapid acceleration in the rate of innovation saw the domestication of plants and animals spread rapidly amongst the human species. As recognised by Fredrick Engels, "(i)n short, the animal merely uses its environment, and brings about changes in it simply by its presence; man by his changes makes it serve his ends, masters it. This is the final, essential distinction between man and other animals, and once again it is labour that brings about this distinction" (1876). As humans are primarily a social group, distinct social relations influence and are reproduced in the 'mastery' over nature.

Although constrained by the availability of historical evidence, Engels utilised the detailed anthropological research of Lewis Morgan, to describe the early transitions of the human sub-species through three distinct periods (1884). Engels summarised these as the movement between the following phases of development: 1) "Savagery: the period in which man's appropriation of products in their natural state predominates and the products of human art are chiefly instruments which assist this appropriation; 2) Barbarism: the period during which man learns to breed domestic animals and to practice agriculture, and acquires methods of increasing the supply of natural products by human activity; and 3) Civilization: the period in which man learns a more advanced application of work to the products of nature, the period of industry proper and of art" *(ibid.)*. Whilst essentially exposing a fixation with modernisation, the caricatures of savagery, barbarism and civilisation are contextually bound to an era with its own set of mores. As a historical categorisation, it also reminds us of the limitations of our times.

These critical transitions contributed to shaping the general contours of our current conjuncture. As observed by Karl Marx "[…] nature does not produce on the one hand owners of money or commodities, and on the other hand men possessing nothing but their own labour-power. This relation has no basis in natural history, nor does it have a social basis common to all periods of human history. It is clearly the result of a past historical development, the product of many economic revolutions, of the extinction of a whole series of older formations of social production" (1867: 166). Subsequent evidence largely corroborates these transitions though recognising that the process was not universalised and therefore unevenly distributed across the peoples of the planet.

In this long period, the fossil record clearly evidences our expanding technical capabilities, and especially our tool-making specialisation. The *Lomekwian* find of stone tools, including flakes, cores, hammers, and anvils, in a spatiotemporal association with Pliocene hominin fossils in a wooded paleo-environment has

been dated to ~3.3 million years ago (Harmand et al: 2015). The artefacts discovered "indicate that their makers' hand motor control must have been substantial and thus that reorganisation and/or expansion of several regions of the cerebral cortex (for example, somatosensory[7], visual, pre-motor and motor-cortex), cerebellum, and of the spinal tract could have occurred before 3.3 [million years ago]" (*ibid:* 314).

It has also been speculated that tool-making capabilities co-evolved with the emergence of socio-cultural learning and the capacity for the transmission of knowledge within groups of individuals and amongst society as a whole. The human capability to transmit knowledge over generations would seem to have afforded the sub-species a significant advantage in its rivalry with other Hominids. The increasing technical prowess and an expanding knowledge-specialisation correlates with an increasing intensity of the deployment of human competencies for exploiting the natural environments. In the late Pleistocene Epoch (20,000 years ago until the Holocene), food acquisition had already shifted from being largely random towards higher levels of organisation, complexity and regional specialisation. It is argued that the 'wide-scale exploitation of marine resources derived from fishing and shellfish collection' represented "a major departure from the previous focus, lasting hundreds of thousands of year" (Larsen: 2003: 3894S). Whilst fish and shellfish provided valuable sources of protein, energy and micronutrients; they also required new and innovative strategies of food collecting. It was in this epoch that humanity basically transformed from Palaeolithic to Neolithic entities

The diffusion of technology allowed for more settled populations to become established and changed social life from subsistence towards surpluses and accumulation – facilitated by an intensification of the division of labour through higher levels of specialisation and sophistication. It has been suggested that increases in our socio-economic differentiation coincided both with the generation of surpluses and through controlling access to surplus (viz. ancestry, authority, and inheritances). Gerda Lerner argues that male dominance over women is not 'natural' or biological, but the product of an historical development begun in the second millennium B.C.E. in the Ancient Near East (1987). Lerner uses historical, literary, archaeological, and artistic evidence to trace the development of these patriarchal gender relations ideas, symbols, and metaphors and their incorporation into Western civilization *(ibid.)*. This argument has recently been supported by the findings of Dyble et al, who show that "[…] it was only with the dawn of agriculture, when people were able to accumulate resources for the first time that an imbalance emerged" (2015). Until then, they argue that "sexual equality may have proved an evolutionary advantage for early human societies, as it would have fostered wider-ranging social networks and closer cooperation between unrelated individuals" (*ibid.*).

With the shift to the Holocene and the advent of the agricultural revolution, "human diets began to change in dramatic ways; people in select areas around the globe began to domesticate the plants and animals that heretofore had been wild" (*ibid.*). This transition to less meat and more plants resulted in less nutritional diversity but increased the availability of food in much larger qualities and on a more regular and purposefully-planned basis. According to Bagley, "(u)ntil the advent of agriculture and urbanisation, the human population was largely limited by the same factors that limit other living organisms. Limiting factors in the environment, such as availability of food, water and shelter, evolutionary relationships like predator/prey ratios or presence of pathogens provide natural balances to populations" (2013).

Since the advent of the Neolithic period, human development may be seen as the outcome of the dynamic, uneven and uncertain combination of "three motors of history: technological progress, ruling class competition, and the struggle between classes" (Faulkner: 2013: 296). Indeed, each of these drivers has resulted in specific outcomes for humanity and their combination helps describe contemporary combined and uneven development under a near totalising globally hegemonic mode of production called capitalism in the 19th and 20th centuries. Foster et al. have expanded on the critique of contemporary capitalism to argue that the source of our present ecological crisis lies in the paradox of wealth in capitalist society, which expands individual riches for some at the expense of public wealth and the wealth of nature (2010). This process generates an ecological rift, between humans and nature, undermining the conditions of sustainable existence. As argued by Foster et al, "[…] a deep chasm has opened up in the metabolic relation between human beings and nature – a metabolism that is the basis of life itself. The source of this unparalleled crisis is the capitalist society in which we live" (2010:1). This metabolic rift between humanity and nature is irreparable within Capitalist society, since the rift is integral to the laws of motion of the system. Structure and agency seem paralysed as the institutional framework appears incapable of reconciling developmental inequalities with a mode of production that is fixated with growth as an end in itself regardless of its social and ecological consequences. Whilst most of the world-systems are capitalist in practice, their contemporary ubiquity is not for want of alternatives.

The Paris Commune of 1848 was one of the first anti-capitalist experiments. Since then, various attempts at constructing alternatives to capitalist expansion have met with variable success and also failures. The Soviet Revolution of 1917 ushered in the possibility of a large-scale leapfrogging opportunity from Feudalism to the building of a Socialist system. The invasion of Russia by a number of countries, the establishment of a bureaucratic and repressive state apparatus, and subsequent emersion in World War Two, stultified the possibilities for redressing the metabolic rift.

World War Two occasioned another form of primitive accumulation in response to the generalised economic crisis of 1929. Subsequent Keynesian reforms and a so-called 'civilized' capitalism especially in the Scandinavian counties also did little to redress the metabolic rift. A third opportunity emerged in the struggles for national liberation from the yoke of colonial subjugation. Unfortunately, except for some success in the special-case of Cuba, most other territories rapidly transited from post-colonial euphoria into neo-colonial re-incorporation into the global circuit of Capitalism.

A further attempt at an alternative developmental trajectory was established in the People's Republic of China (PRC). The Chinese Communist Party's (CCP) ascended to power and declared the PRC in 1949. Since then, much change has been experienced by the most populous country on the planet. The CCP has especially since 1978 sought to update and upgrade its version of socialism with Chinese characteristics. Between 1978 and 2014, China's GDP expanded from approximately USD 59 billion to approximately USD 9.4 trillion. Zhang quotes Zheng Zhen, a Marxist scholar and professor at the Fujian Provincial Party School, as expressing the view that "(i)n the past, we thought environmental pollution and ecological crisis were maladies exclusively associated with capitalism. China as a socialist country would be unlikely to have such problems. However, in the past thirty years of reform and opening-up, China's resource and ecological problems have grown in proportion to the economic growth, whose level of severity even is no less deplorable than in the primitive accumulation stage of capitalism" (quoted in Zhang et al: 2014).

In 2007, the CCP introduced proposals to build an 'ecological civilization.' According to Hu Jintao, "[…] the essence of the construction of ecological civilization is building a resource-saving and environment-friendly society based on the environmental carrying capacity of resources, the laws of nature and sustainable development […]" (2012). The objective of utilising the concept of an eco-civilization could therefore be seen as seeking to balance the relationship between humanity and nature, which includes economic development, population, resources and the environment. For Xiao, the concept represented "a new civilization form which takes respecting and maintaining ecological environment as a theme, accords to sustainable development, takes the continued development of the future human as starting point, and realizes interdependence, mutual promotion and coexistence communion of man and natural environment" (2012).

> Kai notes that the term "is a historical concept" and argues that the "relationship between people and nature is the most fundamental relationship that exists in human society. Like all other creatures, people are creations of nature, and rely on nature for their survival and development. Nature is the foundation and the precondition for the emergence, existence, and development of human society. Therefore, humans are in no way the masters of nature, and in no way are they able to command nature as they please without serious consequences. On the other hand, humans are different from other creatures. Through their social activities, humans are able to purposefully utilize and transform nature in order to improve their modes of survival and development, which gives rise to human civilization. Therefore, humans are not mere 'servants' of nature, capable only of passive adaption. Nature is both rich and generous. But at the same time, it is also vulnerable, and requires balance. With the growth of populations and the improvement of living standards being irreversible trends, the impact that humans have on nature is becoming increasingly great. However, humans are, after all, a part of nature, and their activities should not go beyond the limits of what nature permits. In other words, the activities of people should not result in nature irreversibly losing its capacity for self-restoration; otherwise, people will risk undermining their own survival and development. Ecological civilization is all about striking a balance between humans and nature. It is about taking in moderation, using nature in ways that are mindful of the consequences of doing so , and promoting dynamic balance between development, populations, resources, and the environment, so as to constantly raise the level of harmony that exists between humans and nature" (2013).

In 2013, at the 18th National Congress of the CCP the concept of an ecological civilization was integrated into the constitution of the CCP. According to the former Vice Chairman of the Standing Committee of the National People's Congress of China, the following seven characteristics define the country's approach to an ecological civilisation:

> "Human beings are a part of nature. The relationship between human beings and other creatures should be one of equality, friendship, and mutual reliance, as opposed to a relationship in which humans are supreme.
>
> Since it is nature that has given us life, we should feel gratitude towards nature, repay nature, and treat nature well.

We should not forget the debt that we owe to nature, or treat nature and other creatures violently.
Humans are entitled to exploit natural resources, but we must take the tolerance of ecosystems and the environment into account when doing so in order to avoid overexploitation.
Human beings must follow the moral principles of ensuring equity between people, between countries and between generations in resource exploitation. We should refrain from violating the rights and interests of other people, other countries, and future generations.
[Human beings] should advocate conservation, efficiency, and recycling in the utilisation of resources so as to maximise efficiency whilst keeping consumption and the impact on nature to a minimum.
[Human beings] should view sustainable development as our highest goal, rejecting the overexploitation of resources and short-sighted acts aimed at gaining quick results.
The fruits of development must be enjoyed by all members of society and not monopolised by a small minority" (Chunyun: 2013).

According to the Climate Group, the outcomes of the 3rd Plenary of the 18th National Congress places the meeting "on a par with the historic third plenary session of the 11th Central Committee conference in 1978. This session famously launched the major 'Reform and Opening-up' policy of Chinese leader and reformist, Deng Xiaoping" (2014: 2). For Zhu and Qin, "(c)onstructing ecological civilization is not only the important pathway to the rise and prosperity of China, but also is the new contribution for human civilization" (2014). Wang et al, have however argued that because of the deep influence by Western modernity, "China has predominantly accepted an anthropocentric worldview and values, which regard human beings as totally different from the world of natural things, and accordingly treats the world of nature as a world of objects. The value of natural things lies merely in being 'used for our purpose'" (2014).

Wiedmann et al. have developed a new metric called the 'material footprint,' which "provides a consumption perspective of resource use and new insights into the actual resource productivity of nations" (2014: 6271). Their results show that the material productivity gains in the Organisation for Economic Co-operation and Development (OECD) countries[8] and that have been reported since 1995 are false when expressed as material footprint per gross domestic product. They thereby prove that overall material use does not decline when countries get wealthier. Interestingly, whilst China had the largest absolute material footprint in2008, Australia has the largest material footprint per capita (2014: 6272).

Human evolution has not ended. As Stearns has argued, "(w)hether we want to or not, we have already changed our future course of evolution, and it is not being done by some small group of people who are thinking carefully and planning, it is being done as a by-product of thousands of daily decisions that are implemented with technology and culture" (*ibid*.). Based on results from a five-year global technological forecasting study, James Canton argues that there will be a massive Internet of everyone and everything linking every nation, community, company and person to all of the world's knowledge. This will accelerate real-time access to education, health care, jobs, entertainment and commerce (2015). His views anticipate a trans-human advance where humans and robots merge, digitally and physically, as artificial intelligence becomes both as smart as and smarter than humans (*ibid*.). This represents a techno-determinism that is difficult to reconcile with the contestations of the contemporary conjuncture. Speculating along similar lines is Michio Kaku, a physicist, who has drawn upon advances in neuroscience technologies to explore the future of the science of consciousness (2014). Kaku ventures that we could see the gradual transition from the Internet to a brain-net, in which thoughts, emotions, feelings, and memories might be transmitted instantly across the planet over the next decade (*ibid*.). Such speculations assume that our current level of scientific prowess allows us to simplify nature into a model of reality from which we can then reproduce and expand our current capabilities. These suggest some of the ways in which the metabolic rift may further be widened. The irreducibility is epitomised by the recent identification by Yildirim and Correia of a new emerging 'situational phobia[9]' which they call nomophobia or a 'no mobile phone phobia' (2015). The distance between our technological artefacts, our physiology and our psychology is increasingly becoming intertwined.

PLANETARY BOUNDARIES AND THE ANTHROPOCENE

Human society has transgressed some planetary boundaries and appears to be hurtling towards a catastrophic descent into barbarism at the behest of global capitalism, particularly under conditions of corporate imperialism enforced through Empire and its neo-liberal ideology. Environmental degradation is exacerbated by intensified exploitation and oppression through mass unemployment in the formal sectors, short-term contract work, 'casualisation', increasingly meaningless and boring labour punctuated by periods of unemployment and short-time work, declining real wages, and a rapidly diminishing social wage, and from wholesale alienation of people from the things they produce and consume.

The proposition to recast the Holocene as the Anthropocene recognises that within the contemporary geological epoch, humanity has become a critical driver of rapid changes in the earth system (Zalasiewicz: 2008). Whilst the exact start-date for this remains unclear but some consensus has emerged that locates its origins with the advent of Industrial Revolution of the 18th century CE and the establishment of the current capitalist mode of production. Besides the fact that this recently framed geological epoch acknowledges the devastation that results from the impact of human activities on the planet's ecosystems and biodiversity, our current conjuncture also experiences conditions of over-production and under-consumption. Improvements in the material living conditions of parts of humanity have resulted from the extension of the provision of various infrastructures including water supply, housing, electricity, transport connections and a wide range of essential products and cultural activities. These are however not universalised and their provision has increasingly become dependent on international linkages in globally commoditised chains of production, distribution and consumption under the accumulative drive of financialised neoliberal and globalised capitalism.

Whilst humanity has inordinate power to materially alter planetary realities, this potential remains constrained by the dominance of capitalism. These constraints are the contradictions of our contemporary mode of social organisation, its political economy and the metabolic rift that it extends. Thus, whilst it is not the technology that is the problem, it is the social choices we make about technologies and their uses that generates some of the contradictions underpinning the contemporary crises of capitalism. The resulting precariousness of humanity is an expression of such contradictions and are manifest in the increasing brutality though which repressive state machineries of nationalistic elites impose their self-determined agendas in pursuit of narrow short-term accumulation strategies at the expense of global sustainability. These are usually conducted in comprador[10] relations with global capitalism. As recognised by the United Nation's Intergovernmental Panel on Climate Change: "there's a more than 90 percent probability that human activities over the past 250 years have warmed our planet. The industrial activities that our modern civilisation depends upon have raised atmospheric carbon dioxide levels from 280 parts per million to 379 parts per million in the last 150 years" (IPCC: 2007). The panel also concluded there's a better than 90 percent probability that human-produced greenhouse gases such as carbon dioxide, methane and nitrous oxide have caused much of the observed increase in Earth's temperatures over the past 50 years.

The planet currently faces multiple tipping points that will ultimately signal the failing of some of the world's ecosystems with life-threatening consequences for all. The IPCC maintains that "with increasing warming, some physical systems or ecosystems may be at risk of abrupt and irreversible change" (2014). According to an international team of scientists examining numerous interdisciplinary studies of physical and biological systems, nine environmental processes were determined that could disrupt the planet's ability to support human life (Stockholm Resilience Centre: 2009). The nine earth system boundaries identified are:

- Climate change;
- Stratospheric ozone;
- Land use change;
- Freshwater use;
- Biological diversity;
- Ocean acidification;
- Nitrogen and phosphorus inputs to the biosphere and oceans;
- Aerosol loading; and
- Chemical pollution.

The boundaries for these processes recognise the limits within which humankind can safely operate. All of the boundaries are interconnected and changes in one area have an influence on each of the others. Seven of these processes have clear boundaries established by science. Three of those boundaries – for climate change, ocean acidification and stratospheric ozone depletion – represent tipping points, and the other four signify the onset of irreversible degradation. The remaining two processes comprising atmospheric aerosol pollution and global chemical pollution have no determined limits due to their temporal proximity and the lack of long datasets relating to them. According to a recent data updates, four of the boundaries (climate change, biological diversity, nitrogen input to the biosphere, and change in land use) may have already been transgressed (Steffen et al.: 2015).

The potentially irreversible climate change implies the loss of productive land, extreme weather conditions, rising sea waters, massive dislocation of people, desertification and serious economic and social upheaval. Other resource shortages like fresh water, forests, agricultural land, and biodiversity are being severely impacted. Depletion of oil and gas reserves impacts directly on the lives of the billions of people of the world and the fragile biosphere. The current production paradigm remains locked into fossil fuel dependencies that include long distance transportation; factory and

other production systems; and corporate commodification This system will become increasingly difficult and constitute an important site of conflict because of the planet as a finite system in itself. In the context of the Anthropocene, under duress of Planetary Boundaries, the Metabolic Rift transforms into a more generalised concept of an ecological rift which has "arisen between human beings and the earth, emanating from the conflicts and contradictions of the modern capitalist society" (Foster et al.: 2010: 1).

CONCLUSIONS: TRANSITIONING TOWARDS A PLANETARY CIVILISATION THROUGH GLOBAL CITIZENSHIP

Human beings are only just beginning to better appreciate the limits of the Earth's capacity to maintain life on the planet. The system of global capitalism has enveloped the planet and established a distinct pattern of combined and uneven development within world-systems. The resulting inequalities, marginalisation and exclusion requires a fundamental reassessment of the life-defining aspects characterising our contemporary social, economic and political paradigms. Converging global living standards between the more developed and mature capitalist systems and the rapidly emerging developing parts of the world will undoubtedly be expressed through further stresses on the planetary boundaries. This is especially true as the vast majority of countries remain outside the remit of benefit flows and a predatory elite further ensures an uneven distribution of material goods and services within countries.

The array of forces emergent from these contested dynamics hold the possibilities of enabling a 'Great Transition' to a planetary civilisation. Significant interests however remain bound within the logic of an expansion of capitalist relations for accumulation through destruction that maintains inequalities and threatens the collective survival of biodiversity and humanity itself. However, as noted by Müller, "(w)hat has changed fundamentally after the financial crisis is the fact that capitalism, the system legitimating most aspects of our modern economic science (and corresponding academic positions), has decisively lost its comfort zone" (Müller: 2014: 1).Gerst et al argue that "(p)erhaps the key theme in the story of the 21st Century will be how humanity addresses multiple threats to the stability of the planetary social-ecological system" (2014: 124). The Global Scenario wove together major economic, social, cultural, institutional, technological, and environmental themes whilst providing disaggregated regional and sectorial detail. Gerst et al suggest that emergent scenarios align with at least three archetypal visions: evolution, descent, and transformation; and which they argue have been "recurrent in the history of ideas and in the contemporary scenario literature" (2014: 125).

According to the UN, "The central challenge in designing the post-2015 development agenda is to ensure that efforts to improve the quality of life of the present generation are far – reaching, broad and inclusive but do not compromise the ability of future generations to meet their needs. Accomplishing this goal hinges on the ability of the international community to ensure access to resources for growing numbers of people, eradicate poverty, move away from unsustainable patterns of consumption and production and safeguard the environment" (2015). As argued by Steffen et al "there is an urgent need for a new paradigm that integrates the continued development of human societies and the maintenance of the Earth system in a resilient and accommodating state" (2015: 736). UNCTAD is supportive of this view and has argued that a very important part of the challenge is for a developing countries to ensure that development is sustained environmentally, economically, financially, socially, politically and in other dimensions as well (2013). They further emphasise the need for a "broader, developmental concept of sustainability – ensuring that development can be sustained in all its dimensions, rather than only seeking to minimise environmental impacts" (*ibid.*). In sum this requires the establishment of an integrated developmental agenda that encompasses both "more viable and inclusive national development strategies and changes in the global economic system to accommodate and support them" (*ibid.*). Unfortunately, such pronouncements from UN agencies have often tended to confirm causal relationships without explicitly mobilising for a more radical systemic and structural transformation. Appreciating our long evolutionary past, reconciling the metabolic rift and liberating ourselves from an irrational and unjust mode of production requires our collective transition towards a shared commons. Global citizenship for a planetary civilisation is within our grasp, should we be willing to release ourselves from the captivity of institutional anachronisms and a political economy of inequality.

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