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Sustainability and Economic Theory: An Organism in Premise

Abdallah M. Hasna, The University of Southern Queensland, Queensland, Australia

Abstract: So what is the link if any between economic management theory and sustainability? Is it the interrelatedness of the world international economies; but alongside connectedness comes vulnerabilities? as I reflect on the impact of the economic turmoil and the deepening economic contractions of late 2008.Since economic traditions are migrating towards sustainable development raising the need for an understanding of operational principles of Sustainability. what are its implications for the engineering industry in particular commodities sector, with this in consideration I would like to call on Gaia hypothesis Lovelock (1972) that proposed living and non-living parts of the earth form a complex interacting system that can be thought of as a single organism, similarly another interesting and relative theory is that of Meadows in his book "Limits to Growth" (1972) modeling the consequences of a rapidly growing world population and finite resource supplies, commissioned by the Club of Rome. This paper examines juxtaposition of sustainability in economic management theory using the laws of thermodynamics. The objective of this review paper is to collaborate on the economic dimensions of sustainability. We posit that cohesiveness between economic theory and sustainability are necessary to alleviate the current credit crunch. We argue that a sustainable management theory as an organism is a key determinant of economic relationships; it thus highlights the relationship between industry sectors diversification and economic sustainability.

Keywords: Commodities, Sustainability, Organism, Management Theory, Economy

Introduction

CLASSICAL MANAGEMENT THEORY highlights the relationship differences between objectives and goals, for instance organizations with visible, measurable objectives follow these objectives even when they diverge from goals. It is from such a standpoint, this paper considers economic theory by comparing the ideal state (target , goal and objective) of sustainability. From an economic point of view, the Laws of Supply and Demand were used to shape the theories by classical economists. Farley et al. (2002), defined economics as the science of allocation of scarce resources towards alternative ends. However deciphering sustainability and economic theory in the midst of 2008 credit crisis, or liquidity bubble, leads us to question the viability of infinite exponential growth in a finite world, is it achievable? What are the consequences? What has economic theory got to do with sustainability? A great deal, the economy determines how society will operate and technology tailors the tools to suit. Furthermore in order to understand sustainability and economic growth we need to be familiar with the physical sciences, the physical confines, for example we live in finite world of time and space where resources are nongrowing and materially closed, no matter enters or leaves it, a delicate balance of the ecosystem. economist have a defined a development path as sustainable if total welfare does not decline along the

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path (Hamilton 2003). However the concept of sustainability is much broader than the concepts of sustained yield of welfare, resources or profit margins. Similarly there is an important difference between sustainability as goal and as an objective, goals refer broad terms, and objectives are more narrowly defined and indicate specific desired outcomes (Rossi et al. 2004). In the past, sustainability has been executed as another business agenda item, i.e. 'join the hype', since "Green image" sells, as well as being a great image booster. However, nowadays with the advent of the credit crunch, sustainability is a reality for most organizations. Organizations have a certain corporate Social Responsibility, which means that profit is not the only concern a company has (people) social and environmental (planet) aspect into custody in other words they are being expected to look after the sustainability of their entire supply chain to help create social prosperity. Today some governments are formalizing these expectations into regulation, so in the near future; companies will need to factor in environmental economics as obligatory legislations are enforced. Since the economics of the environment as a sub-discipline has only developed within the last 80 years, let us revisit the fundamentals of this evolving science landmark work by (Pigou 1932)introduced the concept of a technological externality, whereby a decision maker acts in a way that either improves or harms the wellbeing of others, but these effects are neither considered by the decision maker, nor 'priced' or accounted for in the market place. In the late nineteenth century, attention shifted to individual markets within the economy, known as microeconomics, opposed to macroeconomics (the whole economy). An intrinsic part of this shift was the discarding of any special role for environmental resources, and the development of marginal analysis that focuses on how 'marginal' units of consumption, production or other activities. Marginal analysis uses mathematics to model individuals' (agents) actions in an economy as being subject to precisely defined laws of supply and demand. This crystallized in the neoclassical approach to economics that has become 'mainstream' since the 1940s, and which emphasizes the benefits of markets and competition to help achieve Adam Smith's 'invisible hand' result (Grafton et al. 2005). Bearing in mind the credit crisis events it is acceptable now to claim that the global economic growth, at the current growth and consumption path, is not sustainable from a social-ecological perspective. Rapid increase in human populations dramatically shifted societal expectations for both commodities and services from natural resources, the growths of economic prosperity, mobility, and technology, as well as a continuing evolution from an industrial to an information-based society, have accelerated the shift (Bare 2002). Taking a u-turn is essential. Running an 'ecological deficit' is tantamount to diminishing our planet's finite natural capital (Nagarajan 2003).

Economic globalization is the greatest single contributor to the massive ecological crises of our time, yet this is an aspect that is often ignored by the media, NGOs, policymakers, and citizens (Barker et al. 1999). The word "globalization" is often used at present to reflect a growing trend for supranationalization: global phenomena are taking place at world level beyond the institutional frameworks of the nation-states. This is the case in the globalization of finance, the globalization of science, the globalization of the environment and ultimately of governance (Duchin et al. 2002). Failure to consider the complex interconnectedness of the economy, society, technology and ecology, particularly in constructing the so- called economic growth theories, is a tragic flaw of conventional economics. In national income accounts, sustainability among other things is completely ignored, the contributions of finite natural capital and the invaluable ecosystem services to the gross domestic product (GDP). Consequently, GDP is a distorted and misleading indicator for gauging the health of the economy and the so-called standard of living. Comprehending the powerful dominance of ivory tower economic theories, out of touch with reality, in shaping global economic thinking and strategic economic policies is really hard. In an era of escalating forces of globalisation, an increasing discord between the demands of unlimited economic growth and the fundamental requirements for a sustainable social-ecological system has emerged. Mounting evidences show that global market-driven economic growth has seemingly exceeded the earth's carrying capacity, causing an increasing 'ecological deficit'. This poses serious threat to the sustainability of social-ecological systems. Ecological economics is not a single discipline. It is an emerging interdisciplinary area, attempting to integrate social and natural sciences to understand the interactions and interdependence between human activities and the supporting ecosystems. The cornerstone of ecological economics is the recognition of the biophysical limits to economic growth. The human organizations, the environment, technology, values and knowledge are considered to co- evolve with each other. As there is a finite scale for the human economy, human wants can, and should, be shaped by broader social values. By transcending the limits of neoclassical economics, ecological economics relies on a systems approach in bringing together economic, social, ethical and ecological perspectives (Nagarajan 2003). In recent years, economists and environmental scientists have come together to hang a price tag on nature's benefits. Far from demeaning nature, this exercise reveals how much we depend on it. The Millennium Ecosystem Assessment published 2005 identified services—from pollination to water filtration—that humans would have to provide for themselves, at great cost, if nature did not. Of the 24 broad categories of services, the team found that 15 are being used faster than they regenerate. (Musserm 2005) this is in line with the classical economists attention to natural resources, particularly agricultural land most famously in Malthus' pessimism, that population growth would be bound to outstrip food production (Quentin et al. 2008). However acknowledging Malthusian concerns (Thomas Robert Malthus: 1766-1834), the main issue here is not over population collectively it is the existing structure of consumer-capitalist economies that is a deep driver of unsustainable practices. This theory echoes some of the concerns and predictions of Malthusians central premise: that growth cannot proceed indefinitely against a finite resource base. however in Limits to Growth (Meadows et al. 1972, 1974) examined exponential growth and finite resources through five main variables world population, industrialization, pollution, food production and resource depletion, notice that these five variables rely heavily on economics, however to explore the possibility of achieving sustainable economic growth in by altering these five variables is cornucopian, due to physical limitations of the model. Therefore in a broader understanding of underlying economic issues will be crucial to communities seeking a more sustainable future (CSIRO 2005). Thus any drive towards sustainability must be justified monetarily or institutionally in order for it to be widely accepted. For example recycling is advisable as long as the resource costs are below those of primary production (Gobling-Reisemann 2008) .

1.0 Sustainability as a System

In our material world we deal with fluxes of matter and energy, which are shaped by human action into economic phenomena (Cimbleris 1998). From a sustainable economic perspective,(King 1993) noted that because a system is defined by both its components and the interactions between them, a system description simultaneously involves both structure and function that are the components, how are they connected, and how do they operate together. Sustainability implies an explicit consideration of ecological, economic and social factors. While it incorporates components related to economic efficiency, ecological carrying capacity and social justice and acceptability, it also conveys a measure of intergenerational equity as well as the distribution of rights to use environmental services contained within the global ecosystem. The human-centered approach to sustainability has been termed weak (Pearce, 1993; Gray, 1993; Turner, 1988) because it employs existing theories and structures to underpin it. Neoliberal economic theory - based on efficiency and market issues with underlying monetary values - allows the environmental crises to be blamed on inefficient use of natural resources or, in its worst manifestation, justifies the unrestrained use of the environment because it cannot be costed (it is an externality and therefore a free good). However the longer humanity pursues affluence, along with current population forecast, the more likely our resources will deplete. Where resource use R is a function of population P and W per capita waste generation. We will visit the concept of resilience in order for to understand ecological system maintenance in relation to its surrounding.

For ecological systems, sustainability is defined by a comprehensive, multiscale, dynamic, hierarchical measure of resilience, vigour and organization. Resilience is the ability of ecosystems to persist despite external shocks, i.e., the amount of disruption that will cause an ecosystem to switch from one system state to another (Holling 1973). An ecosystem state is defined by its internal structure and set of mutually re-inforcing processes. Vigour is associated with the primary productivity or growth of an ecosystem. Organization depends on both complexity and structure of the system. For example, a multicellular organism like a human being is more highly organized than a single celled amoeba. Higher states of organization imply lower levels of entropy. Thus, the second law of thermodynamics requires that sustainability of complex organisms and systems depend on the use of low entropy energy derived from their environment, which is returned as (less useful) high entropy energy. In this context, natural resource degradation, pollution and loss of biodiversity are detrimental because they increase vulnerability, undermine system health, and reduce resilience (Munasinghe et al. 2007).

The notions of a safe threshold and carrying capacity are important, to avoid catastrophic ecosystem collapse (Holling 1992). It is useful to also think of sustainability in terms of the normal functioning and longevity of a nested hierarchy of ecological and socioeconomic systems, ordered according to scale – e.g., a human community would consist of many individuals, who are themselves composed of a large number of discrete cells. (Gunderson et al. 2001) used the term ‘panarchy’ to denote such a hierarchy of systems and their adaptive cycles across scales. A system at a given level is able to operate in its stable (sustainable) mode, because it is protected by slower and more conservative changes in the super-system above it, while being simultaneously invigorated and energized by faster changes taking place in sub-systems below it.

2.0 Population Growth

No discussion on economics and environment is complete without mention of classical population growth models; the scope of this paper is limited on presentation of mathematical modeling however in an attempt to demystify the issues surrounding population growth it remains valuable to mention Malthus Verhulst model(1836). Whether cornucopian neo

Malthusian or other school of thought fundamentally there is an unassailable limit to growth for any population that sustains positive population growth referring to carrying capacity (resources) parameter; the limits to growth concept have profound implications for the challenges of dealing with resource and environmental problems. Plausible the earth itself represents the ultimate limit to growth. Figure 1 schematizes a simple relationship between strong population and a strong economy from an economic rationalist perspective and without direct consideration of environmental impacts. The increased demand for goods and services contributes to elevated production, economic growth and higher average living standards for many (but not all). In terms of balance, sustainability is the holding stool for the entire activity to which in one sense it would function as one body an organism. However in a period of instant gratification of "needs" billions of people, arguably somewhat over 3 billion have US$3/day per capita or less for all their needs. Their goal is to survive, and thoughts of sustainable use of the planet are not likely to enter their minds. This is in contrast to a nation, the United States, of over 270 million people (Bureau of the Census, 1998, 373) is using approximately 25% of Earth's resources, although the global population is in excess of six billion (Cairns, 2002). Another question stems to mind is how does civilization contribute to the values of sustainability. To some the concept of civilization, affluence or modernization (improvement in quality of life) is to live in larger and bigger comforts and ease through better conveniences even though the ecological constraints imposed by a finite planet with finite resources are not always realized. Whilst it has been argued that human ingenuity will replace depleted resources, this argument has certain scientific limitations initially based on the first and the second law of thermodynamics, since the economic process transforms matter/energy from a state of low entropy to a state of high entropy and secondly science is developed at a constant rate or polynomial where as population growth is exponential.

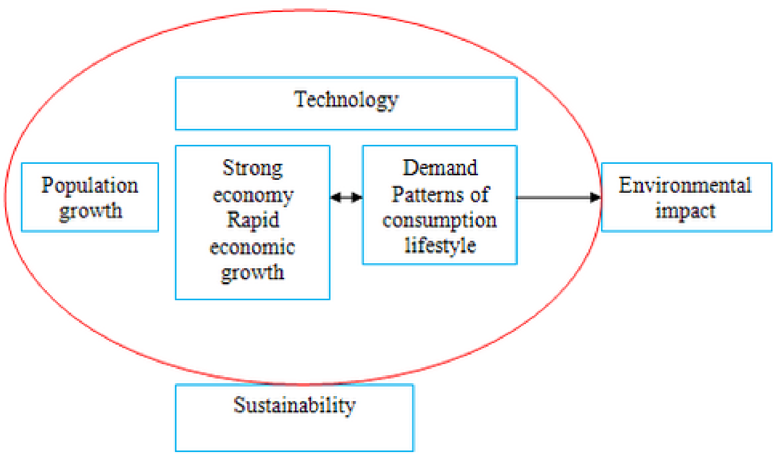

Figure 1: Environmental Impacts and Economics at Different Growth Components

Using the analogy illustrated in Figure 1 Sustainability is dynamic in character, and by no means an ending process, constantly evolving, it is defined as a continuous process-methodology that ensures developments in every point of human life affecting sustenance. Sustainability comprises of five crucial segments like economic development, environmental condition, social structure, technological sense, institutional validity and time dependency. Sustainability resolves or sorts out the conflicts, difference of opinions, competing goals while achieving the universal target of economic prosperity, environmental quality and social equity it is a continually evolving process to produce useful technology for the development of mankind, a means to an end. Hence sustainability the 'destination' is no pre fixed destination, not a fixed place in the normal sense that we understand destination. Instead, it is a set of wishful characteristics of a future system a 'journey' (the process of achieving sustainability) is of course vitally important, but only as a means of getting to the destination (the desired future state), an ongoing process to ensure moderation for humanity now and the future. However considering our present knowledge of our planet's physical limits it is not possible to sustain human life indefinitely.

3.0 Economic Theory

The financial market turmoil in 2007 and 2008 has led to the most severe financial crisis since the Great Depression and threatens to have large repercussions on the real economy (Brunnermeier 2009). Economic models of Harrod-Domar model, Neo-classical growth model or Solow-Swan growth models, they all shared a common spirit "Unending growth", this spirit ignored the limitation and contributions of energy. The neglect of the physical realities in economic models has been a complaint from many environmental and resource economists and has been repeatedly brought under attention (Ayres et al. 1969; Georgersuroegen 1976; Beard et al. 1999; Daly et al. 1989) This has resulted in the extension of the physical flows analysis to also describe the pathways of materials and energy in the economy and new fields of research have emerged in the area of industrial metabolism (Ayres 1994) and material flow analysis (De Bruyn 1997).

Considering that our world is finite, with finite resources but our economy is built on unending growth. For example the financial/ monetary system is very closely tied to debt, for a large part banks and insurance companies depend on lending, with lending being primary source of revenue for banking institutions. Arguably the USA lending boom and housing frenzy laid the foundations for the crisis since banks lending operated under the assumption that house prices will always keep raising almost on an infinite basis in a finite economy. If we relate the housing boom to the first Law of Thermodynamics: Conservation of Energy, to which you cannot get more out than you put in. since both energy and matter enter the economy as inputs, are transformed into goods and services, and leave as wastes , therefore sustainable economic models need to factor conservation of energy as a primary limitation.

Furthermore to better include sustainability concerns in economic performance measurement for example the (GDP) Gross domestic product is the common market-based measure which influences macroeconomic policy. However it holds some well-known shortcomings neglect of income distributional concerns, non-market activities, and environmental effects. Similarly (SNA) system of national accounts measures do not adequately reflect either the depletion of natural resource stocks (like deforestation), or environmental damage (due to pollution) (Munasinghe 1995). In response the United Nations Statistics Division (UNSD) developed a System of Integrated Environmental and Economic Accounting (SEEA) as an extension of the world-wide adopted System of National Accounts, the SNA. The System incorporates environmental assets and their use in monetary and non-monetary terms (Bartelmus 1997). Economist managed to evaluate the economic impact, first in microeconomic

Impact Evaluation, The main aim of a micro-economic impact evaluation is to calculate costs and benefits against normal market prices. This can be done on the basis of net present value calculations or an annualized costs basis. Second, Macro economic impact evaluation, main indicators for macro-economic impacts are (1) gross domestic product GDP, (b) balance payment, (c) government budget deficit, and (d) employment (Broek et al. 1996). Another economic performance measurement tool was introduced, the Cost-benefit analysis (CBA) listed in table 1,which is a hybrid technique, designed to quantify in money units the net benefit or cost of a particular project, such as a new environmental regulation or a new emission control investment. To engage in cost-benefit analysis, regulators must make difficult and often speculative judgments about the likely effects of alternative regulatory strategies. CBA requires agencies to engage in multiple acts of conversion, assigning economic values to human lives, human morbidity, and a range of harms to the environment (Sunstein 2005). A key aspect of an environmental CBA is the choice of non-market values to use, and the decision of how many second- and third-order effects to include in the analysis. Typically American agencies assign monetary values on the basis of private "willingness to pay" (WTP) (Viscusi 1992) For example, the Environmental Protection Agency (EPA) values a human life at about $6.1 million, a figure that comes from real-world market (Ackerman et al. 2003) For example, in evaluating the non-market effects of a road construction project, does one include just the reduction in traveling time of existing drivers, or the compensating increase in congestion resulting from new drivers taking to the roads once travel is faster(Quentin et al. 2008).

Table 1: The Main Steps of Cost Benefit Analysis (Angelsen et al. 1997)

Define the alternatives
Identify economic and environmental effects (cost and benefits)
Select key externalities for consideration
Qualify in physical terms the economic and environmental effects
Value the economic and environmental effects
Weigh the costs and benefits
-Between different groups of people (by income, location)
-In time (discounting)
Sensitivity analysis

4.0 Discussion: Sustainability and Economics an Organism in Premise

While recent definitions of sustainable economics abound (Daly 1986, 1991, 1996, 2003) provides a good summary, traditional economic relation to the environment have assumed that the environment is a subset of the economy as shown in Figure 2. The environmental models deal with physical flows (of pollutants), economic models deal with monetary flows. However the distinction between environment and economy described over time between flows and stocks is shown in

Figure 2, where the economy is a subset of the ecosystem as where the environment is a source of the economy's resources, and a sink for its wastes.

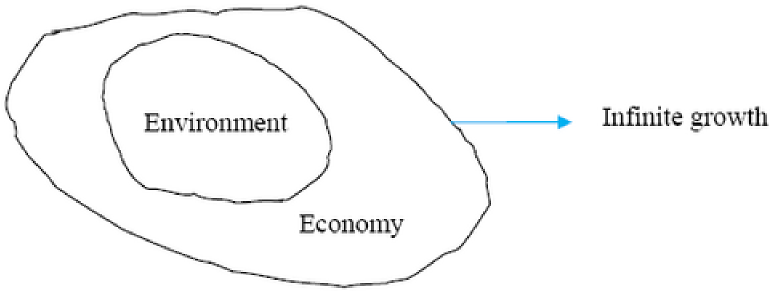

Figure 2: Environment is a Subset of the Economy

According to Jha and Murthy(2006) globalization and economic growth are fast becoming an irreversible process. In addition Jha and Murthy(2006) critiqued development in high-income countries since they are responsible for global environmental degradation.

This leads to the importance of what (Hayes 2002) described that environmental policy is, in fact, economic policy. Whereas the magnitude of growth which may cause environmental damage, could be moderated by policy measures that restructure growth -to make it less resource intensive and polluting (Munasinghe 1995). therefore, all the known sustainability measurement tools in the world will not assist in achieving sustainability if the dollar value is not recovered, our economic principles are based on business making money, whether expenditure treated as intermediate, final consumption or capital formation, at the end of the day, if no money is made it means no jobs. Having said that, crucial changes in current paradigm of economic development are much needed and moving towards sustainability under the current framework is impossible without taking into account the problem of ecological security.

The main determinants of the ecological security;- estimating its level with the help of various methods;- working out the adjustment methods of ecological security. We suppose that it is necessary to distinguish between two aspects of ecological security: the first - ecological security of produced final products from the view of their ability to correspond to consumer standards and quality, and the second - ecological security of products from the view their production impact on environment conservation and its quality (Andriouchtchenko et al. 1997). Another important aspect of this debate is the time dimension. (Hubbert 1949) articulated that since fossil fuels were created in geologic time (500 million years) and their supply is therefore fixed and finite, annual extraction of a fossil fuel must start at zero, rise exponentially at first, pass through one or more maxima, and then decline asymptotically to zero. The great paradox is that economic prosperity of the 19th and 20th centuries is owed to the environment (what's dug up from the ground) and it is claimed that we have already entered the 'peak oil' zone. similarly many governments use World Energy Outlook (International Energy Agency) to help guide their energy and climate change policies. Therefore let us examine energy in terms of our fundamental physical laws that govern our universe.

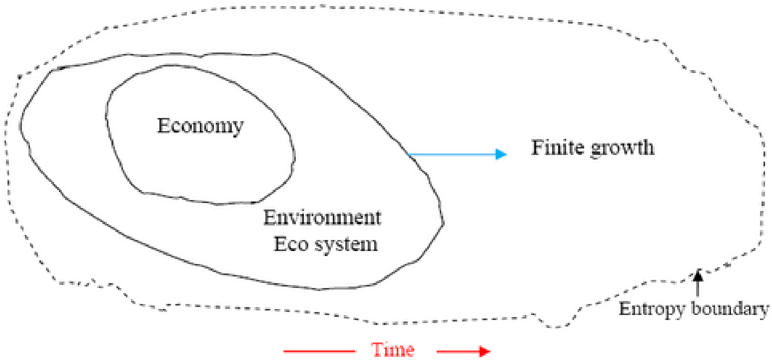

Figure 3: Ecological Economics

Although entropy, energy, and efficiency are most often associated with heat engines, they have broad applicability. In economic theory the first law of thermodynamics as expressed in eqn(1) "conservation of energy" essentially any process that signify a violation of this condition can be dismissed as impossible without even inquiring further into the details of the process. In another context this law governs the conversion of energy from one form to another,

$$dU = dW + dQ$$
$$= dW + TdS \quad (1)$$

Where dU, the change in the internal energy of a system is equal to the sum of the reversible work done on it dW and the heat irreversibly exchanged with the environment $dQ = TdS$ (which is associated with a change in the entropy of the system). Second Law: Law of increasing entropy or unidirectional flow of thermal energy, no machine that is 100% efficient. Hence if we consider entropy in terms of thermodynamic efficiency, which is the ratio of the amount of work done by a system compared to the amount of heat generated by doing that work.

$$dS \geq 0 \quad (2)$$

Since most natural processes are irreversible, the entropy law (physically reversible operation) implies that matter can be recycled only partially, and that energy cannot be recycled at all and can be used only once. It also implies that creating order through producing manmade capital entails creating greater disorder elsewhere in the environment-too much of which will make the environment unable to support human life, although the tendency is to think of thermodynamics solely in terms of Carnot efficiency. The entropy dS of the system (Thermodynamic law) thus severely limits what we can do, and implies limits to growth. correspondingly energy analysts of all perspectives suggested the likelihood of a significant increase in the cost or a shortfall in the availability of conventional fossil fuel resources by 2030 and perhaps sooner (Hanson et al. 2004). For example, whether we include in our policy analysis the nuclear, hydrogen, renewable or non-conventional fossil fuel resource options, can we afford to rule out energy efficiency? And yet, economic models and conventional policy tend to assume that energy efficiency can make only a limited and "not always cost-effective" contribution to our energy future (Laitner et al. 2003; Lovelock 1972) proposed the Gaia Theory that posits living and non-living parts of the earth form a complex interacting system that can be thought of as functioning as a single organism, which also sees the Earth (biota and material environment) as an active self-regulating system (Lovelock 1992, 2000), i.e. the biosphere fosters and maintains suitable conditions for itself by affecting Earth's environment. Similarly this falls with the boundaries of the laws of thermodynamics (entropy law): in an energetically closed system (no energy enters or leaves), the availability of useful energy always declines (Georgescu-roegen 1971). Hence Sustainability in economic theory requires societal and individual behaviors compatible with a preservation of finite of natural capital. However, citizens of developed countries "want it all right now." The instant gratification of perceived "needs" without regard for future consequences is totally incompatible with sustainable use of the planet, which espouses preservation of ecosystem health and integrity (Cairns 2002). The 1987 Nobel prize winner (Solow 1991) was of the opinion that "sustainability is an essentially vague concept, and it would be wrong to think of it as being precise." If there was a meaning, it belonged to the realm of ethics rather than science: "It says something about a moral obligation that we are supposed to have for future generations." It was understood as a declaration of a broad social value, sustainability "is not at all useless." According to (Nelson 1995), sustainability cannot literally mean "to leave the world as we found it in detail" something not only physically "unfeasible" but also "when you think about it not even desirable." instead sustainability must be understood in the terms of "an obligation to conduct ourselves so that we leave to the future the option or the capacity to be as well off as we are." Thus, society is morally obligated to act to ensure that the social welfare of future generations will be at least as great as that of the present generation.

5.0 Conclusion

Will history repeat itself? Lessons have been learned but we haven't had a frank discussion of what created the economic crisis? Social responsibility, transparency needs to replace profit driven values, since the most-watched economic statistic such as gross domestic product (GDP), does not measure resource depletion; they are essentially measures of cash flow rather than balance sheets of assets and liabilities. for example If you clear-cut a forest, GDP jumps even though you have wiped out an asset short term that capable of producing steady stream of income long-term. More broadly, the prices we pay for goods and services seldom include the associated environmental costs. Similarly in mining, exponential extraction of finite resources to sustain the indefinite economic growth is short term, impossible to be sustained indefinitely. Therefore economic growth is different to sustainable economy, hence developing a sustainable economic model as an organism requires throughput to the system be within the regenerative and absorptive capacities of the surrounding system. Consequently the premise of the current economic model advocating indefinite exponential growth is a false one. Since the world has limited natural resources, shouldn't our economic system be altered so that it does assume the reality that we live in a world with finite resources? So that it's not based on the assumption that exponential extraction of resources can keep up with GPD and the exponentially increasing money supply.

In response to the economic woes of 2008, a number of common vocabularies echoed the discussions mainly economic morality and western financial institutions moral deficit surfaced frequently. The recent London G20 summit, April 2009, called for a rewrite of the rules, the assembly echoed -on an international stage the introduction in the U.S. of securities regulation after the 1929 crash.

- a new moral order, specifically moral capitalism, world leaders pledged some 1 trillion dollars in a bid to crawl out recession
- "By any measure the summit was historic," President Barack Obama said after the talks.
- U.K. Prime Minister Gordon Brown said, "We have reached a new consensus that we take global actions together to deal with the problems we face."

These were all measures set to fight the recession and reform the global financial systems to avert a repeat. The above statements almost amount to a rewrite of the rules of capitalism to address an integrated world economy that has outgrown the ability of nations to keep it in check. So what do we want economic sustainability model to represent? Cooperation, collaboration, opportunism or domination exploitation, and conflict. Whilst these thoughts may possibly appear as idealistic or naive, the bells for change are ringing; the recurring theme of this arrangement is that economic theory should not necessarily be at odds with nature, or vice versa. Traditionally the economy and environment have not been evenly described in like terms. Simply sustainable economy is an oscillating process with vision for the economy and society that instead of being based on the illusion of unlimited economic growth and huge disparities in standards of living, aims at living within the world's means and achieving social fairness. We need an agreed language and principles to engage in transparent dialogue, Do we need to create new institutions to deal with the issues raised by globalization? We need new institutions/bodies to facilitate this dialogue. Will developing countries make the same mistakes as the developed countries have? Is sovereign equity a disadvantage for a country? if we have agreed language and principles to go forward? What are our measures of success?

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About the Author

Abdallah M. Hasna

A.M. Hasna was awarded a PhD in Manufacturing Engineering from Swinburne University of Technology in 2002, Graduate Certificate in Higher Education Deakin University, Graduate Certificate in Management, Swinburne University of Technology, and Bachelor of Engineering Chemical RMIT University. He has experience in process engineering, held senior positions in the chemical and process industry, mainly waste water treatment, water flocculation systems in the mining industry, plantation timber molding, fuel cell power generation for air independent propulsion, and sacrificial corrosion protection for the green river project, paperboard manufacturing, and developed a microwave corrugator with Visy Industries. Previously a senior lecturer Department of Sustainability, Central Queensland University.

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