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Green Transformation through Sustainability of Natural Capital: The Path for Africa

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Abstract
Carbon emission and green growth are not just coterminous but axiomatic necessity which is closely inter-related with our biospheric limits. Carbon-based growth for low-income countries will ensure the transition to middle-income economy but presently such growth is based on resource depletion. For Africa, natural capital is the large bowl for the transition to middle-income country. However, growth based on exhaustion of natural capital is not ecologically neutral. Our results suggest that biomass holds great potential for improving the economic wellbeing of Africa in the post-Paris era. Despite its beneficial attribute, biomass extraction forebodes grave danger for the bio-geophysical properties of the planet capable of magnifying existing inequalities within and between societies. Africa has acceded to non-binding cuts in greenhouse emission. But with business as usual attitude, unsustainable extraction and consumption will continue into the future, thereby reinforcing climate-related extreme events. Though green transformation is fast catching on, it is not economic 'Uhuru' as the journey to ecological disequilibrium has begun in earnest, which is threatening to undermine the narrow gains of eco-efficiency. Therefore, it is sunset at dawn for the poor, a paradox of sustaining man's wellbeing on the heels of its consequential impacts. We conclude by advocating a policy mix of materialization and dematerialization as a solution to Africa's agro-ecological deteriorations. To this end, the paper comprises five sections. The introduction is section one. Conceptual issues form the second section while the driver of biomass economy is the third section. The fourth section is on the path forward with the conclusion as the last section.

Keywords
Biomass economy - climate change - food security - green transformation - natural capital

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1. Introduction

Natural capital plays a vital role in biomass economy globally. Biomass economy relies extensively on the existence of stable environment provided by the ecosystem services to grow [1, 2, 3, 4]. Hence natural capital is essential for human as well as planetary existence. Albeit, the pace of industrialization has grown with the utilization of natural capital to provide humankind's basic needs which is exacerbating climate change [5, 6, 7, 8]. Natural capital is also vital for providing local communities and industries with the much-needed energy to provide their material wellbeing [9]. However, the process which provides humans with their basic needs also engenders depreciation of natural capital.

Carbon production and consumption play crucial roles in food, energy and water production, globally. As a result, the world energy production and consumption are gradually rising. In 2010, the world's energy consumption grew by 5.6% faster than any year since 1973 hence, the single largest demand humanity puts on the biosphere is its carbon footprint which has increased tenfold since 1961[10]. The International Energy Agency (IEA) [11] report projected that Africa will witness increases in biomass consumption by 2035; whereas in other regions it is expected to reduce. And that with business as usual scenario Africa's consumption will rise with exponential population explosion leading to between 51% - 57% higher demands for biomass. Global demands for energy is on

the rise with serious consequences for natural capital. If the trend persist unreversed, countries in the Southern hemisphere will face the dilemma of how to reconcile their energy consumption and carbon footprints within acceptable limits. Certainly, economic development in Africa has not really matched with physical growth of capacity of nation-states and other actors to manage the consequences of growth. For now, growth in the biomass sector has led to depletion of the social ecologies and the increase in food insecurity in Africa [12, 13]. Although Africa made remarkable progress towards consolidating biomass and waste by advancing the integration of renewable energy into the energy supply mix [14, 15] but most of such measures are at the expense of natural capital. With business-as-usual scenario, unsustainable biomass extraction and consumption will grow to about 51% - 57% in the 2035 [9] which will reinforce climate-related events [16, 17, 18].

Most recently, there is the growing emphasis on modern biomass economy as capable of ushering an era where biomass consumption and production are not just heightened but are ecologically sustainable [14, 10]. Nevertheless, the low carbon future is already taking shape. What has emerged is that utilization of waste will rather reconfigure the global socio-economic space [10, 18]. For Africa with low adaptive capacity, a new power configuration of bio-corporations who are intent on defending the interests of the economically powerful lobby groups has emerged [19, 20, 13, 21].

Balancing the interests of the diverse groups with different intentions for Africa's natural capital is critical to her green transformation. The challenge to Africa's low-carbon future is the focus of this paper. This is critically examined in the light of the threats to Africa's green infrastructure in the unbundling of ecosystem services through the current financialization of the natural capital drive. In the paper, we will examine how Africa can sustain its natural capital through green transformations. But such transformation must also ensure that economic growth initiative is not derailed by pollutions which will lead to further destruction of the ecosystem.

Hence the central plank of this study is to provide us with an ecologically benign path out of the existing political gridlock resulting from Africa's quest to build a green society. This is an upshot of the central question asked by some political ecologists on mankind's progressive exhaustion of natural resources based on the present-day growth-oriented development. The study goes beyond this to situate Africa's socio-environmental conflicts in its proper ecological milieu where conflicts between different forces struggling to subvert nature are commonplace. Our analysis of nature here is not limited to the flow and depletion of natural resources alone. The analysis transcends this simplistic view of man/nature dualism but delves into the issue of resource conflicts. Here questions such as: who uses these resources? When? For what purpose is it used? At what cost? And, with what impacts are answered.

2. Conceptual Issues

The environment consists of natural resources viewed largely as natural capital. Daly [22], describes natural capital as the stock which yields the flow of natural resources; the population of fish in the ocean regenerating flow of caught fish meant for the market, the standing forest which regenerates the flow of cut timber, the petroleum deposits on the ground whose liquidation yields the flow of crude oil. The environment also plays the crucial role of 'stock'. As a stock concept, the environment can be measured by indices of air and water quality, ore deposits, genetic diversity and so forth [1, 2]. It represents raw materials that flow directly into the production and consumption processes. These resources can be further differentiated into renewable and non-renewable resources [23]. On the other hand, the environment can be viewed as a sink. And as sink concept, the environment performs the vital function of absorbing carbon dioxide emitted by pollution while through decomposition it can also reproduce environmental capital [4].

Different types of capital exist and this depends on the stock which produces the range of ecological/economic goods and services used in the economy. These are: natural capital, human capital and manufactured capital with the latter two as human-made capital [24, 25]. Natural capital and human-made capital are inter-dependent hence to some extent complementary. Given this, natural capital and human-made capital are essentially complements and not substitute. Natural capital to a large extent is the determinant of development as it is a limiting factor. Therefore, to sustain income natural capital must be maintained. For this reason, the stock of natural capital should not be extracted such that it limits the regenerative capacity to sustain the well-being of not only present but future generations. In this sense, there are bound to be trade-offs. That is, we must pick an option either to reduce the pace of economic growth in preference for eco-transformation.

In order for us to really grasp the importance of this epochal shift in the transformation of nature, one must consider the biological and biogeophysical alterations that follow human activities in this era. For starters, all species of the animal kingdom are engaged in constructing niches [26] but humans have excelled in the construction of niches than all other species put together [27]. Human niche construction is highly reliant on energy creating more greenhouse gas which is eroding the ozone layer [28, 29]. However, this climatic reordering of the planet has a large anthropogenic causation [28] leading some scientists to

refer to this current era as the Anthropocene [30] or the Homogenocene [27]. Whilst others like Moore [31] refers to this age as the Capitalocene. However, McBrien [32] sees the Capitalocene as also a Necrocene – a system that not only accumulates capital, but drives extinction. To a large extent, Anthropocene or Capitalocene are weasel words of the rich and powerful to replace their epochal accumulation with a more seemingly benign word where humanity bears the blame for their fossil-led growth.

Because of these controversies, natural capital's appeal as a mobilizing agent for political engagement has declined. With its decline, its power as a radical agenda has been neutered [33] and as its radical stance is neutered, the ecological concerns no longer constitute a space of political contestation. What has emerged is that the liberal-capitalist state has appended "the environmental problematic to its 'crisis management' functions and logic", with the claims of ecologism now redundant to contemporary politics [34]. The worrying thing here is even where scholars have succeeded in the reconceptualization of nature; the trend towards globalizing environmental crisis does not change the energy crisis. Rather, in fact: it is an affirmation of the energy crisis. This, again, is indicative of a 'post-ecological politics' wherein the eco-politics surrounding our exploitation has degraded it to the extent it can no longer be regarded as a potent paradigmatic critique of modern industrial capitalism. Indeed, the eco-politics is degraded to a level where it cannot provide a scaffold for an alternative normative and ethical framework for the organization of human societies or for a transformative praxis [35].

Accordingly, the reconceptualization of our ongoing transformation of nature is strictly anthropomorphic [31] which only obscures humankind's reconfiguration of nature [33]. Thus is largely a mystificatory concept designed to hide our heinous waste of global resources. The main strength of the ongoing rationalization of nature lies in its ability to unify humanity and nature in one long embrace of mutual destruction which is also its principle weakness of falsifying the mutuality of the destruction [27, 31]. The result is that the environmental crisis constitutes merely one issue amongst many, capable of amelioration through the apparatus of market liberal theories [35]. Written large, market liberals' appropriation of the green economy is a work in progress. Not only that the interference from the market capitalists' portend grave danger to the environment but it is with serious consequence for an alternative normative framework.

In reviewing the market liberals' re-appropriation of greening in sustainable development Bluhdorn [35] concludes: 'the project of constructing ecological theorization to be an ideology in its own right thereby providing a consistent basis for the ecological restructuring of society has not only failed – theoretically as well as politically – but is outdated'. Stated most simply, the political demands of ecologies have been translated into the vocabulary and mechanisms of the very system it seeks to dethrone, unwittingly consolidating its hegemonic sway [36]. So, we are transitioning into an era of unchartered research in the transition to an ecologically sustainable polity which is now making implementation of the green economy concept a tricky endeavour. It is a tricky exercise for the mere reason that it is on a treacherous grounds with diverse complexities emerging daily. These complexities are not only linked to the use which the analysis of greening is put but also to the fact that it has different ramifications for the socioeconomic circumstance of the affected states. In the past, the solution to these seemingly intractable problems lies in formulating an extractive trajectory which the continent must follow. It is in conformity with this that liberal scholars energetically pursue pro-growth natural capital agenda or what is generally known as the financialization of nature considered (in some quarters) as the only appropriate toolkit for Africa's economic development [37]. Under this skewed economic setting, there is an overt attempt at conflating unfettered free market approach to nature based on the economic rationality of market instruments as the only primary supplier of all advice on human preferences. Quite the opposite, in fact: nature also exerts its influence on mankind with an appreciably greater weight in determining the optimal allocation in society.

Despite nature's pressures, the undertaking to unpack human/nature relations has not really changed. Rather, is slanted towards humans neglectful of nature's potential value. Given its short-term benefits, most scholars preoccupied with research on Africa agroecological crisis lashed onto this mainstream model with the hope of transiting from traditional societies to a modern state. In most of these enclave economies, there are appreciable developments using natural capital as the breadbasket of their growth. On the basis of its high carbon intake, the road to Africa's economic development has been paved with the depletion of natural capital. The argument here is that different societies should profit from their natural resources irrespective of its consequences for nature.

2.1 Sustainability of Natural Capital

Humankind receives extensive benefits from the natural environment in the form of goods and services provided for economic growth, energy, protection from floods and soil erosion. It is expected that at the earliest stage of development, societies will depend heavily on these natural resources for economic growth. In the wake of heightened economic activities culminating in growth and development, natural capital has been increasingly transformed into physical and social forms of capital. This transformative process is an attribute of capital in its attempt to rebalance itself in every era. For an economy

to develop sustainably, its productive structure should be flexible enough to allow substitution between scarce and abundant forms of capital. Additionally, there should be a change in technology before productivity is increased in the face of declining resources throughput. This assertion, according to Hartwick [38], is not justifiable because for sustainability to take root, society should first invest all its profits or rents from exhaustible resources in the reproductive capital. This process may not endure indefinitely since it depends on the extent to which physical capital is substitutable for natural capital. However, this may not subsist because it is also necessary in some cases to combine the conversion of capital stocks with directed technological progress. The possibility for this process to endure indefinitely depends on the extent to which physical capital is substitutable for natural capital. However, UNEP [39] cogent analysis of sustainability from experts indicates that substitutable natural capital together with the reinvestment of capital (the so-called Hartwick-Solow rule) is a necessary but not sufficient condition for sustained growth. It is, therefore, necessary to combine the conversion of capital stocks with directed technological progress. While Smulders [40] argument is, in the face of decreasing returns to capital, growth will cease in the absence of technological progress that is capable of securing increasing productivity from reduced resource inputs. Given this argument, what then is sustainability?

Simply put, sustainability is "non-declining consumption" over time [41]. The ultimate goal of economic growth is to provide avenues for consumption to continue infinitely. Nonetheless, consumption itself is an act of depletion and once most items are exhausted regeneration takes a very long time. The argument here is sustainability is a matter of taking decision in the short-run with no serious negative impacts in the long-run. Field and Field [2] stepped up to argue for sustainability noting natural biological and ecological processes create connections between the rates of resource use in the present and quality of resources available to the future generations which is the ultimate focus of sustainability. Therefore, the resource use rate which is sustainable is one maintained over the long-run without impairing the fundamental ability of the natural resource base to support future generations.

The idea here is sustainability should not be taken to mean natural resources are left untouched. Instead, it should be cognizant of the intergenerational equity between the present and future generations in resource use and distribution. This then means that the present consumption should be at a rate ensuring the stock of non-renewable resources contributes to the long-run economic and social health of the population. In the case of renewable resources, this implies establishing rates of use coordinated with the natural productivity rates affecting the mode resources grow and decline.

2.2 Biomass economy

Biomass economy has been considered one of the fastest growing sectors in Africa [10, 16]. Biomass economy proponents see agriculture as potentially effective in transforming the economies from fossil dependence to a low-carbon economy where carbon consumption causing climate change is limited. Its remit is to promote non-fossilized biological materials as feedstock for production. Biomass economy comprises of traditional and modern biomass economy [10]. Traditional biomass economy is basically based on wood fuel and waste consumption for energy while the modern biomass economy makes use of agricultural feedstock for energy. Here, large amounts of biomass are applied as feedstock in the industrial production of synthetic materials, such as bioplastics to replace cokes in iron and steel manufacturing [42]. Whereas Kulshreshtha, McConkey, Liu, Dyer, Vergé, and Desjardins [43] sketch the sustainability of biomass economy landscape by defining and identifying sustainable choices as those maximizing per capital utility subject to ethical constraints in that per capita utility will not decline over time. This utilitarian formwork can be applied to derive sustainable outcomes in the context of biofuel, and in particular to identify which bio-feeds to produce.

In biomass economy, agriculture is the driving force but relies on biotechnology to harness this energy. However, biomass economy is not entirely new per se but is part of the current reinvention of the age known process of appropriating nature. As Monbiot [44] suggests, the current financialization of natural capital serves to unbundle ecosystem services such that they can be individually traded. Even then, we cannot safely disaggregate green infrastructure without destroying its functions as a coherent holistic system. Ultimately, however, neo-Malthusian concern for the degradation of the ecosystem as the driver of growth is the kernel of modern biomass economy since it is certainly exhaustible and can also be pollution augmenting. Thus, it is a double imperative with a double-edged sword. Crucially, its effectiveness as a transformative process is dependent on those applying biomass technologies and the goal of attaining the bio-based economy. If the bio-economy places a higher premium on shareholder returns, then, profit-maximizing technologies will further ensure ecological deteriorations. It is a disservice to the green infrastructure. When the goal of a biomass economy out rightly considers planetary heritage, its emphasis will be on efficiency in resource utilization leading to eco-equilibrium between consumption and production. Clearly, then, biomass economy is only sustainable to the level of how we allow green technologies to relate with us and nature. If the economic pillar of sustainability is superimposed over the ecological or social pillar, the goal of bringing about an equitable

transition to a low-carbon society in biomass economy will be defeated. If not, then we shall arrive at an eco-disequilibrium wherein economic needs and ecological resources are discordantly interrelated.

In the current green valuation regime, land grab is the future of biomass economy. Land grabs is an international phenomenon associated with the biomass economy. It is a global phenomenon dealing with the purchase of vast tracts of land by wealthier food-insecure nations and private investors from mostly developed countries in order to produce crops for export [19]. For this reason, it can be assumed on the surface land grabs are beneficial to both the foreign investors and the host communities. Interestingly, some of the current participants in the 'new scramble for Africa' also experienced colonial rule [3]. In fact, the driver of Large Scale Land Acquisitions rests more on the economic hegemonic pretensions than in the claim of feeding the teeming hungry population of the South. Certainly, the search for an alternative source of food and energy is theoretically the main basis for the land grabs. However, geostrategic machination of the investors is the most important motive for land acquisitions [45]. And the medium through which such land deals are implemented is through the use of force. Force, here, ensures compliance. Still, forceful eviction of the real owners of the land is ecologically entropic as further constraints are placed on the green infrastructures not just by the bio-corporations but most importantly by the displaced farm families. Resolving this ecological disequilibrium will require curbing depletion by all parties engaged in the decimation of natural capital.

3. Drivers of Biomass Economy in Africa

There are different factors acting as drivers of biomass economy in Africa. These drivers are not only interrelated but are agriculture based issues, therefore, have food security imperative. The drivers are intricately linked with food, fuel and financial crises. The specific drivers of biomass economy are as follows:

3.1 Alternative source of fuel

Traditional biomass is driven by the growing need of the people to use bioenergy for domestic purposes. In Africa, over 80% of the population depends on wood as a source of energy. Traditional biomass consumption is widespread with most of the rural dwellers burning wood for fuel. Poverty is a major driving force for this untenable extractive business. With most of the poor in rural areas, finding a ready alternative to wood fuel is a difficult endeavour. The Intergovernmental Panel on Climate Change Fourth Assessment Report [29] links this rising trend towards the biomass economy to increases in GHGs. Cognizant of the perilous state of global carbon emissions, different nations seek to reduce their fossil dependency by finding alternative sources of energy. With the incidence of climate change, finding an alternative source of energy to reduce emissions of greenhouse gases informed the recent traction of bioenergy. Given this scenario, production of biofuel is viewed as a solution to the carbonization of the biosphere and is also a major trigger of the transformation of natural capital in Africa [12], The biofuel boom, therefore, is driven by climate change doom and the need to provide alternative sources of energy through food crops such as maize, sugarcane, palm oil and non-food crops like Jatropha.

3.2 Food security

The threat to food production underpins the biomass economy globally. In biomass economy, large-scale land acquisition is considered a strong incentive to invest abroad. In doing so, it is hoped will ensure the investors have food when there is crisis. Praskova [46] links the land acquisition to rich countries that face food supply problems and/or constraints, such as low agricultural productivity. This may be due to limited water supply or productive land (land degradation, soil erosion) or population growth and trends in diet changes (shift to greater consumption of dairy products and meat is increasing the need for animal feedstuff; geotrategic machination, climate change, market constraints and profitability logic). The constraint experienced by the region where water shortages are high is very significant thus are the vital impetus for the land grabs. Countries in the Middle East faced with water shortages also need new fertile lands to augment their depleted food supply.

Significantly, the race towards the biomass economy is exacerbated by the 2007/2008 global food and energy crisis. Food hikes of 2007/2008 propelled major food exporting countries to restrict food exports thereby posing further constraints to those who rely on them. Though prices of maize, wheat and other food crops have dropped since 2008, some of the structural factors underpinning rising prices are likely to stay [3]. To avoid committing the costly mistakes which led to the food shortages, most nations now establish farms in a foreign land to guarantee their access to food in periods when there are shortages. This is not only to avoid depending on exporting nations but this will also reduce their import bills. By so doing, net food-importing countries sought to guarantee their food security by maintaining direct control over the production and supply of the food chain as outsourcing food production abroad is a ready solution to their food crisis.

3.3 Demographic Explosion

Demand for biomass is also heightened by demographic pressures thereby placing severe strains on the agricultural system. Population growth and urbanization limit food supply as changing diets and consumption patterns by the middle class in emerging economies pushed up

food demands [13]. Against this background, acquisition of new sources of producing food is vital for the survival of these states. Thus, it is a strategic choice to engage in the biomass economy in Africa where land is inexpensive and where institutional debilities have put in place governments who are more amenable to investors' overtures.

3.4 Financial Returns

Traditionally, agricultural value chains have tended to concentrate returns in processing and distribution, while the risks fall mainly on primary production acting as a disincentive for investment in agriculture [3]. But all this is changing with the mad rush for land. In the aftermath of the 2007 financial crisis, many investments portfolios collapsed. The drive to invest in new enterprise lies with the fact that present investments were considered too risky. Investing in biomass and agriculture, therefore, was seen as a new safe and profitable investment in an unsteady financial context. Big time investors considered farmland investment as the future of investment funding. This explains why land grabs in Ethiopia are very high, with more than 90 funds from all over the world investing in their farmlands [47].

3.5 Carbon Market

Carbon trade is a market-based mechanism for trading in carbon with the view to reducing the production and consumption of carbon. The fossil fuel dependent global economy has been the principal source of emission of greenhouse gases. It is perceived that through reduced emissions from deforestation and forest degradation in developing countries (REDD+) mechanism carbon stored in forests can be valued and quantified. Once forests are commodified by placing value on it, it will then improve the sink function of the forest. In this sense, the forest is seen as more valuable standing than when they are cut down. Private companies will have to earn the right to cut down trees or emit carbon either by planting new trees somewhere else or by initiating better forest management [17] in anticipation of increased return. By using the land for forestation projects many firms are now targeting long-term gains through their investment in land.

3.6 Carbon Credit

Carbon credit is part of the Clean Development Mechanism negotiated at Kyoto as the climate change regime. To La via Campesina [20], a carbon credit is equivalent to the emission of a ton of carbon dioxide. Compared to the current rate fixed by the Kyoto Protocol, it allows its holder to emit more gases which are responsible for global warming. Carbon credits are allowed to state or companies participating in reducing GHG emissions. Such carbon appropriation is supposed to help participating countries respect their engagements to the Kyoto Protocol. A good example of where this scheme featured prominently in the initiation of a project is Mali's Biocarburant biodiesel project in the Cede of koulikoro. According to Via Campesina [20] report, carbon credit of $65,000 from the Netherlands and Switzerland governments is the source of the biofuel project in Mali. Generally, funds used as carbon credit are mostly derived from $130 billion dollars set aside by rich countries as part of their commitment to the Kyoto Protocol. It is based on the idea that the best way to control climate change is to transform carbon emissions into exchangeable good on the international market.

3.7 Growth in Transition Countries

Unprecedented economic growth in transition countries immensely facilitated land grabs. In the last decade, BRICS (Brazil, Russia, India, China, South Africa) nations recorded impressive growth both in economic and demographic spheres [13]. This growth necessitates finding alternative avenues to invest fund and as a source for food production to feed their rising population. This fuelled interests to acquire farmlands in a foreign land to reduce their food and energy constraints. Consumers in these countries are demanding higher standards of living and are in a haste to catch up with Western welfare standard. However, the Western consumptive pathology comes with the high price of degrading the environment. This has become necessary in that developed countries in their rapid industrialization degraded the environment and are still set to continue into the future. Finding new sources of energy is a precondition for a food secure future. Premised on this, BRICS nations are actively involved in large-scale land grabs using South Africa as their regional hub. Matondi et al. [13] are of the view that the large-scale acquisition of land has renewed interests in plantation-based agriculture globally. The renewed interest in plantation-based agriculture is itself fuelled by scepticism regarding the effectiveness of market and trade mechanisms guaranteeing access to basic food supplies. This is in fulfillment of the promise of using large-scale agricultural production to modernize the agricultural sector in low-income countries. But in places where the diffusion of technology is taking place, the pace has been slow if it even occurs at all [19].

3.8 African Countries' Incentive

The incidence of hunger and starvation are on the rise despite growth in GDP in many low-income countries 48]. Industrial agricultural food production is perceived as a strong mechanism to grow the economies using mechanized agriculture as a source of employment and revenue. Given this, Foreign Direct Investment is perceived as capable of bringing new technologies, developing productive potentials, facilitating infrastructure development, and creating employment and supply of food to local markets [3]. Some African countries also needed to diversify from

depending on a single resource-based growth. Examples of such monoculture entities are oil in Sudan, copper in Zambia (using agriculture as the alternative [12]. Attracting foreign investor to grow food and biofuel crops locally is a means of not only improving their rural dweller's economic well-being but will most essentially transfer new farm techniques to the host countries.

4. Sustainability of Natural Capital in a Biomass Economy

Africa is a continent where large proportions of the people still live in rural areas. Of this, about 80% are engaged in agriculture-related activities. The livelihoods of many people who directly depend on natural resources are intricately linked with exploiting the fragile environment and ecosystem. In Africa, the level goods and services have drastically reduced with the natural capital failing to meet all their requirements. Africa in the haste to build cities and develop approximate infrastructure for human welfare have been depleting the ecosystems at an unsustainable rate. Prediction for the coming years indicates that declines are inevitable if the world is to continue with its consumption culture [11]. Population growth, changing land use, economic expansion and global climate change are accelerating Africa's natural capital degradation. Given this, most countries have witnessed large-scale soil erosions and water-quality deteriorations, deforestations and declining soil productivity in rural areas [3]. Similarly, urban areas like Lagos in Nigeria, Johannesburg in South Africa, Cairo in Egypt and a host of others are now increasingly confronted with the challenges of diminished air, and water quality [49]. The main reason for this is the strong priority on economic growth seen as ensuring sustained improvement in living standards of the people. Giving the high priority placed on economic growth in some countries in sub-Saharan Africa, extensive demands are placed on ecosystem services. Therefore, demands for goods and services have outstripped supply for several commodities putting more pressures on natural systems. And as a healthy ecosystem underpin all economic activities, the quality of life and social cohesion is affected by the defective interaction with the source of man's well-being. Consequently, the Congo basin which is the second largest rainforest in the world known to provide man with shade from excruciating rays of the sun is depleted daily for timber and bio-prospecting. With this, its natural function as an animal sanctuary for many species is threatened. With the current accelerating pace of resources depletion, Africa is challenged into rebalancing economic growth and environmental quality. The dilemma most nations face in the post-Paris era is whether they should pursue economic growth through intensive dependence on natural capital or they should deliberately maintain a desirable extraction within the earth's carrying capacity. This is in line with the Intended Nationally Determined Contributions most states hastily crafted which tantamount to positive management of the environment for present and future generations' well-being.

Africa is a continent in a hurry to catch up with the West. However, the pace of catching up might be slowed down with the Paris Agreement. At the conference of the parties to the Kyoto Protocol, most states in Africa acceded to carryout radical reduction of greenhouse gas emission in order to achieve the 1.5oC mean global temperature objective of the accord. In doing so, will place their economies on the path to a low carbon growth. Nonetheless, natural capital exhaustion is the breadbasket of growth in most states with the prospect of transforming the economic fortunes of these countries. Give this, the promises of Paris are not only far-fetched but are not really sustainable within the economic and political circumstances of the states. Most states faced with series of crises may jettison the commitment in opulent pursuit of economic development on the back of fossil fuel. But Africa is neglectful of the fact that rapid industrialization and urbanization comes at a price: the ill-health of the environment. Since no nation can achieve substantial economic growth without large-scale urbanization and industrialization; the problem then is how to ensure eco-efficiency and eco-equilibrium in resources utilization without the huge environmental costs. No doubt, the concerns for the environment are a more recent phenomenon in Africa. Nevertheless, such concerns are not misplaced. Hitherto, the emphasis was on economic growth which historically has been the defining focus of most developing economies. In this landscape, emphasis on economic growth was conceived as the appropriate framework to close the economic gap with the developed economies. With the prevalence of threats of different caliber, Africa's major challenge is how to reconcile the competing needs for economic growth with eco-development within the framework of their obligations in Paris.

Again, an eco-efficient future will require a pathway capable of reducing carbon dependency; promote resource and energy efficiency while lessening environmental depreciations. That is to say, Africa's growth should transcend the 'brown economy' most states will follow despite their commitments at Paris. (A brown economy is one heavily invested in environmental dependent assets but sacrifices environmental quality to attain economic growth). On the basis of this, embracing brown economy is with serious consequences for Africa. Hence finding new ways to protect the global ecosystem, reduce the risks of global climate change, improve energy security while simultaneously improving livelihoods assets of the poor is important for Africa's quest to achieve equitable green transformation for its people. By extension, the major source of

the livelihoods for the poor should be made sustainable. Biomass should be operationalize in a manner that ensures equity not only between different class of people but with nature thus is with an intra- intertemporal dimension.

5. Path Forward

The central task of policy in Africa today is how to navigate between the narrow lines of policy initiatives for the good health of the environment and eschewing solutions that foster catastrophe. Balancing this contending issue requires tradeoff as the green transformation policies formulated should go beyond a prescriptive outlook of nature to evidence-based diagnosis. No doubt, environmental quality and resources depletion are issues very fundamental to the green transformation of rural societies in the post-Paris era. Policy initiatives such as the green economy concept [39] can correct this since it recognizes the critical role population pressures and ecological integrity play in ensuring ecological balance through improvement in people's living standard thereby reducing poverty and inequality.

To achieve an efficient use of energy will require a level of production of resources (materialization) [50]. But such production of critical natural capital in the guise of fostering efficiency will lock the present generation into a fossil fuel dependent future. Correspondently, there will be degradation of the quality of life if there is minimal utilization of resources leading to unsustainable growth. Even then, efficiency gains in green growth do not always imply a reduction in the total material and energy input. So, to achieve an efficient use of energy some level of de-materialization is also needed. This will require a cultural shift as well as reprioritization of the production or consumption of biomass towards building a green society [16]. A green society is one heavily invested in people, one that is fair, equitable and inclusive [21]. A fair and socially inclusive society should also be climate resilient and eco-efficient and one where environmentally sustainable growth is possible [5]. Building a green society requires profound structural transformations involving reorienting society in a comprehensive manner towards a deeper understanding of human/nature interdependence. Improved knowledge of nature would spur interest in the vulnerable class and in so doing empower women and children to bring about inclusive participation in decision-making processes. But hamstrung by poverty, the vital bridge between pollution and environmental quality may never be crossed. The present building block for transformation based on the market [23, 25, 39] is no panacea to humankind's environmental despoliation [31, 51]. Salvation for Africa's environmental malfeasance cannot be addressed in silos but in holding perpetrators to account for their actions. Taking prompt action on businesses that foul the environment is inevitable. Cases such as those despoiling the environment of the Ogoni people in Niger Delta of Nigeria, the Chinese illegal miners of Ghana and those plundering forests resources in Cameroun and the Central African Republic hunting endangered animals in East Africa in the name of participating in Safari must be promptly dealt with through legal instruments [51]. Bold commitment in establishing sound policies is a critical building block for sustained prosperity. An equitable growth cannot occur on the present BAU platform but on scaling down pollution hence climate change [28, 29, 51, 52].

Any decision on clean energy transition must be guided by the vision of eradicating poverty [39] once and for all. The post-Paris framework of 2015 and SDGs of 2015 collectively have attempted to answer issues regarding humanity's future. With powerful lobbies from energy, food and beverages industries and kingpins of fossil fuel embedded in most countries, it is doubtful if any optimization of natural resources can take root. In most cases it will depend to a large extent on the nature and form of our valorisation and economisation of nature.

Most importantly, resolving the issue of Africa's green transformation through the biomass sector hinges on good governance which is the bedrock of a sustainable energy future. Yet, it is still linked to the prerogative of different societies which also dovetails to the goal of their political office holders. Where the political class is aligned with large businesses, the preferences of the elites will prevail against those of the larger society. In Africa, the absence of a vibrant middle class and want of credible leaders have turned the continent into an eco-colonial enclave of pollution and expropriation of natural resources. And where this sharp practice still exist the institutionalization of the green economy will stimulate growth but cannot totally enshrine an eco-efficient revolution in the allocation of resources.

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