2. Review of Literature

History makes no sense without prehistory (Wilson, 2012).

Economic knowledge is historically determined...what we know today about the economic system is not something we discovered this morning, but is the sum of all our insights, discoveries and false starts in the past. Without Pigou, there would be no Keynes; without Keynes, no Friedman; without Friedman, no Lucas; without Lucas, no.............(Blaug, 1991).

In other words, without the history of economics, economic theories just drop from the sky; you have to take them on faith. The moment you wish to judge a theory, you have to ask how they came to be produced in the first place and that is a question that can only be answered by the history of ideas (Blaug, 1994).

The review of literature offers the intensive and extensive revisiting of those literatures, which have compatibility with the end(s) of the thesis. Such literatures can be divided into the three areas/parts: (2.1) Conceptual Clarification, (2.2) Keynesism on Sustainability or Sustainable Development (SD), and (2.3) Reconstructions of HK for Sustainability by Previous Literatures for Contributing to MOS.

2.1. Conceptual Clarification

Various concepts/terms are embedded in the different sections and sub-sections of this thesis. Conceptual/terminological ambiguity makes the thesis naive. The clarification of the crucial concepts/terms is needed for its sophistication, because the relevant concepts/terms are interrelated or interdependent. Their interrelationship/interdependence gives rise to the complementarity, consistency and/or coordination of the constituent components of the thesis.
2.1.1. Sustainability

The Substantive Signification of Sustainability has been disclosed by Konar and Chakrabortty (2011). By the principle of structuralism, we cannot conceptualize “sustainability” without considering its opposite polarity “anti-sustainability” or “unsustainability”. Sustainability is a synonym or a close/perfect substitute for stability, persistence, perpetuity, durability, endurance, permanence, eternalness, intransience, constancy, continuity, indefinite existence or sustained survival. Sustainability is pointless without the suffix “of something”, say, “of X”. Thus, it is correct to substitute “sustainability of X” for simply “sustainability”. Sustainability is a “portmanteau word” or “telescope word”, which means a word formed by combining multiple words. Thus, sustainability of X implies “sustain plus ability”, which in turn implies “ability to sustain X”, which ultimately implies “ability to maintain and continue the survival of X”. Further, “sustainability of X” can also be translated into “X sustainability”, where X stands for an appropriate adjective. For example, sustainability of environment is mapped into environmental sustainability, sustainability of ecology is transformed into ecological sustainability, and sustainability of society is converted into social sustainability.

The concepts of sustainability and unsustainability acquired global recognition with the enthusiastic celebration of the First Earth Day on 22 April 1970 throughout the world. But the seeds of sustainability were sown in the various works of many scholars prior to the year 1970.

Hence, given the exogenously and spontaneously determined natural instability indicated by natural catastrophes, and natural stability indicated by the enduring equilibrium of various natural life support systems, “sustainability (or unsustainability)” means “ecologically social sustainability (or unsustainability)” or “ecologically sustainable (or unsustainable) social stability (or instability)”, where the concept “social” consists of multitude of “sub-socials”. In fact, under the ceteris paribus assumption, sustainability (or unsustainability) implies the
coexistence of ecological stability (or instability) and social stability (or instability).

While the “indicators of ecological instability” can be encapsulated in the depletion, degradation and/or destruction of ecological/natural capital, the “indicators of social instability” can be reduced to the depletion, degradation and/or destruction of social capital, which consists of various sub-social capitals (e.g. economic capital, political capital, cultural capital, and moral capital).

Most importantly, there are people, who erroneously recommend for reducing sustainability to ecological sustainability. But social sustainability and ecological sustainability are interdependent, neither independent, nor dependent at the cost of other (Konar and Chakrabortty, 2011).

The more we learn about current environmental trends, the more the unsustainability of our present course becomes clear to us (Foster, 2009).

The emerging global environmental indications are so grave that the term sustainability may be treated as a “euphemism and euphuism for survival of human species” (Konar and Modak, 2010; Konar and Chakrabortty, 2011). Obviously, “unsustainability” should be regarded as the “crisis of human survival” (Gohn, 1980). In this context, it is worthy to recall A Blueprint for Survival (Ecologist Magazine, 1972) in Only One Earth (Ward and Dubos, 1972).

Sustainability is treated as an “enlightened self-interest”, as opposed to “destructive self-interest”, where “self-interest” is confined to “survival”, which refers to the perpetuation of life in the “tiny little islet of life amid the boundless ocean of lifelessness” (Rebrov, 1989) over the eons.
Further, sustainability can be likened to the global public goods, which have two properties: “non-rivalry” and “non-excludability”. Moreover, sustainability also implies “interspecies cosmopolitanism” (Konar and Chakrabortty, 2011).

Albert A. Bartlett (1997-1998) has devised the Seventeen Laws of Sustainability, with which he has sought to clarify the meaning of sustainability in terms of population and resource consumption. Moreover, Richard Heinberg (2011b) has disclosed the Five Axioms of Sustainability, as follows:

(1) **First Axiom**: Any society that continues to use critical resources unsustainably will collapse. **Exception**: A society can avoid collapse by finding replacement resources. **Limit to the Exception**: In a finite world, the number of possible replacements is also finite.

(2) **Second Axiom**: Population growth and/or growth in the rates of consumption of resources cannot be sustained.

(3) **Third Axiom**: To be sustainable, the use of renewable resources must proceed at a rate that is less than or equal to the rate of natural replenishment.

(4) **Fourth Axiom**: To be sustainable, the use of non-renewable resources must proceed at a rate that is declining, and the rate of decline must be greater than or equal to the rate of depletion.

(5) **Fifth Axiom**: Sustainability requires that substances introduced into the environment from human activities be minimized and rendered harmless to biosphere functions.

**2.1.2. Sustainable Development (SD)**

The World Commission on Environment and Development (WCED, 1987) has defined SD as follows:
Sustainable development involves more than growth. It requires a change in the content of growth to make it less material- and energy-intensive and more equitable in its impact. These changes are required in all countries as part of a package of measures to maintain the stock of ecological capital, to improve the distribution of income, and to reduce the degree of vulnerability to economic crises.

The precise meaning of the WCED’s (1987) definition of SD is as follows:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

The WCED’s (1987) concept is correct, but its important limitation is that it is anthropocentric in the sense that it only considers human species and it says nothing about non-human species. Thus, Boff (2012) has redefined SD as follows:

Sustainable development is every action destined to maintain the energy, information, and physical-chemical conditions that make all beings sustainable, especially the living Earth, the community of life and human life, seeking their continuity, and also to attend the needs of present and future generations in such a way that the natural capital is maintained and its capacity of regeneration, reproduction and eco-evolution is enriched.

According to Bartlett (2012), the WCED’s (1987) definition of SD has a flaw. It focuses first on the needs of the present, which have nothing to do with sustainability, and secondarily, it mentions the needs of future generations, which are vital for sustainability. This sets the stage for intergenerational conflict, in which the present generation wins and future generations lose. Thus, Bartlett (2012) has redefined SD as follows:
Sustainable development is development that does not compromise the ability of future generations to meet their own needs.

The FAO’s (1995) definition of sustainable development can be restated as follows:

Sustainable Development is the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development, which conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable.

From the WCED’s (1987) definition of SD, it is possible to infer two different implications:

(1) That the stock of natural/ecological capital must be left intact for the next generations. In better words, the depletion of non-renewable resources must stop so that natural/ecological capital is not further depleted. In policy terms, this implies putting a stop to all activities, which exploit a non-renewable resources affecting the future generations.

(2) That the aggregate stock of manufactured capital and natural/ecological capital must not decline between one generation and the next generations. In better words, there can be trade-offs between manufactured capital and natural/ecdological capital. The depletion of natural/ecdological capital is justified so long as there is investment in a natural or manufactured alternative and the aggregate stock is retained. In policy terms, for example, this means that the oil stock can be depleted so long as it is replaced by investment in another capital, which allows future generations the same quality of life and choice as was supplied by oil to the present one. But this interpretation is also problematic,
because there are some other capitals, which cannot be substituted for others (e.g. ozone layer, species, etc.). Nor can we be sure that future generations will accept or positively interpret our decisions about substitutes. How can we today know the needs of future generations? This highly normative definition raises some important questions. For example, needs are not given, but change constantly over time, and also vary cross-culturally. Further, development is not just a means to meet needs, but is a process, which entails the development of needs themselves. Therefore, how can “needs” be defined independently of “development”, if it is often the process of economic growth/development initiated by the North, which creates and defines “needs”?

### 2.1.3. Weak Sustainability versus Strong Sustainability

The generally accepted two versions of sustainability are weak sustainability and strong sustainability (Ayres, van den Bergh and Gowdy, 1998). They have been eloquently stated in Pearce, Markandya and Barbier (1989). Though the difference between them has created a hubbub of heated controversy (Solow, 1997; Stiglitz, 1997), yet there is a place for both of them. The difference between them is a matter of difference in the degree of substitutability between natural/ecological capital and manufactured capital. Either concept of sustainability implies some limits to economic growth. As planetary ecosystem has certain limits, there must also be limits on macroeconomic scale (the overall level of resource use and goods output). Hence, there is a need in the long term to reach a plateau, a steady state in terms of the consumption of material and energy resources. Some capitals must fall under the requirement of strong sustainability, others under the weak sustainability. Which of the two it is, will depend on the degree of substitutability between manufactured capital and natural/ecological capital. The depletion of fossil fuels (natural capital) is an example of weak sustainability. Provided other sources of energy (manufactured capital) can be developed instead, we are not obliged to leave our descendants an undiminished stock of petroleum. An extinct species, on the other hand, cannot, at the current state of scientific knowledge, be recovered, and must,
therefore, be considered a loss in terms of strong sustainability.

2.1.3.1. Weak Sustainability

Weak sustainability shows that the substitutability of manufactured capital for natural/ecological capital is more or less unlimited. Unlimited substitutability and perfect substitutability are not the same. For example, in the case of Cobb-Douglas production function: \( X = AK^aN^b \), manufactured capital \( K \) is an unlimited substitute for natural capital \( N \), because however small a positive \( N \) is, there is always some \( K \), which will produce a given level of output \( X \). By contrast, in the case of linear production function: \( X = (aK + bN) \), a unit of \( K \) is a perfect substitute for \( (a/b) \) units of \( N \). In the case of weak sustainability, the next generation should inherit a stock of wealth, comprising manufactured capital and natural/ecological capital, no less than the stock inherited by the previous generation. The depletion of natural/ecological capital is justified as long as manufactured capital can substitute for natural/ecological capital. Any loss of natural/ecological capital can/should be balanced by the creation of manufactured capital of at least equal value. Hence, it is acceptable to use or destroy natural/ecological capital provided that manufactured capital of equal value is substituted for what is lost. Weak sustainability can be criticized on the grounds that economic valuation does not reflect the full value of ecological/natural services, and therefore, encourages to ignore ecological limits. This can lead the process of economic growth or development on very dangerous roads. In the past, destructive ecological feedbacks have caused civilizations to collapse.

2.1.3.2. Strong Sustainability

Strong sustainability shows that natural/ecological capital and manufactured capital are not substitutable and therefore, stock of natural/ecological capital must be maintained. In other words, the substitutability of manufactured capital for natural/ecological capital is absolutely ruled out. In the case of strong sustainability, the next generation should inherit a stock of natural/ecological
capital no less than the stock inherited by the previous generation. Where there is danger of irreversibility, that is, damage that cannot be repaired, we should observe the precautionary principle. Such principle implies that we should not risk environmental damage, which can permanently harm our own society or future generations.

2.1.4. Contextual Macroeconomics

By any criterion, economics is contextual or context-dependent. This means that the nature, role and principles of economics change with the change in context.

Although the reconstruction of economics started since the publication of Boulding’s (1950) *A Reconstruction of Economics*, the first book on contextual economics is *Economics: Principles and Practices* (1979; Last edition, since the first edition is out of print) by Kelvin Lancaster, a Columbia University economist (Goodwin, Anaanyin, Ackerman and Weisskopf, 1997).

On the basis of the principles of the contextual economics, economics is being redefined as the study of the way people organize themselves or their efforts to sustain life and enhance its quality (Goodwin, Nelson, Ackerman and Weisskopf, 2009; Goodwin, Nelson and Harris, 2009). Thus, economics studies how individuals engage in the following four essential economic activities and how their social coordination is achieved: (i) maintenance of resources (e.g. natural resources, manufactured resources, social resources, human resources, financial resources, etc.), (ii) production of goods and services, (iii) distribution of goods and services, and (iv) consumption of goods and services.

Hence, contextual economics is the result of an evolutionary process, in which economics practitioners have eliminated those ideas that failed and kept those that appear to explain reality well. In better words, contextual economics is the
result of a sustained process of (re)construction of an interaction between ideas and events in the changing context.

The examples of contextual economics are cultural economics, ecological economics, environmental economics, family/household economics, institutional economics, military economics, political economics, religious economics, resource economics, social economics, social ecological economics, sustainability economics and “Sustainomics”, coined and clarified by Mohan Munasinghe (1992), the Chairman of Munasinghe Institute of Development (MIND), Sri Lanka.

As an important branch of economics, macroeconomics is not devoid of context or de-contextual. Because “the material is not homogeneous through time” (Keynes, 1938) and there are no unchanged structures or mechanisms for all times. That is why we have to make a new thinking, which is relevant to the changing or contemporary world. If macroeconomics is contextual, its objective is to cope with the changing context.

Needless to say, macroeconomics looks at the performance of the overall economy. But how the macroeconomics or macroeconomy and macroeconomic factors and their general conditions are examined varies in different schools of thought *ceteris paribus*.

Macroeconomics is also being contextualized to create the environmental macroeconomics, ecological macroeconomics, social macroeconomics, social ecological macroeconomics, sustainability macroeconomics, or macroeconomics of/for sustainability, etc.

The context of the 21st century macroeconomics is radically different from the context of the 19th and 20th century macroeconomics. The contextual difference creates a differentiation in the nature and role of macroeconomics.
Blanchard (2000) has divided the history of macroeconomics into three epochs: (i) pre-1940 epoch, (ii) 1940-1980 epoch, and (iii) post-1980 epoch.

If macroeconomics for the former two epochs is designated as “old contextual macroeconomics”, then macroeconomics for the latter epoch should be denoted as “new contextual macroeconomics”. Evidence indicates that old contextual macroeconomics was confined to the exploration of the causes, consequences and cures of the problem of persistent economic instability through accelerating the economic growth in the capitalist world *ceteris paribus*. But economic instability is one of the multiple sub-social instabilities of social instability. The old contextual macroeconomics fails to tackle the problem of persistent social instability, non-economic social instability or remaining sub-social instabilities.

In addition, the worldwide celebration of the *First Earth Day* on 22 April 1970 reminds/warns us that the “old context” (*persistent social instability*) has been coupled with a “new context” (*emerging ecological instability*) in the capitalist world, given the exogenously and spontaneously determined natural instability and natural stability including solar stability. This “dual instability” (*dual context*), that is, the coexistence of the “persistent social instability” (*old context*) and the “emerging ecological instability” (*new context*) cannot be tackled by the “old contextual macroeconomics”. Hence, the need for a “new contextual macroeconomics” has become eventually inevitable. The substitution of a new contextual macroeconomics for an old contextual macroeconomics means contextualization of macroeconomics or contextual (re)construction of macroeconomics. Such contextualization is needed only when there is a substitution of a new context for an old context.

*Macroeconomics in Context* of Goodwin, Nelson and Harris (2009), is the result of contextualization of macroeconomics. In this book, they have reinterpreted economics, microeconomics and macroeconomics in the context of sustainability.
Thus, macroeconomics is not a set of principles, which is set in stone (Goodwin, Nelson and Harris, 2009). Rather, it has changed over time with the change in context. Contextual macroeconomics studies how the various macroeconomic principles fit into different contexts or changing context.

The contextual (re)construction of macroeconomics started since the 1970s. But such (re)construction needs adequate, apposite and/or appropriate context. The examples of contextualization of macroeconomics are as follows:

1. Fellner’s (1976) *Towards a Reconstruction of Macroeconomics*
2. Sims’s (1980) *Macroeconomics and Reality*
3. Gregory’s (1988) *Recent Developments in Macroeconomics*
4. Fisher’s (1988) *Recent Developments in Macroeconomics*
5. Phelps’s (1990) *Recent Developments in Macroeconomics*
7. Harris and Goodwin’s (2003) *New Thinking in Macroeconomics*
10. Cohn’s (2007) *Reintroducing Macroeconomics*
12. Harris and Goodwin’s (2009) *Twenty-First Century Macroeconomics*

In this connection, it is relevant to recall the title of a conference “Rethinking Macroeconomics”, which was held at the Pocantico Conference Centre of the Rockefeller Brothers Fund, on 20-23 June, 2002, and sponsored by Global Development and Environment Institute of Tufts University, Medford, USA.
2.1.5. Macroeconomics of Sustainability (MOS)

A different kind of macroeconomics is going to be needed... The time is now ripe to develop a new macroeconomics for sustainability... There is no macroeconomics for sustainability... So there is an urgent need to develop the capabilities required to build a new macroeconomics for sustainability... A new macroeconomics for sustainability is not only essential, but possible (Jackson, 2009).

The implementation of ambitious programs for social investment and redirection of the macro economy towards sustainability will be essential for preserving economic systems in the twenty-first century (Harris, 2009).

When the “core concepts” of macroeconomics developed, the world contained four billion less people than it does today. The pre-analytic vision, which informed the development of neoclassical thought, was that of a world, in which human activity was but a tiny fraction of global activity. Human use of resources and production of wastes was considered costless, because the regenerative and absorptive capacities of the earth appeared to have no limits. Today, evidence, to the contrary, arrives with regularity, to the point that the Royal Society of London and the United States National Academy of Sciences, Population Growth, Resources Consumption, and Sustainable World (1992) issued an unprecedented joint action statement-warning (Kysar, 2001):

The future of our planet is in the balance. Sustainable development can be achieved, but only if irreversible degradation of the environment can be halted in time. The next 30 years may be crucial. The continued dominance within economics of a view of nature as limitless demonstrates that macroeconomic theorists also may have committed Whitehead’s anti-rationalist fallacy: an arbitrary halt at a particular set of abstractions.
Yet surprisingly, little recognition has been given to the fact that macroeconomics rests on what is arguably now a discredited worldview. Among economists, increasing divergence between theory and reality is accounted for by increasing recognition of externalities, much like the Ptolemaic astronomers, who attempted to save their model of circular planetary motion through desperate addition of epicycles.

However, lest society is to risk growing beyond the biophysical limits of the earth (not to mention the point at which marginal costs of macroeconomic growth exceed marginal benefits), it seems appropriate to develop a “new macroeconomics”, which is grounded in scientifically plausible visions of the “relationship between macroeconomics and sustainability”. Such a new macroeconomics can be designated as “sustainability macroeconomics”, “macroeconomic for sustainability”, or “macroeconomic of sustainability” (MOS).

MOS is the eventual and inevitable responsiveness of a group of ecologically and socially conscious macroeconomists to the earlier intensive and extensive inducements provided by another group of environmentally conscious multidisciplinary and interdisciplinary scholars/thinkers in the form of their writings about the causes, consequences and cures of the threat of global unsustainability. In better words, MOS can be seen as the collective, collaborative and independent effort of a group of ecologically and socially conscious practitioners of macroeconomics to respond to the threat of global unsustainability perceived/observed and documented/interpreted by the multidisciplinary and interdisciplinary scholars/thinkers in the form of their writings/articles in books and journals.

Such writings assumed unprecedented proliferation since the worldwide celebration of the First Earth Day on 22 April 1970. The First Earth Day can be treated as the “typical turning point” in the history of global human society. That is why all the sustainability-related writings can be divided into three different periods: (i) pre-1970 sustainability writings, (ii) 1970 sustainability
writings, and (iii) post-1970 sustainability writings. All these literatures can be treated as the roots, inputs or ingredients of a comprehensive MOS.

If macroeconomics is (re)constructed for realizing the context of sustainability, then macroeconomics can be designated as MOS. Unfortunately, up till now, no comprehensive text on MOS has been constructed/created. There are only several articles/texts, whose titles are like Rethinking, Reconstructing, Reorienting, Reformulating or Rebuilding MOS. These titles indicate that such texts are under (re)construction. Independently, but not simultaneously and collectively or collaboratively, many practitioners of macroeconomics are writing only the “pieces”, not the “whole” of MOS. Besides, such practitioners come from all over the world. Their specific concerns, interests, activities and cultures are diverse. There is hardly any coordination and consensus among them. Obviously, there are differences of thought and emphasis among them. Hence, their collected writings can constitute the “naïve whole” (naïve MOS), but not the “sophisticated whole” (sophisticated MOS). That is why in the Prosperity without Growth, Tim Jackson (2009) has rightly disclosed that “There is no macroeconomics for sustainability. So there is an urgent need for one. A new macroeconomics for sustainability is not only essential, but possible”.

However, the relevant examples of fractional and fragmented (re)constructions of macroeconomics for the realization/restoration of sustainability can be demonstrated by the following seventeen literatures:

1. Macroeconomics of sustainability in Ikerd’s (1997) Toward an Economics of Sustainability
3. Harris’s (2001) Macroeconomic Policy and Sustainability
4. Kysar’s (2001) *Sustainability, Distribution and Macroeconomic Analysis of Law*
8. Courvisanos’s (2005) *A Post Keynesian Innovation Policy for Sustainable Development*
9. Harris’s (2007) *Reorienting Macroeconomic Theory towards Environmental Stability*
11. Harris’s (2008) *Ecological Macroeconomics: Consumption, Investment and Climate Change*
12. Macroeconomics for sustainability in Jackson’s (2009) *Prosperity without Growth*
15. Victor’s (2010) *Macroeconomics for Sustainability*
17. Van der Ploeg’s (2011) *Macroeconomics of Sustainability Transitions*
The construction of MOS is possible, if the pre-existing or unreconstructed theoretical approaches, frameworks or models of macroeconomics can be reconstructed accordingly, or in other words, if the pre-existing or unreconstructed theoretical approaches, frameworks or models of macroeconomics can be substituted with the new or reconstructed theoretical approaches, frameworks or models for sustainability. From neoclassical perspective, there is no need for a new macroeconomic framework/model for sustainability (Pollitt et al., 2010). But Victor (2008) claims that even in a rather conventional macroeconomic framework/model (e.g. hydraulic Keynesian macroeconomic model), a new MOS is not only meaningful, but also possible.

The construction of MOS is still being executed by many practitioners of environmental macroeconomics, ecological macroeconomics, social macroeconomics and social ecological macroeconomics to reduce/rule out the emerging threat of unsustainability and/or to restore/realize the state of sustainability of the “tiny little Titanic of global life amid the boundless ocean of lifelessness”.

Hence, the reconstruction of HK, coined and clarified by Coddington (1976, 1983), for restoring/realizing the context of sustainability, can be regarded as one of the complementary contributions to MOS.

Albert Einstein (1879–1955 AD) remarked that “problems cannot be solved at the same level of thinking that lead to their creation” (Ikerd, 1997). If so, problems arising from old contextual macroeconomic thinking cannot be solved using that thinking. A new contextual macroeconomics (e.g. MOS) cannot be derived from the contextual macroeconomics of the old belief system. A new belief system is inevitably needed for reconstructing MOS.

2.1.5.1. Need for a MOS

The need for a MOS has been disclosed by Ikerd (1997) in his *Toward an Economics of Sustainability* by an analogy as follows:
We need a new (macro)economics of sustainability, because the old (macro)economics is fundamentally incapable of addressing the social and ecological issues of sustainability. The old (macro)economics is like an old house that has been fixed up over and over with new paint, new siding, new roofs, added rooms, and added stories; but still has the same support structure and foundation. Now, the old beams are rotting and the foundation is crumbling. There is no way to fix it without tearing it down and starting over from the foundation up. This necessity should not be viewed as any discredit to those who have spent careers painting, roofing, and remodeling the old house. They have made due with what they had to work on – there seemed to be no logical alternative. We all hate to see the old building come down. But, nothing lasts forever. It simply is time to rebuild.

2.1.5.2. Crucial Characteristics of MOS

The crucial characteristics of MOS have been described chronologically by the following ten authors:

(1) Indian economist Amlan Datta (1997) said:

There was a time when by the new (macro)economics was meant the Keynesian economics, which was notable as a response to the depression of the 1930s. The new (macro)economics that is struggling to grow today is something very different. It constitutes our response to a new set of problems, which was only dimly perceived earlier, but has steadily grown in urgency over the last quarter of this century. It attempts to put forward new ideas about how to organize the foundations of a sustainable (macro)economy at this juncture in history when there are clear signs that the global economy cannot move much further along the accustomed paths of industrial growth without ending up in total disaster. For the true welfare economist, the horizons of enquiry are shifting again in a new direction…. The study of wealth and welfare stands at a new crossroads.
(2) Ikerd (1997) argues that MOS must be multidimensional – with economic, ecological and social dimensions. It must deal with balance among, as well as attainment of, things economic, social, and ecological. Thus, MOS must be “holistic”, not just “aggregate”, in nature. It must promote the sustainability of communities, nations, and the world. We need a new MOS, because the old macroeconomics is fundamentally incapable of addressing the social and ecological issues of sustainability.

(3) According to Robertson (1999), MOS reflects the growing worldwide demand for new ways of economic life and thought that will conserve the earth and its resources, and empower people to meet their own needs and the needs of others. Robertson (1999) has pointed out the following six principles of MOS:

(a) Systematic empowerment of people (as opposed to making and keeping them dependent), as the basis for people-centered development.
(b) Systematic conservation of resources and environment, as the basis for environmentally sustainable development.
(c) Evolution from a wealth of nations model of economic life to a one-world model, and from today's inter-national economy to an ecologically sustainable, decentralizing, multi-level one-world economic system.
(d) Restoration of political and ethical factors to a central place in economic life and thought.
(e) Respect for qualitative values, not just quantitative values.
(f) Respect for feminine values, not just masculine ones.

(4) Harris (2001) points out that there is as yet little work on reforming macroeconomic theory and policy to take account of sustainability. Since Herman Daly first called for an environmental macroeconomics a decade ago (Daly, 1991), there has been relatively little forward progress on this issue – certainly none that has penetrated the mainstream of macroeconomic theory, practice, and teaching. A sustainable perspective implies that radical and proactive government policies are required to achieve economic development that is both socially just and ecologically sound. The fundamental redirection
required for sustainable development cannot be achieved without reorienting macroeconomic policy. There is an increasing recognition that the achievement of social goals is essential to environmental sustainability. Given the urgency of many macro-level and global environmental issues together with the clearly inadequate state of current macroeconomic theory, it appears that the time is ripe for a reassessment of macroeconomic theory and policy.

(5) Goodwin (2003) emphasizes that macroeconomic theory has not yet come to grips with major issues of the 21st century. These include environmental pressures, demographic changes, the size, structure, and power of MNCs, and growing economic inequality. Existing macroeconomic theory also does not deal adequately with normative issues, focuses excessively on market solutions, assumes that a single macroeconomic theory can apply to all situations, and ignores issues concerning the scale of economic activity and the speed of change. Macroeconomic theory has been left behind by some critical facts and trends that are emerging in the 21st century. One large set of discordant facts may be summarized as the limits of earth’s carrying capacity in relation to both human demands for resources and anthropogenic emissions of destructive pollutants.

(6) Harris and Goodwin (2009) have examined the following seven crucial issues of MOS:

(a) Understanding the challenge of global warming.
(b) The new climate economics.
(c) Economics and climate change: Resilience, equity, and sustainability.
(d) The right to development in a climate-constrained world.
(e) The economic fundamentals of global warming.
(f) Macroeconomics and sustainable development: Applying “sustainomics” framework.
(g) Ecological macroeconomics: Consumption, investment and climate change.

(7) According to Jackson (2009), there is an urgent need to develop a new ecologically literate macroeconomics capable of offering meaningful guidance
for a lasting prosperity – a prosperity that for now at least will have to do without growth, and may eventually be able to replace it altogether. It will be essential in understanding how to build a different kind of macroeconomics, one in which stability is no longer predicated on increasing consumption growth, but emerges through strategic investment in jobs, social infrastructures, sustainable technologies and the maintenance and protection of ecosystem. A new macroeconomics for sustainability must abandon the presumption of growth in material consumption as the basis for economic stability. It will have to be ecologically and socially literate, ending the folly of separating economy from society and environment. MOS does not rely for its stability on relentless growth and expanding material throughput. Jackson (2009) has prescribed twelve steps to a sustainable economy as follows.

(A) Four Steps for Building a Sustainable Economy
(A_1) Developing macroeconomic capability
(A_2) Investing in public assets and infrastructures
(A_3) Increasing financial and fiscal prudence
(A_4) Reforming macroeconomic accounting

(B) Five Steps for Protecting Capabilities for Flourishing
(B_1) Sharing the available work and improving the work-life balance
(B_2) Tackling systemic inequality
(B_3) Measuring capabilities and flourishing
(B_4) Strengthening human and social capital
(B_5) Reversing the culture of consumerism

(C) Three Steps for Responding Ecological Limits
(C_1) Imposing clearly defined resource/emission caps
(C_2) Implementing fiscal reform for sustainability
(C_3) Promoting technology transfer and international ecosystem protection
Sachs (2009) remarks that sustained and widespread future prosperity will require basic reforms in global macroeconomic governance and in macroeconomic science. Structural challenges like energy, climate change, higher education, public health and infrastructure are not treated as economic priorities in the conventional macroeconomics. A new strategy of economic governance – one that is structural and global – is now needed, and a new science of macroeconomics must supersede the stale debates of Keynesian and rational expectation theories. The new tools of macroeconomics are quite different from the existing tools. Macroeconomics needs an overhaul not only in concepts and tools, but in global cooperation as well. Global macroeconomics, as opposed to national macroeconomics, should be reconstituted around the global challenges, since solutions to the problems will do more to promote and sustain global growth than further fiddling with macroeconomic dials. Yet as important as these areas are to our current and future economic wellbeing, we have a surfeit of words and a dangerous deficit of real action. We will need, urgently, to strengthen global institutions so that they can provide reliable expert guidance, quantification, monitoring, and oversight of global cooperative actions. The data matter and we are flying blind. We will do well to start the new macroeconomics with three crucial and interconnected challenges: (a) climate and energy security, (b) food and nutrition security (including land use, water use and biodiversity), and (c) poverty reduction. The world’s macroeconomic challenges are new, because we have hit generational roadblocks due to persistent poverty, escalating environmental threats, and deepening energy insecurity. Macroeconomic aggregates will not produce the next generation of automobiles, the safe worldwide use of nuclear power, the protection of rainforests, or global capture and disposal of carbon dioxide at cost-fired plants. The new macroeconomics must be structural – concerning itself with poverty, education, food, energy, and climate over CPI – if we are to find our way to sustainable recovery and development.

Goodwin (2010) says that the critical role for macroeconomic theory is no longer simply to explain how the existing macroeconomic system works, but also
to explore how the macroeconomic system can be changed to become more adaptive and resilient in the face of the challenges of the 21st century, and how it can be more directly designed to support human wellbeing, in the present and the future. Simultaneous changes are needed, in both the actual macroeconomy and also in macroeconomic theory. In short, the major problems with mainstream macroeconomic theory begins with its assumption of final ends – most probably, maximizing GDP – that are not appropriate to a resource-constrained world. It views the macroeconomy as separate from its social and ecological contexts, understanding neither its dependence on these contexts nor the impacts of meta-externalities from the macroeconomic system upon them. It only counts things that go through the market, and it has a bias against the public sector and in favor of the status quo.

(10) Nadal’s (2011) book *Rethinking Macroeconomics for Sustainability* reveals the linkages between monetary, financial and fiscal policies, and the environmental degradation, which threatens the planet’s biosphere. Rebooting the world economic system is simply not enough to get us on the road to sustainability. If we do not bring macroeconomics to the discussion of sustainability, we will have failed in the endeavor to make this a better world. Nadal’s (2011) book is an effort to bring together macroeconomics and the current debates on sustainability. The world will never reach sustainability, if we do not redefine macroeconomic theories, policies and practices. Nadal (2011) points out that it is a good time to seize the opportunity to go back to basics and redefine the object and the role of macroeconomics. It is time to rethink macroeconomics for sustainability.

### 2.2. Keynesism on Sustainability or Sustainable Development (SD)

Contrary to the meaning of “Keynesianism”, “Keynesism” refers to the composite/collective writings of John Maynard Keynes (Konar, 2011b).
In his article, entitled, *Keynes and Sustainable Development*, Eric Berr (2009) has revisited the writings of Keynes to demonstrate that Keynesism contains the premises of SD. Keynes’s position on uncertainty, money, the place of economics, arts, philosophy, etc. are consistent with SD. Keynesism on the environment and the arts, which lead Keynes to a virulent criticism of capitalism, constitutes the basis for “ecological sustainability”, which has been termed as the *First Pillar of SD* by Berr (2009). Such base is reinforced by Keynes’s philosophy of uncertainty, which foreshadows the precautionary principle. Regarding social aspect, which constitutes “social sustainability” [Berr’s (2009) *Second Pillar of SD*], Keynes also gives some useful clues. Keynes’s emphasis put on unemployment and equity, on the one hand, and his views of economics as a secondary science, on the other hand, represent the foundation of “social sustainability”. Keynes’s references to environmental issues are rather rare. But he was aware that some classical economists (e.g. Malthus and Mill) had investigated environmental problem.

Berr (2009) concludes that Keynes is conscious of the environmental and cultural limits of capitalism. But for more personal reasons, due mainly to his social origins, he does not reject it, and proposes only a regulation of the capitalist system. This position does not seem to be free from contradiction on behalf of an author wishing to reduce the importance of pecuniary aspects. Thus, Keynes appears to be halfway between the “weak sustainability” and “strong sustainability”. Ultimately, promoting a cut in working time, rejecting an immoderate pecuniary accumulation, conflicting with speculation, and favoring a balanced trade result in minimizing the place of economics and make Keynes an initiator of SD.

2.3. **Reconstructions of HK for Sustainability by Previous Literatures for Contributing to MOS**

The pursuit of knowledge is a cooperative endeavor, and will be more successful, if everyone is allowed to make a contribution. For each man has something personal to contribute toward the truth.
A journey of a thousand miles begins with a single step. This is an old proverb. Initiatives to integrate the sustainability with macroeconomic theory and policy are a step in the right direction to develop a MOS. The objective of the reconstruction of HK to realize the context of sustainability is to lay the foundation for that first step.

Earlier, it has been stated that HK consists of two constituent Keynesian macroeconomic models: (i) Simple Keynesian Model and (ii) IS-LM Keynesian Model. Hence, reconstruction of HK for sustainability means the reconstruction of both the foregoing two models of HK for realizing/restoring sustainability to contribute to MOS.

Chronologically, the following twenty two previous literatures demonstrate how HK can be reconstructed for realizing/restoring “different dimensions” of sustainability:

(1) Young (1975) argues that in addition to describing short-run functional and causal relationships between the main economic aggregates in a capitalist or mixed economy, the hydraulic Keynesian model can also be reconstructed in “ecological terms”. This follows from the fact that psychosocial, normative, and subjective factors are both explicitly and implicitly included in the hydraulic Keynesian system. This system can, therefore, be described in terms broader than purely economic ones, and thus the word ecosystem can be utilized in this regard, as it seems to cover both the economic and ecological factors involved.

(2) Daly (1991) pleads for an environmental macroeconomics. The response within the school of ecological economics has been limited to the use of the hydraulic Keynesian model (IS-LM Keynesian model), because the IS-LM Keynesian model is the “workhorse model” in macroeconomics (Daly and Farley, 2004; Lawn, 2003b). It is more accurate to say that the IS-LM Keynesian
model is the Trojan horse, from which the effort to distort and recover Keynesian theory has been launched by the establishment (Nadal, 2011).

(3) According to Girma (1992), macroeconomic and program policymakers are presently not well equipped with analytical methods for examining the environmental effects of their recommendations and actions. Girma’s (1992) article proposes a framework for examining macropolicy effects on incentives and constraints in the environmental sector and approach for adapting policy cost-benefit analysis to incorporate sustainability concerns. A simple Keynesian model is constructed, and used to show how the environment may be incorporated as a sector of the macroeconomy. Aggregate demand policy, sectoral policy and distributional issues are examined within the context of this simple Keynesian model. In short, Girma’s (1992) article starts from a simple Keynesian model and adds an environment sector to examine key macroeconomic policies and their impacts on the environment.

(4) Thampapillai (1995) was the first author to try to assimilate the environment into a macroeconomic model by defining an environmental cost function and projecting it on to a conventional IS-LM Keynesian model. The model is used to identify how macroeconomic policies can be used to alter the IS-LM equilibrium in order to attain a position, which maintains the assimilative capacity of the environment. The issue is how macroeconomic policies can be used to attain a position of environmental equilibrium. In terms of modified IS-LM Keynesian model, Thampapillai (1995) suggests that the restrictive or tighter fiscal and monetary policies can reduce the level of macroeconomic activity, and such reduction of the volume of macroeconomic activity can return the economy to the level of environmental sustainability.

(5) The article of Thampapillai and Uhlin (1996) discloses that the depreciation of environmental capital is internalized within a simple Keynesian model to permit the determination of sustainable national income (SNI). This article includes the simulation of SNI paths and the evaluation of wages and technology/management policies for achieving convergence between full
employment and SNI. The scope for further conceptual development is demonstrated by the illustration of aggregate supply in the context of environmental depreciation.

(6) Building on the basic tenet of environmental accounting, a simple Keynesian model has been adapted by Thampapillai and Uhlin (1997) for the determination of SNI. This adaptation involves the formulation of linear (See Figure 2, Thampapillai and Uhlin, 1997) as well as nonlinear (See Figure 3, Thampapillai and Uhlin, 1997) frameworks of national income determination. These frameworks are empirically demonstrated for the US economy by integrating standard macroeconomic data with macro-environmental data. The analysis includes the derivation of SNI paths and the evaluation of wages and technology/management policies for jointly achieving full employment and SNI. The results indicate efficiency improvements in the utilization of environmental capital and possible converges between the SNI path and actual NI path.

(7) The article of Ahmed and Mallick (1997) has incorporated environment into a simple Keynesian model for estimation of SNI of Pakistan and Bangladesh. It is now widely accepted that the indicators of NI accounts do no correctly portray the state of the economy. GDP is the widely used measure of economic activity, and is generally used in formulating demand management and stabilization policies. A major shortcoming of relying solely on GDP is that it ignores the effects of environmental degradation and depletion of natural resources. Where environment is concerned, there is no such thing as a free lunch and the burden of the excessive use will have to be borne by the coming generations. In environmental economics, the environment is regarded as capital, which is durable and provides services overtime. If managed properly, it can provide services indefinitely. As manufactured capital depreciates overtime, the environment also deteriorates if not maintained. Thus, the allowance for the depreciation of environmental capital has to be deducted from a country’s NI to ensure its proper maintenance, that is, to offset the wear and tear of natural
endowments. This allowance is called environmental capital depreciation and is deducted from the GNP to achieve the SNI.

(8) Heyes’s (2000) article has used a modified IS-LM Keynesian model to examine how monetary and fiscal policies affect the environment. The method of Heyes (2000) differs from that of Thampapillai (1995), because Heyes introduces the environmental restriction directly as an environmental equilibrium curve, denoted by EE. Each point of this EE curve corresponds to a situation, in which the wear-and-tear effect on the environment is being restored. In the EE curve, the rate, at which the economy is using the natural resource base or the environment, is equal to its resilience. The EE curve shows that all interest-output combinations are such that the rate at which the economy is using environmental services is exactly equal to the natural environment’s ability to supply them. In a nutshell, the EE curve is introduced into the IS-LM Keynesian Model to show how monetary and fiscal policies can return the economy to a position of environmental equilibrium. Traditional fiscal and monetary policies can set the economy on a scale, which is compatible with environmental equilibrium.

(9) The article of Mallick, Sinden, and Thampapillai (2000) shows that the environment is an asset that provides essential services. Like any other asset, its services will diminish as it depreciates. The environmentally SNI of a nation depends on a sustained flow of these services, and can be estimated by including the environment in a macroeconomic framework, with a goal to achieve both full employment and sustainability. The relationship of NI to employment is estimated at full employment, actual employment and the employment level that is necessary to SNI, for the Australian economy. There proved to be a widening gap between actual NI and environmentally SNI, and between actual NI and full employment NI. Wage reduction and improvement of technology are analyzed as possible ways to meet the goal of an environmentally SNI. In the analysis of the Australian economy, this article suggests that reconciliation between the goals of sustainability and employment may be achieved by a real
wage reduction of approximately 8-10%. This analysis has been structured within the framework of a simple Keynesian model of NI determination and a Cobb-Douglas production function. In this article, the 8-10% wage reduction has been estimated by recourse to a Cobb-Douglas production function for full employment. This wage reduction amounts to the same magnitude as the environmental capital depreciation allowance, which can be subtracted from NNP in the simple Keynesian model of NI determination in order to achieve sustainability.

(10) Munasinghe (2002) traces the relation between macroeconomics and the environment from historical perspective. Then he discusses how environmental considerations can be incorporated into more conventional Keynesian macroeconomic models used in policymaking, ranging from extensions of the IS-LM Keynesian model used in analyses of comparative statics, to sophisticated computable general equilibrium models (CGEMs), which include environmental variables. Longer run environmental macroeconomic models for both closed and open economies are built around supply side issues like capital accumulation, natural resource depletion, long run labour supply, discount rate and the rate of technological progress. Finally, he reintroduces the IS-LM-EE Keynesian model of Heyes (2000) briefly in terms of IS-LM-EE diagram and its mathematical explanation.


(12) Lawn (2003b) has provided an appraisal of Heyes’s (2000) IS-LM-EE Keynesian model for the further development of environmental macroeconomics.

(13) Lawn (2003c) has extended the IS-LM Keynesian model to include an environmental equilibrium curve, which is similar to Heyes’s (2000) EE curve. Lawn (2003c) has demonstrated that a decade has now passed since Daly made a plea for an environmental macroeconomics. Despite an expanding literature
on green NI accounting and the efforts of ecological economists to measure the sustainable net benefits of a growing macroeconomy, it is only recently that Daly’s plea has been adequately answered. This has been achieved with the incorporation by Heyes of an environmental equilibrium curve (EE) into the familiar IS-LM Keynesian model. However, the IS-LM-EE Keynesian model proposed by Heyes is incomplete. By extending Heyes’s model to include the role of technological progress and the sustainable net benefits of economic activity, this article shows that conclusions regarding the desirability of expansionary fiscal and monetary policies alter quite radically. Moreover, it sends out a clear message that environmental concerns should be incorporated into macroeconomic models. They should not be solely confined to microeconomics.

(14) The article of Daly and Farley (2004) has adopted a different approach to the use of an IS-LM Keynesian model. First, it assumes that it is possible to calculate the throughput-intensity per unit of output. Second, it also assumes that it is possible to estimate the maximum ecologically sustainable level of output. This can then be imposed as an external physical constraint. The new physical restriction is introduced into the model through a vertical line, which is called ecological capacity line and is denoted by EC. Each point on the vertical EC line shows a biophysical equilibrium. Given the technology used in the economy, the EC line indicates the balance between usage and extraction rates, and the capacity of the environment to replace used materials and restore the health of ecosystem. The points on the EC line are ignored by the actors, whose behavior is captured in the IS-LM curves.

(15) Sim (2006) revisits Heyes’s (2000) attempt to incorporate an environmental constraint into the IS-LM Keynesian model. Sim’s (2006) article extends the IS-LM-EE Keynesian model of Heyes (2000). In Heyes’s (2000) model, exogenous fiscal or monetary shocks are needed so that the intersection of all the three curves: IS curve, LM curve and EE curve, is reached. Such independent adjustments are circumvented in Sim’s (2006) article, which
argues that a naturally adjusting process exists and formalizes the mechanism for the IS-LM-EE Keynesian model. Sim’s (2006) model arises out of the requirement of overcoming the inadequacies of Heyes’s (2000) model. The main inadequacy of Heyes’s (2000) model is that it fails to answer the question raised by Sim (2006): Is there a natural adjustment mechanism in the environmental Keynesian framework? Sim (2006) claims that Heyes (2000) cannot suggest so. While the simplicity and elegance of Heyes’s model deserves merit, nevertheless one difficulty is existent in his model. In Heyes’s model, convergence to the macro-environmental equilibrium is not automatically guaranteed, but is achieved by exogenous adjustment of IS or LM curve. In this respect, Heyes’s model imposes a strong assumption that policy maker has perfect knowledge of what the environmental constraint is, and the precise amount of monetary or fiscal policy stimulus to attain an environmentally consistent market equilibrium. Sim’s (2006) model offers an adjustment process for the IS-LM-EE Keynesian model of Heyes based on insights from the question: Will a level of economic activity, which is excessively polluting, be sustainable in the long run? Recent works suggest that the answer is negative. Sim’s (2006) article suggests that in the absence of institutional arrangements, the level of economic activity must eventually conform to that accommodable by the environment. Through the IS-LM-EE Keynesian model, one important lesson emerges: overlooking the environment, when developing an economy, is a strategy programmed for serious breakdowns. Eventually, drastic but costly control measures have to be initiated, heavily polluting manufacturing and power plants may have to be retired, and lifestyles could change. Sustainable economic growth must also be accompanied by progressive upgrading of regulatory standards. The objective of Sim’s (2006) article is to offer a simple way to improve the workability of the IS-LM-EE Keynesian model so that further extensions can be conducted from this point onwards.

(16) In Morales’s (2007) article, a simple framework extending the IS-LM-EE Keynesian model is presented to address the perceived problem of having to balance the twin macro goals of economic growth and environmental
sustainability. This article shows that unless environmental policy is optimal, the policy maker’s decision will lead to unsustainable growth. On the contrary, if environmental policy is optimal, there is a: (i) finite period of sustainable growth initially, and (ii) gradual adjustment to a stationary sustainable output level due to thermodynamic constraints. Social preferences, however, play a crucial role in terms of characterizing the long-run adjustment process. The aim of Morales’s (2007) article is to contribute further to Heyes’s (2000) original proposal – the greening of textbook macro theory in terms of IS-LM-EE Keynesian model. Morales’s (2007) article has been influenced by Daly’s suggestion that macroeconomic theory should promote the basic goals of human development and sustainability.

(17) In terms of simple Keynesian model, Thampapillai, Wu and Sunderaj (2007), in their joint article, demonstrate that China has been heralded as the fast growing economy in the world. This growth has been achieved significantly at the expense of its environment. Conventional measures of economic performance (e.g. GDP) do not take into account environmental damages, and thus may be biased towards an unsustainable development path. This article compares China’s economic performance as measured by GDP against a measure of sustainable GDP, estimated by adjusting GDP for the depreciation of air, soil, and water resources. The results of this article indicate that China’s performance may not be as remarkable as commonly perceived, and that its quest for sustainable development may be challenged by political and social considerations. The challenge includes the resolution of conflict between the goals of employment and sustainability. With the help of several equations and the income-expenditure diagram (See Figure 3, Thampapillai, Wu and Sunderaj, 2007) of simple Keynesian model, this article illustrates the potential conflicts between sustainability and the pursuit of full employment. This article also points out formidable challenges in searching for sustainable development path for the Chinese economy. The sustainability-employment conflict shows that the quest for sustainable development could severely undermine the government’s ability to maintain social and political stability through labour participation.
While the concept of sustainable development has gained a wide acceptance among the decision-makers in China, its implementation involves difficult trade-offs among the various objectives.

(18) Emmanuel (2008) has transformed the IS-LM Keynesian model into the IS-LM-BP-BE Keynesian model to incorporate the problem of pollution. This reconstruction of the IS-LM Keynesian model has shown the ecological and economic effects of different monetary and fiscal policies depending on the type of small open economy considered (with or without different kind of pollution control activities). The introduction of pollution in the form of stock in a dynamic IS-LM Keynesian model, has allowed us to analyze the environmental consequences of macroeconomic policies. According to this model, an environmental public expenditure, even if it leads to increased pollution, is preferable to a usual public expenditure, because it causes relatively fewer emissions of pollution than the latter, for an identical increase in national income. The environmental effect of an expansionary monetary policy depends on the type of economy involved in. In the unusual case, where the bulk of investment activities is dedicated to clean up, any change in money supply leads to a variation in the opposite sense in the level of pollution, for the reason that a lower interest rate stimulates investment in pollution control that compensates the much more adverse effects of investment in usual sector. In the normal case, where the private sector pollution is smaller than the usual private sector, any monetary policy induced by the decline of interest rates, encourages more the usual investment (with environmental standards unchanged), and thereby increases pollution and the income levels. Hence, one of the major lessons of this model is that what is important is the expectation in the sector of the pollution control and the size of this sector relatively to the rest of the economy. Also, a government anxious to make a sustainable economic growth should give priority to try to drive the expectations of these pollution control firms through environmental standards increasingly severe as long as the economy did not have a private sector of pollution control at least as important in its economic size as the usual private sector. In the meantime, environmental public policies
should be preferred, from an environmental point of view, to any monetary and budgetary policy, provided that public environmental measures are concrete and truly effective remediation. Thus, our findings reinforce the arguments of post-Keynesians, who recognized the importance of informational constraints in a state of uncertainty, and preferred maintaining standards seeking optimality. Moreover, if one takes as relevant the criterion proposed by Daly of carrying capacity, i.e., the optimal scale of the economy compared to the ecosystem behind it, it can be concluded that the model, except in unusual circumstances, shows that any monetary or budgetary policy increases the pollution level and therefore drives the economy a little closer to the sustainable limit. If the economy is in an unusual case, one moves more and more from this limit, and then there is sustainable development in its fullest sense.

(19) On the basis of simple Keynesian model, Victor (2008) has invented a notion of LowGrow, which is an interactive computerized model of the Canadian economy. This LowGrow model has suggested how both ecological sustainability and social sustainability can be achieved.

(20) Harris (2008/2009) has tried to solve the following three dilemmas by extending the simple Keynesian model, in which three modified equilibrium equations are embedded: (i) The balancing of consumption and investment while maintaining high employment as well as limits on material consumption, (ii) The provision of adequate social and health expenditures, including the added expenditures necessary for a graying population with greater longevity, and (iii) The sufficient investment in the maintenance of critical natural capital systems including ecosystems and atmosphere.

(21) The remark of Custers (2010) is much relevant to realize the need for reconstructing the “ecological Keynesianism”. His argument can be summarized as follows. The world economy today is facing the juncture of two simultaneous crises: (i) The deepest recession since the end of World War Two, and (ii) An unprecedented world ecological crisis. Does Keynesianism offer viable ideas to face this combined crisis, alternative to the neoliberal policymaking, which has
prevailed during the last thirty years? Historically, if viewed from a longer-term perspective, the form of Keynesianism, which has predominated is “military Keynesianism”, defined as macroeconomic policymaking by capitalist governments aimed at stimulating aggregate demand for goods. Thus, deficit spending was already applied by the British government, when it competed with other European states to gain world hegemony in the late 17th and the 18th century. Again, whereas for a limited period of time after World War Two, a “civilian type of Keynesianism” has coexisted with “military Keynesianism”, especially in Western Europe, the “military form of Keynesianism” has clearly prevailed in the era of globalization, especially in the US. Keynesianism offers possibilities for a shift from current policymaking, but only if its mode of application is radically different from its historical modes. An “ecological Keynesianism” needs to fulfill both a social criterion - promotion of employment - and an ecological standard - countering capitalism’s inherent tendency to destroy its natural surroundings. Three examples of an “ecological Keynesianism” initially come to mind: (i) The state’s use of transfer and investment measures so as to accelerate the shift from reliance on fossil fuels towards reliance on renewable energy, (ii) State intervention to discourage incineration of waste, and to enhance reliance on recycling, and (iii) Conversion of military production facilities into units, which produce for the sustenance of life on earth. While an “ecological Keynesianism” does offer ample possibilities to address today’s combined crisis, the given policymaking needs to be understood as transitional. A solution to the world’s ecological crisis is only possible via the transition towards a stationary state - a zero growth economy at the world level, which protects the interests of the global South.

(22) Konar (2010) argues that Coddington’s HK, which consists of two constituent Keynesian macroeconomic models, such as, Simple Keynesian Model and Hicks-Hansen IS-LM Keynesian Model, is devoted to explore the causes, consequences and cures of the “persistent problem of economic instability” in the capitalist world. But recently the global environmental indications are that the “persistent economic instability” is being coupled with
the “emerging threat of ecological instability” in the world capitalist system. This dual instability – the coexistence of persistent economic instability and the emerging ecological instability – constitutes the “ecologically unsustainable economic instability” or “ecologically economic unsustainability”, which cannot be tackled by conventional HK due its ingrained inadequacies. This article shows how HK can be “ecologized” to restore “ecologically economic sustainability” through the compositional modifications of the conventional equilibrium conditions for income determination by incorporating the macroecological variables into these equilibrium conditions, and also through the introduction of new policy measures and applications. This article suggests that conventional HK shows upward or downward bias with respect to ecological HK in the sense that the values of most of the conventional macroeconomic variables (that is, surface values) are significantly different from that of ecologically adjusted macroeconomic variables (that is, true or real values).

**2.3.1. A Critical Conclusion from Previous Literatures on the Reconstructions of HK for Sustainability**

Serious criticisms and serious replies are both essential parts of science (Daly, 1997).

The twenty two previous literatures on the reconstructions of HK for realizing the varied versions of sustainability can be classified into two groups. While the first group has attempted to reconstruct the Simple Keynesian Model, the second group is devoted to reconstruct the IS-LM Keynesian Model.

2.3.2. Common Features of Previous Literatures

The common features of the twenty two previous literatures on the reconstructions of HK for realizing the different versions of sustainability can be summarized as follows:

(1) The previous literatures are based on hydraulic Keynesian methodology, framework, setup, model or paradigm.
(2) They have devised different models, in which different tools of analysis are embedded.
(3) While some models have introduced the different new variables, other some models have introduced the different new equations, functions or curves.
(4) Some models have been designed to tackle the problem of environmental or ecological sustainability, while few models have considered social sustainability, ecologically social sustainability or ecologically sustainable social stability.

2.3.3. Distinctive Features of the Reconstructed HK for Sustainability

The distinctive features of the reconstructed HK for sustainability in the present thesis can be summarized in terms of the following two points:

(1) Reconstructed HK for sustainability consists of different sub-models. Each sub-model is characterized by its “representative equations”, which are indicated by the “equilibrium equations” of the commodity market and/or money market. The nature of the equilibrium equations is determined by the nature of the (i) economy (e.g. two-sector closed economy, three-sector closed economy, four-sector open economy) and (ii) new variables (e.g. economic, ecological, social, sub-social) incorporated into the equilibrium equations.

(2) Though the nature and composition of equilibrium equations in each sub-model has been transformed through the incorporation of the new variables, yet no new equations, functions or curves have been introduced. Because adequate
or appropriate reconstitutions of the equilibrium equations rule out the necessity of introducing the new equations, functions or curves.

### 2.3.4. Two Critical Questions

The critics can raise the following two crucial questions:

1. What are the missing points or demerits of the previous literatures?
2. What is the novelty, newness, originality or merit of the present thesis?

### 2.3.5. Response to Two Critical Questions

The response to the foregoing two critical questions is based on the most relevant remarks of the following three authors:

1. According to the American Nobel laureate (1982) economist George J. Stigler, originality has the temporal priority in the statement of an idea. Originators usually discover their leading ideas rather than excavate them from the literature. This is an interesting problem, but it makes no difference whether the new ideas come from current originality or past originality. Originality should be measured against the knowledge of one’s contemporaries. If one opens our eyes to new ideas, new perspectives on old ideas, or new errors/inconsistencies, she/he is an originator. Originality means difference, not improvement, and one may invent new errors as well as new truths (Stigler, 1955).

2. Lawrence Boland (1994) argues that those, who actively engage in refuting one theory, are doing so only because they have an alternative theory in mind. It is not enough to indicate that the researcher’s idea is or was new, but one may want to show that it is a solution to some problem. When examining the contribution of an economic thinker, problem orientation always involves presuming that the thinker was implicitly or explicitly trying to solve a problem: achieving his/her aims by overcoming or dealing with all relevant obstacles. But
problem orientation is always retrospective. Sometimes, the situational analysis is substituted for problem orientation (Boland, 1994).

(3) The French Nobel laureate (1988) economist Maurice Allais argues that the successful scholar is always the one, who adds some marginal improvement to the dominant theories to which everyone is accustomed. If, however, a new theory falls outside established paths, it is certain to face general opposition whatever its justification. For all these reasons, it is essential to subject established truths (which cannot be questioned without confronting the active ostracism of the establishment) constantly to a critical analysis without indulgence. All genuine scientific progress comes up against the tyranny of the dominant ideas generated by the establishment. The true scholar undeniably seeks truth for its own sake, but he/she cannot be insensitive to the recognition of the value of his/her work. Whatever they may have said, the most eminent scholars have never remained completely indifferent to the opinions of others (Allais, 1997).

By comparison of the present thesis with the previous literatures, it can be emphasized that the introduction of the new equations, functions or curves by some of the previous literatures indicates not only their “superfluity”, but also the “lack of methodological mechanism” about the transformations of the equilibrium equations. Some literatures have used ecological/environmental equilibrium curves to indicate ecological/environmental sustainability. Surprisingly, none has thought to introduce “similar curves” (e.g. social equilibrium curves or sub-social equilibrium curves) in his/her model in order to realize social sustainability or multiple variants of sub-social sustainability. This implies that such literatures have concentrated only on ecological or environmental sustainability, not on social sustainability, ecologically social sustainability or ecologically sustainable social stability. In better words, social sustainability, ecologically social sustainability or ecologically sustainable social stability has been (deliberately or decisively?) “denied” by the previous authors. Hence, it is a matter of “denialism”, coined by John Bellamy Foster (2011), who said, “Our
worst enemy is denialism”. Because the previous literatures have “denied the real truth about sustainability”: social sustainability and ecological sustainability are interdependent, neither independent, nor dependent at the cost of other (Konar and Chakrabortty, 2011). Moreover, social sustainability includes sustainability of multiple sub-socials: economic sustainability, political sustainability, cultural sustainability, ethical sustainability, moral sustainability, spiritual sustainability, familial sustainability, psychological sustainability, religious sustainability, etc.

On the contrary, the reconstructed HK of the present thesis can ensure the following three variants of sustainability: (i) Ecological Sustainability, (ii) Social Sustainability and (iii) Ecologically Social Sustainability or Ecologically Sustainable Social Stability without the usage of new equations, functions or curves, but by the “rational reconstitutions” of the “conventional equilibrium equations” of HK. Hence, the present thesis can be treated as a “protest against such denialism”.

The major missing point of all the previous literatures is their inability/inadequacy to transform the “conventional equilibrium equations” into “sustainable equilibrium equations” by:

(i) Incorporating the relevant macroeconomic, macroecological, macrosocial and/or macrosub-social variables into them.


(iii) Rationally reconsidering or reconstructing the definitional equations of sustainable national income (SNI).

(iv) Incorporating the SNI into the consumption or saving function.