THE LANGUAGE OF SUSTAINABILITY: EXPLORING THE IMPLICATIONS OF METAPHORS ON ENVIRONMENTAL ACTION AND FINANCE

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Abstract. The relationship between humans and the environment is complex. To capture this complex relationship, metaphors/concepts have always been used. The most prominent of these metaphors/conceptions is the limits concept. This views the natural environment in terms of its carrying capacity and contend that human actions must be controlled so as not to overwhelm the environment. For overburdening the environment will result in a collapse of the natural system. The environmental optimists on the other hand discount the carrying capacity contending that human ingenuity and the market mechanism will overcome any temporary environmental problems that may arise. A tempered version of both is the political-ecological class of metaphors/conceptions which emphasize the political, cultural, and economic factors responsible for environmental decay and/or restoration. In this study, the implications of these metaphors/conceptions on environmental action and environmental finance are examined. It is concluded that, the limits conception views environmental action as a top-bottom endeavor and places governmental and multilateral organizations at the center of environmental and climate finance. The neoclassical and technological optimist concepts contend that, the current capitalist structure is well suited to tackle environmental externalities and government policy should encourage eco-innovation preferable through public-private partnerships. The tapestry and the political-ecological class of metaphors envisages a role for central authorities as well as private local individuals with crowdfunding and corporate social/environmental responsibilities along with governmental and multilateral aid and public-private partnerships being some of the main sources of funds for environmental protection and restoration.
Keywords: *green finance, limits to growth, environmental optimism, environmentalism, political ecology*

Introduction

The malignant impact of human activities and the concept of the carrying capacity of the environment and its implications on the quality of life has long been a subject of social thought and philosophy. In ancient China, the ancient philosophy of harmony (or harmonization), said to predate Confucian times, encapsulates intra and interpersonal harmony and harmony between humans and the natural universe (Li, 2006). Harmony is said to exist when there is a healthy, and stable interplay among persons and things. This necessarily means that humans must not be destitute neither should the natural world be overused. Confucius's idea that "The Wise Find Pleasure in Water; The Virtuous Find Pleasure in Hills" was underpinned by this belief that man is part of nature and should obey and be kind to nature for a harmonious living. This was very impactful on the environmental culture of later generations (Shaoyao et al., 2016).

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Indeed, Kula (1997) reports that there are records pointing to the existence of conservation officers for forest and mountains charged to protect trees and animal species as early as Eastern Chou period (eighth to third centuries BC). These conservation officers exuded the spiritual understanding that nature should not be disturbed and was mandated to educate the common folk on the harmful consequences of environmental destruction.

In The Republic, Plato cautioned inhabitants of the state to be warry that their families do not exceed their means less they will have an eye to poverty or War (Reeve, 2004). Even Aristotle whose philosophy is underpinned by the centrality of humans in the universe's architecture recognized the impact of environmental limits (particularly land) on the achievement of what he termed Best Life. Best life in Aristotelian philosophy presupposes material wealth which is determined by the relationship between land and the population and since land is limited, population control was the only means to increase the material wealth per person. As such, he advocated for population control (Lianos, 2016).

Since the publication of the Wealth of Nations by Adam Smith which essentially birthed Economics as a distinct subject of study, the implications of the environment for economic life have been discussed and theorized at large. Adam Smith in the Wealth of Nations remarked that the fertility or barrenness of the mines (depletable earthly resources) may have no connection with the state of industry of the world and as such no certain limits to the success of human industry (Smith and Cannan, 1937). What Smith sought to advance is the unknowable nature of the quantity and/or limits to depletable resources.

The environmental determinism implicit in Platonism was re-echoed by Malthus in 1798 in his "An Essay on the Principle of Population". Malthus in this book noted that Population, when unchecked, increases in geometric ratio. Subsistence on the other hand increases only in arithmetic ratio. Anyone with a slight acquaintance with numbers will appreciate the immensity of the power of geometric progression in comparison to arithmetic progression (Broten, 2017). This observation formed the basis of the Malthusian Catastrophe which predicts that overpopulation will overstretch the environment to the extent that food production will not be able to cope with population growth leading to starvation and in turn a catastrophic decline in population.

The pessimism that informed, or perhaps, that this prophesy instilled is still harbored by a lot of people albeit in a broader context with Meadows et al. (1972) contending that the ability of nature to support human population, agricultural and industrial activities and pollution is limited with supposed evidence increasingly showing a growing decadence in this ability.

Just as Malthus conceived food production to be limited by the fixed arable land available, most environmental issues have been discussed using the concept of limits with the Club of Rome's Limits to Growth trumpeting how an uncensored growth in population, industrial production, extraction of depletable resources, growth in capital resources and pollution will reach a threshold beyond which the natural environment will no longer be sustainable and thus lead to human decimation (Meadows et al., 1972). The Club of Rome's publication in particular did a lot to liberalize environmental and climate debate making it mainstream. This kind of environmentalism has been termed environmentally deterministic by Norgaard (2006).

These prophesies of doom as espoused by Malthus, the Club of Rome and other environmental determinist have since been proved wrong thanks to technological

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progress which has boosted food production beyond what was imaginable during Malthusian times.

These unfulfilled prophesies of doom have emboldened neoclassical and technological optimist like Simon (1996) to argue that there are no physical or economic reasons to believe that human resourcefulness and enterprise cannot forever solve the issues of "temporary" environmental problems and leave us ultimately better off. This idea that the environment is malleable with human ingenuity has been termed cultural determinism by Norgaard (2006).

Another conception of the environment that is now gaining traction is the political-ecological approach which encapsulates the tapestry metaphor and the human-environment coevolutionary process of Davidson (2000) and Norgaard (2006), respectively. The tapestry metaphor views the environment as a masterpiece of tapestry that is frayed by human action and the human-environment coevolutionary process conception contends a mutual determinism between the environment and human actions/culture. Both emphasize the importance of going beyond the unidirectional determinism to examine the political, social, cultural, and economic factors that result in environmental decimation and/or restoration.

The purpose of this study is to exhaustively examine the various conceptions of the impact of human action on the environment and the implication of these conceptions for environmental action and environmental finance. As such, the various metaphors/conceptions of the environment, their implications for environmental action and for environmental finance are evaluated.

It is concluded that, the limits conception views environmental action as a top-bottom endeavor and places governmental and global multilateral organizations at the center of environmental and climate finance. The neoclassical and technological optimist contend that, the current capitalist structure is well suited to tackle environmental externalities and government policy should encourage eco-innovation preferable through public-private partnerships. The tapestry and the political-ecology class of metaphors envisages the decentralization of environmental action and environmental finance with crowdfunding and corporate social/environmental responsibilities being some of the main sources of funds for environmental protection and restoration.

The remainder of the paper is presented chronologically as follows. Section 2 discusses the limits class of metaphors, their implications for environmental action and the criticisms advanced against the limits conceptions. Section 3 evaluates the optimistic conceptions of the environment, their implications, and the criticisms against environmental optimism. The last class of metaphors, the political-ecology class of metaphors, mainly the tapestry, and the culture-environmental coevolutionary process is examined in section 4 with their implications and criticisms. Section 5 examine the implications of the metaphors for environmental finance and Section 6 concludes the study.

The Environment and Limits to Growth

The first and most eminent metaphor of the environment is the concept/metaphor of limits which encapsulates the writings of Malthus, Paul, and Anne Ehrlich, Boulding, and Denis Meadows and the Club of Rome and many more.

Malthus (1798) postulates that food is a necessary condition for existence and that food growth is bounded by nature. Since population is conditioned by the passion between the

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sexes which is necessary and is more likely to be so going forward. This restrictive law of nature he contends, will dictate the affairs of man rendering the optimism of a society with all members living in happiness, and no anxiety about providing the means of subsistence improbably. Malthus synthesis just as that of Plato in The Republic thus postulates that growth in human population is bounded (limited) by food supply.

In The Population Bomb, Paul Ehrlich espoused the same Plato-Malthusian stance declaring in the prologue that the battle to feed humanity is over and that population control will, through either war, famine, or pestilence, is eminent (Ehrlich, 1968). In "Extinction; The Causes and Consequences of the Disappearance of Species", Paul and Anne Ehrlich promulgated the Rivet Popper Metaphor in which they linked environmental deterioration, particular extinction of animal and plant species to the gradual removal of rivets in a plane. At first, the impact of the rivet removal is minimal until a threshold is reached and the plane crashes (Ehrlich and Ehrlich, 1981). This metaphor thus contends the existence of a lower bound to the species and other planetary resources necessary to prevent a catastrophic ecological collapse.

Boulding (2013) describes the conventional human/economic thinking vis a vis the environment as "cowboy" which is romantic, exploitative, reckless, and violent contrasted to the "true" description of a closed system economy termed a "spaceman". The earth as a spaceship with humanity as spacemen implies that the earth is not blessed with unlimited reservoirs of resources for extraction nor is it blessed with unlimited room to contain pollution. As such, man must seek a cyclical ecological system "capable of continuous reproduction of materials even though it cannot escape having inputs of energy" (Boulding, 2013). This is achieved when the focus is stock maintenance and any technological change that results in the maintenance of a given total stock with a lessened throughput is considered a gain (Boulding, 2013).

Hardin (1974) contends that rather than a spaceship with a single captain and "equitable" distribution of resources, the world is best described by several lifeboats (rich countries) with resources and resource starved swimmers (people of poor countries). This creates an ethical and moral dilemma for the people on the lifeboats whether to allow the swimmers in or not and which swimmer to allow aboard. Hardin then goes at length to discuss the ethical and moral dilemmas that a lifeboat earth creates and concludes that helping the poor is a lifeboat ethics question and discussed at length the implication of a lifeboat earth for population growth, food aid, ethics, and social justice.

Of all the writings on the limits to the environmental carrying capacity of Earth, the Club of Rome's work titled Limits to Growth is the most exhaustive and publicized and has been described by Sandbach (1978) as computer predictions based on Malthusian assumptions.

In the Club of Rome's limits to Growth, Meadow et al. (1972) exhaustively, literally, and metaphorically advanced the limits conception of the environment in the face of growth in industrial output, population, pollution and in the face of depletion in industrial inputs and predicted a general collapse in the world system either through shortage in depletable industrial inputs, population growth, excessive pollution, and/or shortage in agriculture outputs necessary to support life.

The Club of Rome, formed in 1968 describes itself as a non-profit informal organization of intellectuals and business leaders whose goals is to foster the discussion of pressing global issues. Emphasizing the dangers of limiting our space and time perspective to our immediate environment and generation, they forewarned that our efforts and plans can be rendered useless by events outside of our immediate space. This,

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they used to implore and to motivate their choice of issues of global in character and generations far removed from their time.

The first project of the Club of Rome was an ambitious project called "The Project on the Predicament of Mankind" which was aimed at examining the complex problems troubling humanity listed as: "Poverty in the midst of plenty, degradation of the environment, loss of faith in institutions, uncontrolled urban spread, insecurity of employment, youth alienation, rejection of traditional values and inflation and other monetary and economic disruptions". This was informed by the believe that though these seems completely far removed from each other, they were related as they all have technical, social, economic, and political elements; and, most important of all, they interact.

Phase One of the project on the predicament of mankind culminated in the 'The Limits to Growth; A Report for the Club of Rome's Project on the Predicament of Mankind'. This report sought to model the five (5) basic factors that determine and, in their words, 'ultimately limit' growth on this planet, population, agricultural production, natural resources, industrial production and pollution. Specifically, they investigated the five (5) interconnected trends of accelerating industrialization, rapid population growth, widespread malnutrition, depletion of non-renewable resources and a deteriorating environment. These trends were further broken down into 8 variables including population, defined as the total number of people inhabiting the planet earth, industrial output per capita defined to be the annual output per person in dollar terms, food per capita defined to be the per annum kilogram of grain consumed per person, pollution defined as a multiple of 1970 pollution levels, non-renewable resources defined as a fraction of 1900 un-depleted reserves, service per capita defined as per annum consumption of service per person in dollars, crude death rate defined as the annual number of deaths per 1000 people and the crude birth rate defined as the annual number of births per 1000 people.

Analyzing the variables individually, population was thought to grow geometrically (exponentially), and rightly so, for though there are positive and negative feedback loops that act in opposite directions to control population growth advances in medicine and improvement in health systems have weakened the negative feedback. This ensures the positive feedback overwhelms the negative feedback resulting in exponential growth in population. To maintain the current standard of living for the exponentially growing population, industrial production, and production of food ought to also be exponentially increasing to keep up with population growth.

The primary factor determining food production is land with studies indicating that there is about 3.2 billion hectares of land that is suitable for agriculture on earths (Meadows et al., 1972). Half of this hectares of land, they contend, was already under cultivation in 1970 when global population was around 3.5 billion. With the most fertile arable land already under cultivation, any attempt to increase the agricultural land will not be economically feasible. Even if it is decided that all arable land be cultivated irrespective of the cost, Meadows et al. (1972) declare that there was still going to be desperate land shortage before the year 2000.

For this non-cultivated substandard arable land to be cultivated will require expanding use of fertilizers, pesticides and in general increase in the capital stock allocated to food production. The resource that permits growth in the capital stock is mostly non-renewable resources like fuels and metals which are exhaustible. It was then noted that if the rate of resource consumption is to continue, most of the important non-renewable resources will

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be extremely costly in 100 years (i.e., by 2070). Even if technological developments ensure less dependence on land say with synthetic foods, the resources, and raw materials to produce these synthetic foods, the equipment and energy to purify sea water must all come from the physical world system.

Beyond population, food production, industrial production and non-renewable resources, pollution is the key limiting factor in production which is also increasing exponentially. Since pollution generation is a complicated function of population, industrialization, and specific technological developments, it is difficult to estimate exactly how fast the exponential curve of total pollution release is rising and per the spaceship earth metaphor (Cesari and Jarrett, 1967), there is a limit to the amount of pollution that life supporting earth can tolerate. Noting how short the doubling times of all these variables were, it was concluded that soon, we might reach the limits to growth of these factors.

After establishing that the elements that make up the world system individually grow exponentially and are bounded above by the carrying capacity of the physical earth, Meadows et al. (1972) then amalgamated these elements into a global model using system dynamics as developed by Forrester (1968). This model considered broadly the variables, their interconnectedness and feedback loops in different formulations for 200 years with historical data from 1900 to 1970 and projections based on the trend of the historical data from 1970 to 2100 assuming historical trend constancy.

Like any model, they re-echoed the fact that it is oversimplified and imperfect but nonetheless useful in understanding the dangers of unfettered growth in these factors.

Per the results of the standard model, it was concluded that the continuous decline in the natural resources necessary to support growth results in a collapse of the system forcing industrial output, population growth, food per capita and pollution to decline albeit with a lag. Different assumptions including doubling of resources reserves, removing the restrictions on resources reserves to make non-renewable resources infinite, unlimited resources plus pollution control and so forth were made to create 13 different models which all resulted in a collapse of the system. The doubling of resources was found to delay but not prevent the collapse in the system and when non-renewable resources were assumed to be infinite, the system collapsed still due to growing pollution and so forth.

It was then boldly concluded that, subject to the continuation of our present way of doing things, the world system is bound to be growth and collapse. The only way to prevent collapse in the global system, it was suggested, is to ensure equilibrium by imposing restriction on the growth of all elements of the model. This could be done by reducing the birth rate to be in line with the death rate or the death rate must rise. All-natural constraints work through the second channel, that is, by raising the death rate through a collapse of some sort. To stabilize the natural resource consumption and ultimately prevent a shortage in natural resources, natural resources consumption ought to be reduced to 25% of 1970 consumption levels and concrete steps to influence social economic preference towards services and some of the industrial capital should be diverted to agricultural capital to expand food production to ensure no malnutrition.

The predictions of the limits to growth model have largely been avoided with Potapov et al. (2022) estimating a 9% increase in global cropland and a 25% increase in global cropland net primary production instead of the prophesized decrease. Proven reserves of depletable resources like oil have also been increasing with proven reserves of oil in the US doubling from 36.5 billion barrels in 1980 to over 68.8 billion barrels in 2020 (source:

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https://www.statista.com/statistics/236687/proven-crude-oil-reserves-in-the-usa-since-1980/). Nonetheless, most of the assertions of the limits to growth are still being advanced and trumpeted today with Hall (2022) asserting that the models predictions were quite accurate especially when individual countries are considered. The latest report of the Club of Rome, "Limits and Beyond: 50 years on from The Limits to Growth, what did we learn and what's next?", Bardi et al. (2022), still contend that the world is in overshoot and must be curtailed to be sustainable. Commenting on the conclusion of the Limit to Growth, Kula (1994) bemoaned the culture of fighting limits rather than learning to live with limits. He ascribed this to the success humanity has chalked in countering the natural pressures that the environment exerts against any growth process in the past. He then went on to postulate that the club of Rome's model sought to illustrate that growth particularly economic growth with or without growing population is of questionable benefit (Kula, 1994).

In the "Going past limits to growth", Corsi (2017) reiterates that the growth mentality has not been changed and the continuation of the extensive growth path as has been known is doomed. This is reiterated by Bardi et al. (2019) who has shown that pollution alone is enough to trigger the Seneca Effect which postulates that, whereas growth is slow, decline is rapid and thus can be termed collapse.

Implications of Limits for Environmental Action

Environmentalism in the 1960s was fueled by Neo-Malthusian literature like the Population Bomb by Paul Ehrlich, and not least by the Limits to Growth of the Club of Rome which Sandbach (1978) describes as computer predictions based on Malthusian assumptions. According to the neo-Malthusian limits conception, physical limits to growth results from the incapacity of the closed environmental system to absorb changes and a comprehensive, objective and value free scientific analysis is needed to calculate the carrying capacity of the environment (Sandbach, 1978).

The objective of environmental policy and action is then to ensure environmental sustainability by making the environment penultimate with technological change and economic growth and their auxiliaries determined by the carrying capacity of the environment. Studies like the Club of Rome's Limits to Growth is taken to be the required scientific analysis and their results as conclusive proof of the damaging effects and/or possible outcomes of growth. As such, the only limiting factor to environmental sustainability is the political will to make and enforce the right policies as recommended by the environmental and climate science. The limits to growth paradigm and its adherents in line with the forewarned dangers of limiting perspectives to the immediate time and space also views environmental action as a holistic global endeavor (Nulman, 2015) which is deterministic, anti-mechanistic with a populist strain that can often be naïve (Cosgrove, 1990).

The populist elements of the limits to growth environmentalism arose from the apocalyptic predictions of the limits' literature of the 1960s and 1970s that helped dramatize the resource-growth dilemma fueling a sense of insecurity, alarmism, and outright fear (Sandbach, 1978). As argued by Barkun (1974), Fear lowers the threshold of suggestibility and render people readily moveable to abandon the values of the past and place their faith in prophecies of imminent and total transformation. This births charismatic leaders whose ideas and philosophies resonate with the masses as salvationist (Sandbach, 1978). Recent environmental activists like Greta Thunberg can be viewed as

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such with her speeches and rhetoric on the environment resonating and inspiring the youth to several global protests.

Even though the 1970s and 1980s lacked a face of environmentalism as Greta and her likes are today, Margaret Thatcher of Britain became one of the world leaders who persistently echo the environmental and climate issue resulting in the loosely worded declaration on pollution control by the G7 Tokyo Summit conference in 1979. Her environmental legacy as prime minister is however unimpressive which could have been because of a non-alignment of national interest with climate and environmental policy action (Nulman, 2015). Nonetheless, Margaret Thatcher's public rhetoric provided the environmental movements with the opportunity to publicly discuss environmental and climate issues and to attract the attention of the media which they tried to exploit to influence climate change negotiations that had begun to take place (Nulman, 2015). Cotgrove and Duff (1981) contend that the environmental movements whiles inspired by the pessimism of the limits literature also benefited from the growth in affluence in the post war period and the value transformation it triggered.

The combination of the limits inspired global environmental distant time and space perspective, the prophesies of environmental doom, the environmental salvationist preachers, and the growth in affluence since the 1960s have fueled the growth in environmental movements like the Extinction Rebellion and the *de-growth* movement. De-growth, 'décroissance' in French, first used by French intellectual André Gorz in 1972 (D'Alisa et al., 2014) is the idea that the most sustainable economic model is to purposefully stabilize economies away from growth towards social and ecological goals (Hickel et al., 2022). Nicholas Georgescu-Roegen contends that a switch from growth to de-growth is the inevitable path to sustainability in a limits-imposed nature (Baykan, 2007).

Adherents of the de-growth movement are of the belief that sustainable development is an attempt to green wash economic growth and the nature of the market by integrating environmental elements into economic calculations. This has been called a verbal solution by Latouche (1999). To pursue their version of environmental sustainability, the de-growth movement in several countries established green parties whose aim is/has been to challenge the conventional economic and political thinking (Baykan, 2007).

Unlike conventional parties which seek the mandate of the people to govern, the green party of France in particular is explicitly not after power but aims to inspire and expand the debate on post development economics rather than propose clear-cut policies for implementation (Baykan, 2007). This has however been perceived as utopian considering the nation politic pursuance of growth as the means to improve the well-being of their populace and to take their place in the global power and economic architecture.

Criticism of the Limits Metaphor

Criticisms of the limits paradigm is as ubiquitous as the limits inspired environmental theories/conceptions themselves. For example, Woolston (1924) allege that Malthus assertions on the geometric progression of population was a limited inductive proof of a general vital tendency and his assertion on the arithmetic progression of food production as an assumption of a tendency without direct proof and goes to debunk these Malthusian hypotheses.

Boulding Spaceship metaphor has been criticized by non-other than a fellow neo-Malthusian limits adherent Garrett Hardin who in advancing his own lifeboat metaphor

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contend that the spaceship metaphor implies a world government which certainly does not exist, and a ship steered by a committee could not possible survive (Hardin, 1974).

The limits to growth since its publication in 1972 has received its fair share of criticisms. Kula (1994) for example lists the shortcomings of the Club of Rome's Limits to Growth Model as being its treatment of the world as a homogenous unit thus disregarding growth heterogeneity among regions. This, it is noted can result in a population collapse in say the Indian sub-continent which will not necessarily affect say Europe since Europe is currently experiencing a stable and/or declining population growth. Besides, regions currently experiencing rapid population growth are regions which are sparsely populated (Kula, 1994). Kula (1994) also notes that, although in the limits to growth, most natural resources including metals are seen to be depleting, only resources like fossil fuels are actually depleting since almost all mineral deposits in principle can be recycled and used infinitum. Besides some countries like Singapore and Switzerland have grown and developed their economies without notable destruction to the environment and if necessary, other countries might and will adopt these environmentally friendly growth strategies. Also noteworthy was the blatant ignorance of the price mechanism in the limits to growth model (Kula, 1994) which has been the work horse model of all economic analysis for some time now.

Sagoff (1995) lumped all ecological economist who ascribe to the carrying capacity concept of the physical environment challenging that, ecological economists have not been able to point out a single scarcity of natural resources that knowledge and ingenuity are unlikely to alleviate. He therefore downplays the supposed risk of continual economic growth to the physical environment and its sustainability. Similar to Sagoff (1995), technological optimist, Simon (1996) discounted the carrying capacity of the earth claim especially as it has to do with population and declares that there are no physical or economic limits to the continuation of growth in population, economies and the standard of living. Simon concedes that population growth in the short term does instigate some challenges. These short-term challenges are however overcome in the long-term leaving humanity better off. Simon also asserts that population growth is proportional to the growth in standards of living since recorded time and implicitly defend the growth in population.

Nordhaus et al. (1992) on their part claims that growth trends depend on growth of inputs, rate and direction of technological change and the elasticities of substitution among the different factors of production all of which are unknowable. As such, no magic formula or supercomputer can predict the victor in the race between technological change and resource scarcities.

Critic of the Limits to growth paradigm, particularly the model of Meadow et al. (1972) have also been quick to point out the modelling of all variables as exponentially growing to the exclusion of technology and that the Malthusian conclusions can be avoided without basic alterations in social values and consumption patterns if exponential technological growth is included in the world model (Krier and Gillette, 1985).

Sagoff (1995) concludes that advances in technology will eventually expunge the instrumental need for protecting the natural world based on carrying capacity and to argue for the protection of nature based on such instrumental reasons is to erect a fragile and temporary defense for the spontaneous wonder of the natural world. Instead, it is only our cultural commitments and moral intuitions are more valid a reason to protect nature.

In Davidson (2000), the criticisms is targeted at the Club of Rome's model and all limits based conceptions of environmental destruction arguing that, no one can truly

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determine the carrying capacity of the world and thus it's limits. Also, he criticizes the limits conceptualization of environmental 'catastrophe' based on aggregate numbers of resources, consumption, and population which tends to obscure the true underlying causes of environmental destruction.

After debunking the limits of all kind argument including input limits, limits on waste assimilation, entropy limits and limits attributable to the loss of biodiversity, Davidson (2000) further notes that, even if the limits doom prophets are well intentioned to awaken our sense of urgency by trumpeting the impending dangers, the effect has been less than effective since by focusing on aggregate statistics, the limits conception depoliticizes environmental destruction (Davidson, 2000) exonerating those who ought to or could act decisively to check the destruction.

He cites how the limits trumpeters and the believe of impending catastrophe has led to some environmentalist like Hardin (1972) to support withholding food aid to poor nations, forced sterilization (Ehrlich, 1968) and other repressive measures. The idea is, if there is a limit to the carrying capacity of the world as in the number of people it can contain, then why help those who cannot sustain themselves especially when these vulnerable people are those overloading the earth in the first place since poor countries are those with the highest birth rates.

Sandbach (1978) asserts that some critics of the limits paradigm have pointed out the authoritarian and technocratic tendencies of the neo-Malthusian limits ecologists who would rather hand over the responsibility of policy making to the computer modelers and systems analyst.

Environmental Optimism

Environmental optimism, previously an abomination is gradually gaining traction away from the dogmatic and superstitious nature of environmental concern (Ridley, 2001). This is in part due to the unfulfilled environmental prophesies of doom since Malthus.

One of the earliest optimistic metaphors of the ecology and by extension the environment is the clockwork universe metaphor which insinuates that the world is like a mechanical clock which can be repaired (Keulartz, 2007). As such, damage to ecological systems is reversible and will be reversed bringing the environment back to pristine.

Environmental optimism is advanced by two groups, mainstream neoclassical economists, and technological optimist. Mainstream neo-classical economists believe the market will in the long term fix the problems created during the economic development stage eventually leaving the world greener and the environment more sustainable. This thesis, they claim is supported by the environmental Kuznets curve which contend that economic growth in the short run is achieved on the back of environmental destruction and increasing inequalities. These short-term destruction and inequalities are however reversed when the effect of economic growth eventually trickles down to the poor, healing the planet and eliminating the environmental problems created during the economic development phase (Obeng-Odoom, 2022).

Indeed, the neo-classical theory of environmental economics is based on the concept of externalities popularized by Arthur Cecil Pigou in his work, "The Economics of Welfare" (Cordato, 1992). Externalities is said to arise when there is a divergence between social net product and private net product giving rise to sub-optimal results in

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terms of prices charged and outputs produced. The optimal solution is given by the price and output combinations obtained under a "hypothetical" Perfectly Competitive General Equilibrium (PCGE). To remedy this sub-optimal equilibrium, policy makers and theorists attempt to induce the market to conform to the optimal results by imposing taxes for generating negative externalities and by providing subsidies for generating positive externalities (Cordato, 1992).

In this regard, Nordhaus (2018) a Nobel laureate, in his Nobel Memorial lecture called for a macroeconomic environmental tax to remedy the serious economic damage of climate change. In line with this neoclassical theory of externalities, two proposals have been trumpeted by mainstream neo-classical economist. These proposals can be broadly categorized into marketization and market adjusting proposals.

Marketization is the creation of a market for negative externalities like hazardous emissions where a limit is set upon the total amount of allowable emissions/pollution and permits to emit/pollute up to that limit can be issued and traded in the market. The cost of purchasing the permits is then expected to impact on the price of the negative externality generating product (Stilwell, 2011) thereby increasing the private cost and bringing it to equilibrium with the social cost.

The other strategy is in line with Nordhaus (2018) proposal where an indirect tax is levied on goods and services according to the pollution generated in its production and/or consumption so that products whose manufacture and supply requires the burning of fossil fuel and other hazardous pollutants would become more expensive (Stilwell, 2011).

On population, it is argued by Bauer (1998) that poverty is not correlated with population density and that regions of recurrent famines are not the densely populated least developed countries of say, West Africa, but the sparsely populated subsistence economies like Ethiopia and Uganda whose nomadic lifestyle, shifting cultivation and the like are to blame. Thus, population growth in Least Developed Countries (LDC) is an invented crises that is not a major threat to prosperity. Thus, food shortages are not because of population growth (Bauer, 1998). Population growth resulting in greater population density in sparsely populated countries may actually facilitate emergence from subsistence production (Bauer, 1998) thereby improving food security.

Using the concept of externalities, Bauer (1998) raises the various issues regarding population growth in least developed countries concluding that even if the negative externalities of population growth were to outweigh the positive externalities, it will call for different policy intervention other than what is suggested by the population catastrophe trumpeters.

Technological optimists on the other hand believe improvement in technology will overcome any resources constraints going forward rendering unconstrained growth possible. That is, they trust technical development to outpace increasing scarcity and pollution making sustainable growth possible.

In Basiago (1994), technological optimism is defined to mean the believe that technological advances in food production, environmental and sanitation quality will support life even as human population soars. Ridley (2001) in defending optimism on environmental issues call to question the past Malthusian predictions of deforestation, food shortage and depletable mineral resources and declares his belief in Simon (1996) argument that almost no resource is finite. The contention of Simon and his adherents is that resources are of the human mind rather than of nature since by applying ingenuity to the extraction and use of these supposed finite natural resources, they can be made abundant.

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Sagoff (1995) asserts the legitimacy in the belief of technological optimism claiming history confirms that knowledge, ingenuity, or invention find ways around shortages in raw materials either by increasing reserves, substitution between resources or making resources go further. Like Sagoff (1995), in Ridley (2001), it is predicted that humanity will survive global warming not due to treaties, global energy policies or ascetic lifestyle of humanity but through invention that mainstream environmental movements will mostly oppose.

Nordhaus et al. (1992) in defending technological optimism re-stated the world model of the club of Rome limits to growth in standard neo-classical Cobb-Douglas form and the conditions under which "lethal" growth occurs is established. Changing the assumptions of the model to include hick-neutral technological change and computing the results, it was concluded that total factor productivity ought to exceed 0.0025 to offset the drag from diminishing resources and diminishing returns to scale. This they concluded was far below the 0.01 to 0.02 growth in factor productivity observed in developed countries since 1909. As such, there is no cause for alarm.

In conclusion, environmental optimists subscribe to the idea that "natural science is making anything possible" and human endeavors, culture, ultimately determine environmental capacity (Norgaard, 2006).

Implications of Optimism on Environmental Action

In line with the optimistic assessment of environmental issues and adopting the position that these issues and resource constraints on growth will be but modest, Nordhaus et al. (1992), declares that the "peril lies not in the stars but in our own hands".

On the implication of this modest impact of environmental issues on the conduct of government policy, Nordhaus et al. (1992) contend that government action is required in some areas whiles governments must allow the markets to do their jobs in some areas. Even in areas where government intervention is legitimate, they cautioned that excessive and inefficient regulation especially in resources involving oil, natural gas and farming should be avoided since it could be a recipe for distortion in the price and quantity of these goods resulting in an artificial slowing of economic growth.

Simon (1996) also contends that government controls are inevitably counterproductive in the long run because the controls and price fixing does not help in the normally cost-efficient short-run adjustment in response to short-run cost increases. Adjustments, which would more than alleviate the problem (Simon, 1996). Indeed, government intervention is necessary to avoid short-run disruptions and disasters by ensuring that no consumers consume public goods without paying the real social cost for them. This is done by setting market rules that are as impersonal and as general as possible allowing individuals to decide how and what to produce and what to consume in a manner that respect the rights of others to do same whiles paying the full price to others for the costs of one's own activities (Simon, 1996).

Simon (1996) asserts in line with David Hume's quote "Multitudes of people, necessity. and liberty. have begotten commerce in Holland" that going forward, population growth is good in the long run and that necessity and political and economic freedom will make economic growth and improved standards of living sustainable.

The general position of the environmental optimist can thus be summarized as, allow the markets to work and it will make expensive increasingly scarce natural resources and force producers to seek substitutes through innovation and improved technology.

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Regulation when required should be as minimal and as impersonal as possible to nudge the markets to conform.

Criticism of the Optimist Conception

Environmental optimism either the neo-classical externalities-based fixes or the technological kind have been subject of criticisms. Obeng-Odoom (2022) alleges that mainstream neo-classical economics deflect attention from the ecological imperialistic nature of environmental destruction behind veiled rhetoric and prices. The signature tool of neoclassical economics in correcting environmental externalities, taxes and pollution markets have been criticized by Stilwell (2011) claiming that at best carbon tax can play but a modest role as a market modifying mechanism and cannot be relied upon to resolve or even ameliorate the environmental and climate crises. Besides, proposals for the creation of emission markets whiles appearing simple is riddled with complexities including issues about the definition of pollution limits, and how pollution should be policed, enforced and so forth (Stilwell, 2011).

In Cordato (1992), the mainstream neoclassical handling of externalities is criticized asserting that markets should be analyzed as cases of dynamic disequilibrium. Analyzing markets as a case of dynamic disequilibrium will imply that the concept of social cost has no theoretical or practical relevance and as such cannot be the basis for evaluating environmental harm.

Krier and Gillette (1985) argue that there are sufficient reasons to believe that technological developments are systematically biased leading to the neglect of certain kinds of undesirable consequences like pollution. They then allege that the most sophisticated of the technological optimist are aware of this systematic bias in the development of technology and they trust the government to do a good job by nudging the markets. As such, at the bottom of technological optimism is an optimistic theory of politics.

Norgaard (2006) contend that, technological optimism and social organization of modernity facilitate a better control over nature rather than a deeper relationship with nature and has excused people from the moral dilemma of addressing the effects of their decision on the next generation.

Tapestry, and Culture-Environment Coevolutionary Process

The third class of metaphors/concepts are the political-ecology class of metaphors/concepts which include the tapestry metaphor and the culture-environment coevolution concept advanced by Davidson (2000) and Norgaard (2006), respectively. This class of metaphors and conception of the environment are said to have arisen due to the perceived neglect of the political dimensions of human-environment interactions (Vayda and Walters, 1999).

Davidson (2000) argues that environmental extermination can best be described with "Tapestry" where the environment is viewed as an intricate art of different threads which makes the environmental masterpiece and any removal/weakening of a thread amounts to fraying of the tapestry and a reduction in its beauty. Under this metaphor, environmental degradation of all kinds, erosion, extinction, and climate change are equivalent to a reduction in environmental quality and thus its fraying. Environmental quality is used in the broadest sense to imply biological diversity, aesthetics, resilience, recreation, and ecosystem service values to humans (Davidson, 2000).

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To better understand the environmental destruction, it is necessary to examine the multiple 'threads' shaping consumption and production and move beyond the singular focus on the limits to evaluate the political, social, and economic forces responsible for environmental/ecosystem destruction (Davidson, 2000). As fraying is gradual, the tapestry metaphor sees environmental and ecosystem destruction as a continuum with any point along environmental pristine, biodiversity rich environment to a threadbare remnant with fewer species and a sorry state environment (Davidson, 2000). This gives humanity the opportunity to choose the desired condition of the world among the several points between the extremes.

The tapestry metaphor has a downside. Viewing environmental degradation as gradual and continuous rather than catastrophic may embolden those in power who benefit materially from the destructive system to maintain the status quo. The upside of the tapestry on the other hand is that it cast environmental struggle as political struggle/conflict that requires going beyond the aggregate numbers of resources, consumption, and population to understand the political, economic, and social forces responsible for the destruction (Davidson, 2000).

The tapestry metaphor is similar to the coevolutionary development perspective of Norgaard (2006). Taking the differences in culture of the Europeans and that of the American Indians as an example, Norgaard (2006) raises several issues wrong with the environmentally deterministic position that particular environments force people to behave in predetermined ways and that people are similar in comparable environments. Similarly, he disagrees with the technological/cultural determinists who ascribe to the believe that the supposed environmental limits could be breached with technology, markets, and sufficient learning.

Emphasizing coevolution, evolution is no longer assumed to mean a steady advanced towards perfect fitness with a constant environment neither does it diminish the role of environmental changes in explaining evolutionary history (Norgaard, 2006). Norgaard argues that thinking of the social and environmental system overtime as coevolutionary acknowledges the dual validity of environmental and cultural determinism. This contrasts with the neo-Malthusian limits disciples who are entrenched on environmental determinism and the technological optimist who are entrenched on cultural determinism. By viewing the environment as a pristine tapestry which imposes limits on the array of choices and actions available to humans and simultaneously viewing this pristine environment to be impacted/frayed by the actions and inactions of humans accept mutual causality.

The coevolutionary thinking presents diversity, culture and biology as facilitating sustainability and as providing a stronger basis for diversity of culture that does not rely on tolerance, or vague respect (Norgaard, 2006).

In line with the praxeological idea that people act in pursuance of goals using the means available to them, Austrian economist like Cordato (1992) have been critical of the neoclassical theory of externalities which contend the existence of social cost and social value independent of individual actors.

By disputing the existence of social cost and social value, the entire foundation of neo-classical welfare economics, externalities and pareto optimality is disputed and a new praxeological based environmental economic theory is proposed in its place. This environmental theory views environmental problems as arising from inter-personal conflict in the use of the environment. As such it takes as the element of study individual

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actors rather than aggregate markets as in the theories of externalities and social cost and efficiency.

Cordato (2004) asserts that unless there is a conflict in the use of an environmental asset, there is no economic or efficiency problem. The conception of environmental problems as arising from political, economic, and cultural conflict is in line with the tapestry, human-environment coevolutionary process. To solve these problems therefore implies solving the interpersonal conflict. By looking at the individual actors rather than social optimality, this theory places individuals at the center of environmental action and thus more localized.

Implications of Tapestry, and Culture-Environment Coevolutionary Process for Environmental Action

As per Davidson (2000), the core exposition of the tapestry metaphor is that there are no absolute limits but rather the environment is progressively made worse and its ability to support life and growth deteriorates with each destruction. As such, it goes through a continuum of degradation without clear threshold of absolute limits.

The impact of this continuum of degradation result in small losses and occasional larger rips in environmental systems rather than a catastrophic collapse (Davidson, 2000). These small losses give humanity the chance to choose how the environment should be preserved since these small losses are losses in utilitarian value. Davidson emphasize that viewing the environment as a tapestry implies going beyond the degradation to examine the social, economic, cultural, and political structures that shape the degradation. Essentially considering the interpersonal conflict, the political, economic and the cultural elements responsible for environmental degradation.

The implication of tapestry is that those in power who benefit materially from the destructive status quo will fight to maintain it since the malignant effects of environmental degradation is not perceptible immediately. Thus, halting the destructive process is a political struggle which encapsulates broader issues like social justice (Davidson, 2000).

The tapestry metaphor by emphasizing the cultural, social, and environmental elements responsible for environmental destruction illuminate the stance of the coevolutionary development by Norgaard (2006). Norgaard argues that thinking of the environment and human actions, in essence culture, mutually affecting each other implies that cultures affect which environmental features prove fit for specific cultures and which cultures proves fit for specific environments.

Tying environmental sustainability to the viability and sustainability of the local culture and economy makes sustaining the environment the responsibility of every non-vegetative being in the community. This is very beneficial since indigenous peoples with a historical continuity of resources often are equipped with a broad knowledge base of the behavior of complex ecological systems in their localities which can complement western science (Gadgil et al., 1993). This traditional knowledge is helpful in identifying changes in the environment and ecosystem (Chisadza et al., 2015). Indeed, for locals especially Indigenous people, environmental destruction amounts to environmental and cultural resources dispossession which is a matter of survival (Durie, 2008) as such empowering locals to conserve the environment and slow the forward match to destruction will not be an option but sentimental and a matter of survival.

Barnard and Weiss (2020), proffer a litany of political-ecological, interpersonal conflict resolving focused and market friendly solutions to the environmental crises. Key among this is the localization of environmental action where the responsibility for

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protecting the environment is placed under individuals and communities. This, Morris (2020) claims will result in more effective and economically less distortionary outcomes than when mandated by far-away bureaucrats.

In defense of this assertion, Ramanauskas (2020) cites Ostrom's empirical based principles with which local resources can be governed sustainably within a community. These include; defining clear boundaries of common resources, delineating the rules governing the use of common resources that fit local needs and conditions, local participation in deciding the rules, monitoring the usage of common resources, sanctioning violators of defined rules and boundaries, swift resolving of conflicts, higher level authorities recognizing rules set by local people in the governance of natural resources, and resource management should start from the local level and include the entire interconnected system.

Another environmental action proposal that aligns with the concept of tapestry and the coevolutionary thinking of humanity and the environment is the use of land buy ups (Weiss, 2020). Under this, conservationists simply buy up land they want to see protected or preserved for recreational activities. The conflict envisaged by Cordarto (2004) in the use of public property is thus, solved since the property is transformed from a public to a private property. These private conservationists can then lease out this land to developers with protective covenants as asserted in the English landmark case of Tulk v Moxhay (1848, 41 ER 1143).

Criticisms of Tapestry, and Culture-Environment Coevolutionary Process

In a rejoinder to Davidson (2000), Salonius in Salonius and Davidson (2000) criticized Davidson for his stance noting that the critic of limits and the proposition of the tapestry metaphor is dangerous if biodiversity loss will actually lead to ecosystem collapse. He also invokes the principle of micro-rationality leading to macro irrationality to criticize the extrapolation of local ecosystem studies to the whole earth. Noting that continuous degradation without catastrophic collapse allows collective humanity to reject the precautionary principle and assert that it is not ready to stop growing yet forever. Davidson in response to Salonius retort that his proposed tapestry metaphor does not seek to downplay environmental damage and criticized the neo-Malthusians inclination to view anyone criticizing the limits conception as essentially downplaying or at worse denying environmental problems.

In an editorial in New-York Times, Stevens (2000) contend that if the claims of scientists on the pervasiveness of the impact of humanity on the environment is anything to go by, then fraying the tapestry may not be a good description since humanity are rewiring the earth and its ecological systems into entirely new, simpler, duller, and less functional patterns with new mixture of colors and texture. However, this accusation can be rebutted by taking the original pristine untouched earth/ecology as the ideal and any modification, destruction or re-weaving as fraying it.

In a rather broad tirade of political-ecology, Vayda and Walters (1999) accuse most political ecologist of self-attributed misnomer who are better called natural resource political scientist, political anthropologist, or better still political scientist. This stems from their fundamental claim that political influences from the wider political-economic system are important than anything else in explaining environmental change (Vayda and Walters, 1999).

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In place of political ecology, Vayda and Walters (1999) suggest a kind of ecological research that does not prejudice anything political or not in explaining environmental or environment related events which they termed event ecology.

The Metaphors and Implications for Environmental Finance

The limits conception views environmental action as a global endeavor (Nulman, 2015) and emphasize a top-down approach to environmental action. This will require humanity to submit to a gigantic present sacrifice in material and non-material wealth in a regime of global eco-bureaucrats (Kasun, 1999). This top-bottom approach emphasize target setting through negotiations with the responsibility for policy and implementation of set targets falling on a chain of multilateral, intergovernmental and governmental eco-bureaucrats. One of the key convening points for environmental and climate change negotiations has been the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC has organized several global environmental negotiations resulting in but not limited to the Kyoto Protocol in 1992, the Paris Agreement in 2015 and the Glasgow Climate Pact in 2021. These treatises often focus on contentious global issues like climate justice, environmental accountability, and the allocation of environmental funds and whether developed countries should provide assistance to developing countries (Tao et al., 2022). It is often a usual site in environmental negotiation for there to be a stack divide between the global south and global north especially as regard financing technology and technology transfer from the north to the south (Jaiswal, 2015).

In Gampfer et al. (2014), it is concluded that financial aid from richer to poor countries in the range of 50 to 100 billion Euros annually is required as inducement for poorer countries to limit their hazardous emissions. Mobilizing funds of this magnitude will however have a substantial impact on the global north which might require increase taxation, and/or the forfeiture of other services to their citizenry (Gampfer et al., 2014), an unpleasant dilemma for northern governments.

Overall, the limits conception views environmental action and environmental finance as a global endeavor that calls for consensus on and distribution of responsibility to counteract environmental degradation. The financing responsibility is mainly seen as a global, intergovernmental, and governmental endeavor with developed countries providing financing to developing countries to limit and adopt to environmental and climate change. This is especially true with the current UNFCCC principle of “Common but Differentiated Responsibilities”.

The neo-classical market apologist and the technological optimist see the current capitalist economic set-up as doing a good job in regulating and protecting the environment. It concedes that there is short-term environmental cost to development but these environmental costs of economic growth, in the form of environmental externalities, is eventually reversed as development exceeds a particular threshold. In the short-term, the externalities generated can be nudged or marketized so that goods and services reflect the full social cost. One of the major externalities marketized scheme is the Clean Development Mechanism (CDM) embedded in the UNFCCC (Tao et al., 2022). The CDM allows developed countries, also called Annex I countries, to finance emission reduction in developing countries and use the credits obtained to meet their emission reduction commitments under the Kyoto Protocol (Millock, 2013). This provides

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developing countries and even private investors in developing countries a revenue stream for green and environmentally friendly projects executed.

One other implication of environmental optimism is the believe that, as depletable resources become scarce, their prices increase relative to substitutes. The pursuit of profits will drive producers to seek and/or innovate substitutes. In line with this, price of natural gas and its volatility is popular in environmental finance research with focus being on the substitutability between natural gas, crude oil, and clean and renewable energy (Tao et al., 2022). Shahidehpour et al. (2005) contend that the substitution of renewable energy such as photovoltaics for natural gas in power generation will reduces the dependence on natural gas for power generation. This will accelerate the progress to sustainable development by overcoming the limitations of the current energy consumption structure (Apergis and Payne, 2010).

Beyond, marketizing and nudging externalities and the believe that profit motive will encourage private producers to seek substitutes for increasingly scarce inputs, green innovation in projects and technology is trusted to make the world sustainable by the optimist. Until recently, these projects had been financed using public sector funds and borrowing in line with the top-bottom approach of bureaucracy (Ribeiro and Dantas, 2006). Though this approach can be good for innovation (Edler and Georghiou, 2007), it is riddled with challenges including funding deficits (Tao et al., 2022). These projects by their nature makes it difficult for private investor to mitigate externalities and monetize them and often require governmental support through Public-Private Partnerships (PPPs) which is a proven project financing approach (David and Venkatachalam, 2018). PPP has generally been seen to have an edge over purely public procurement in terms of efficiency and may create incentives for the private partner to invest, and innovate (Välilä, 2020).

Thus, the take of environmental and technological optimist on environmental finance is nudge and marketize externalities and encourage private innovation through government policy, possibly using PPPs since innovation projects are naturally risky and may be riddle with market failures (Wu et al., 2022).

The tapestry, co-evolutionary and the political-ecology class of metaphors emphasize the interaction of social, cultural, and economic factors that contribute to environmental degradation/restoration. In line with this, focus is mostly on localized and institutional factors responsible for and in alleviating environmental destruction.

One of the topical issues of research in environmental finance, which seems to align with the tapestry and the political-ecology type of metaphors implication for environmental action, is Corporate Social Responsibility (CSR). CSR is a form of corporate self-regulation (Tao et al., 2022) and associated with corporate efforts to mitigate negative externalities and to enhance positive externalities in the conduct of business (Laudal, 2012). CSR encompasses 4 dimensions which include economic, legal, ethical, and philanthropic responsibilities (Carroll, 1991). The ethical and philanthropic responsibility refers to private business's observance of business ethics and the voluntary pursuit of socially responsible practices which can reduce environmental externalities and encourage pro-environmental behaviour (Tao et al., 2022). The localization of the CSR is due to the utilization of CSR-related activities by marketing managers to generate value for stakeholders (Sanclemente-Téllez, 2017) which can increase corporate reputation, credibility, brand value and thereby boost firm value (Tao et al., 2022).

Another environmental financing strategy that aligns with the political-ecological conception and the localization of environmental action is crowdfunding. Crowdfunding is a new financing strategy that involves an open call, usually through internet-based

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platforms, to private individuals to provide funding to execute a specific project (Belleflamme et al., 2015). Crowdfunding is generally of two types, investment based and reward and donation based. In investment-based crowdfunding, individuals invest towards a project in return for monetary benefits. Under reward and donation-based crowdfunding however, funders do not expect monetary benefits. Rather, they invest in the project to support its cause (Belleflamme et al., 2015). This funding approach allows individuals to participate in local environmental projects and have been used for example in funding renewable energy project, Solar on-demand, in Tanzania and the China Giant Panda Program (Tao et al., 2022).

Environmental aid and funds from multilateral institutions have been criticized as not decentralized enough to tackle the triple crises of nature, climate, and poverty (IEED, 2020). Currently, only 2% of climate finance is thought to make its way to locals who are in the position to act on achieving environmental goals at the local level (Fair Trade Movement Position Paper, 2021). The political-ecology class of conceptions will agree that national and even multilateral organizations have a role to play in financing environmental action. However, financing should be targeted at resolving the cultural, political, and economic conflicts inherent and responsible for environmental destruction. This will include strengthening institutions to tackle and resolve the inherent conflict and empower locals to converse the environment.

Conclusion

The relationship of humans and environment/ecology is complex. To capture these complex relationships, economist, ecologist, and environmentalist have always appealed to metaphors. The most prominent of these metaphors is the limits metaphor aspects of which dates to at least Malthus. The Malthusian perspective is environmentally deterministic as it views the environment as the ultimate decider of possible actions and human culture. On the other extreme is environmental optimist either of the technological type or the neoclassicals. The technological optimists subscribe to cultural determinism of the environment as it views the environment as being under the control of human action/culture/technology. On the middle ground is the tapestry metaphor which is akin to the coevolutionary process of human and the environment. This admits the impact of human activities on the environment whiles simultaneously espousing the limit in the activities permitted by specific environments.

In this study, the comparative merits of these metaphors are examined and their implications for environmental action stated. The implications of the metaphors for environment finance are discussed.

Whereas the limits conception emphasizes the top-bottom approach with governmental and multilateral organizations seen as the main source of funding for environmental and climate change adoption and restoration, the optimist conception contends that, with minimal regulation and market infrastructure to tackle and marketize externalities, the current capitalist structure is well suited to tackle environmental protection and restoration. On the other hand, government policy that encourages eco-innovation though distortionary is seen as legitimate due to the high-risk nature of innovation and related market failures. The tapestry and the political-ecology class of metaphors envisages the decentralization of environmental action and environmental finance with crowdfunding and corporate social/environmental responsibilities being some of the main sources of funds for environmental protection and restoration.

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