

Islamic Economics and the Environment: Material Flow Analysis in Society-Nature Interrelationships

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ABSTRACT. In recent years, a diverse array of ‘physical economies’ have emerged which utilise some form of Material Flow Analysis (MFA) to quantify the pattern of flows of material and energy into the economy. The reduction of the ‘metabolism’ of the economy has become one of the areas of recent environmental and economic research, focusing on ways of achieving global sustainable development. In theory, the reduction of the human socio-economic metabolism, and appropriate changes in technology and consumption, are consistent with the Islamic economic system. Hence, MFA is considered a valuable tool for encouraging and implementing sustainability approaches, which helps realise type of benefits proffered by the vision of Islamic economics. This paper aims to discuss the links between a potential application of MFA and the central themes of the Islamic economic system.

1. Introduction

By definition, economics is concerned with the way people in any society ‘make their living’ or carry out activities to do with their livelihood, such as acquiring food, shelter, clothing and other materials and services. There is also the view of economics that it involves the study of money and business transactions. Generally, any conventional economic system focuses on the market mechanism and on assumptions about inexorable goals related to self-interest and material accumulation. On the other hand, different scholars have offered definitions of Islamic economics, among whom Ahmad (1992) who defines Islamic economics as “a systematic effort to try to understand an economic problem and man’s behaviour in relation to that problem from an Islamic perspective”. In this regard Mannan (1986) argues, “Islamic economics is a social science which studies the economic problems of the people imbued with the values of Islam”, while Khan (1994) states that “Islamic economics aims at the study of human *falah* (well-being), achieved by organising the resources of the earth on a basis of co-operation and participation”.

There may be a great deal of variation in conventional economic systems. For example, conventional economies may be disparaged for its preoccupation with production, consumption and the exchange of the excesses of 'other materials and services' category. A central point is that activities relating to people's livelihoods, and related social arrangements in the broad sphere of economics, are essential in all societies as people cope to facilitate physical existence and continuity in the face of limited resources and means. They are also a major factor on the impact of humanity upon physical and social reality, and have incontrovertible cause-effect linkages to the natural environment, spiritual beliefs, social mores and other foundational values and attitudes. The importance of the connections between the human economy and the ecosphere, within which it is embedded, is highly visible in the emergence and strong growth of new holistic social and natural science perspectives such as ecological economics. The true scope of economics must be closely relevant to Islamic ethical systems, which structure the way in which we live, the morality of all aspects of behaviour and its implications and the means, measures and ideal aspirations and goals of man in this world and hereafter. In this sense, there is a very legitimate basis for developing logical connections between Islam and study of human and ecological economics.

The search for knowledge to envision and create better social and economic alternatives may well follow a development observed in the physical and natural sciences over the past few decades. From the sub-atomic, through the ecological, to the cosmological scales, investigations into the nature and order of physical reality have revealed startling similarities to that espoused in the knowledge and views of Islamic philosophies. Islamic economic theory as developed by the Islamic economists based on al-Qur'an, Sunnah and *Fuqaha's* discourses (Chapra, 2000; Siddiqi, 1996; Ahmad, 1980; Zarqa, 1980; and many other Islamic economists) address the formidable and inter-related economic, social, environmental and spiritual challenges facing humanity in the present century. The most recent evidence of the veracity of this ecological worldview can be found in the clear indication of the dangers associated with the unconstrained, imprudent, and self-indulgent exploitation of the natural world. This realisation is the guiding maxim of the widespread push for 'sustainable development' principles occurring from local to international levels.

In the field of those sciences most concerned with issues relating to sustainable development there has been a strong growth in an adherence to organic, holistic views of the human-nature relationship and the need for 'ecological' economic systems. One of the most recent, comprehensive and synthetic frameworks is the theoretical, empirical and policy utility attached to the depiction of the operation of the socio-economy in terms of metabolism. The socio-economic metabolism consists of a network or circulation of physical flows of materials and energy (input and output) between nature and the economy, and the transformation and accumulations of these flows for human production and consumption within the economy. Material Flow Analysis (MFA) techniques have been developed as the primary generic device for mapping this metabolism of the human economy. In principle, the reduction of the human socio-economic metabolism, and appropriate changes in technology and consumption, are consistent with Islamic economics. Indeed, MFA may be one important device for encouraging and implementing a global techno-economics paradigm that will help realise the type of benefits proffered by the vision of Islamic economics.

This paper will attempt to delineate the strong, potentially very useful manner in which elements of the Islamic economic system and the methodology and intent of MFA, complement each other. MFA is the primary tool for a range of contemporary strategies for reconciling the economy and environment. This study addresses the many positive and relevant features of the premises and rationality of the Islamic economic system and its remarkable compatibility with the new wave of ecological economic approaches. The layout of the paper is as follows.

In section 2 we discuss the idea and views of the Prophet Muhammad (Peace be upon him) on environmentalism. Section 3 provides an overview of MFA with a general model of economy-wide MFA, illustrating the indicators that can be derived from MFA accounts and explaining methods for the calculation of so-called 'ecological rucksacks'. Section 4 addresses the many positive and relevant features of the premises and the rationality of the Islamic economic system and its remarkable compatibility with MFA and the new wave of ecological approaches. Section 5 draws conclusions.

2. The Prophet Muhammad (PBUH) on Environmentalism

“There is none amongst the believers who plants a tree, a person, or an animal eats thereof, but it is regarded as having given a charitable gift (for which there is great recompense)” (Al-Bukhari, III: 513). The idea of the Prophet Mohammed (Peace be upon him) as a pioneer of environmentalism will initially strike many as strange: indeed, the term “environment” and related concepts such as “ecology”, “environmental awareness” and “sustainability” are modern-day inventions, terms formulated in the face of growing concerns about the present state of the natural world around us. And yet a closer reading of the *Hadith* reveals that the Prophet (PBUH) was a staunch advocate of environmental protection. One could say that he was a pioneer in the domain of conservation, sustainable development and resource management, and one who constantly sought to maintain a harmonious balance between man and nature. From all the accounts of his life and deeds, it is found that the Prophet had a profound respect for *fauna and flora*, as well as an almost visceral connection to the four elements, earth, water, fire and air. He was a strong proponent of the sustainable use and cultivation of land and water, the proper treatment of animals, plants and birds, and the equal rights of users.

The Prophet Mohammed's (PBUH) environmental philosophy is first of all holistic: it assumes a fundamental link and interdependency among all natural elements and bases its teaching on the premise that if a man abuses or exhausts one element, the natural world as a whole will suffer direct consequences. This belief is nowhere formulated in one concise phrase; it is rather an underlying principle that forms the foundation of all the Prophet's (PBUH) actions and words, a life philosophy that defined him as a person. The three most important principles of the Prophet's philosophy of nature are based on the Quranic teachings and the concepts of *Tawhid* (unity), *Khalifa* (stewardship) and *Amanah* (trust).

Tawhid, the oneness of God, is a cornerstone of the Islamic faith. It recognises the fact that there is one absolute Creator and that man is responsible to Him for all his actions: “To God belongs all that is in the heavens and in the earth, for God encompasses everything” (Al-Qur'an: 4:126). The Prophet (PBUH) acknowledges that

God's knowledge and power covers everything. Therefore, abusing one of his creations, whether it is a living being or a natural resource, is a sin. The Prophet (PBUH) considered all of God's creations to be equal before God and he believed that not only animals, but also land, forests and water courses should have rights.

The concepts of *khalifa* (stewardship), and *amanah* (trust), emerge from the principle of *Tawhid*. The Qur'an explains that mankind holds a privileged position in God's creation on earth: he is chosen as *khalifa* (vicegerent) and carries the responsibility for caring for God's earthly creations. Each individual is given this task and privilege in the form of God's trust. The Qur'an repeatedly warns believers against arrogance: they are no better than other creatures. "No creature is there on earth nor a bird flying with its wings but they are nations like you" (Al Qur'an 6:38); "Surely the creation of the heavens and the earth is greater than the creation of man, but most people know not" (Al Qur'an 40:57). The Prophet (PBUH) recognised man's responsibility to God but always maintained humility. Thus he said, "When doomsday comes, if someone has a palm shoot in his hand, he should plant it," suggesting that even when all hope is lost for mankind, one should sustain nature's growth. The Prophet's (PBUH) attitude towards sustainable use of land, conservation of water and the treatment of animals is a further illustration of the humility of his environmental philosophy.

3. Material Flow Analysis (MFA)

The principal concept underlying the economy-wide MFA approach is a simple model of the interrelation between the economy and the natural environment, in which the economy is an embedded sub-system of the environment and – similar to living beings – depends on a constant throughput of materials and energy. Raw materials, water and air are extracted from the natural system as inputs, transformed into products and finally re-transferred to the natural system as outputs such as waste and emissions (see Figure 1). The MFA has been a rapidly growing field of scientific interest and major efforts have been undertaken to harmonise the different methodological approaches developed by different research teams. The Concerned Action "ConAccount" (Klejin et al, 1999), funded by the European Commission, was one of these milestones in the international harmonisation of MFA methodologies. In an international working group on MFA, standardisation of economy-wide material flow accounting was for the first time achieved and published in a methodological guidebook by the European Statistical office (EUROSTAT, 2001).

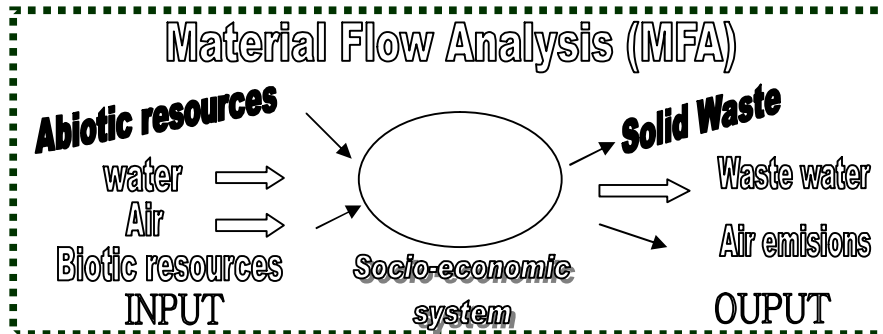


Fig. 1: The basic model of MFA

To highlight the similarity to natural metabolic processes, the terms ‘industrial’ (Ayres and Kneese, 1969) or ‘societal’ (Fischer-Kowalski, 1998) metabolism have been introduced. According to the first law of thermodynamics (the law of the conservation of mass), total inputs = total outputs + net accumulation of materials in the system. This material balance principle holds true for the economy as a whole as well as for any sub-system such as an economic sector, a company, a household. For a consistent compilation of an economy-wide material flow account, it is necessary to define exactly where the boundary between the economic and the environmental system is set, as only resources crossing this border will be accounted for. As described in the System of Environmental and Economics Accounts (SEEA) (United Nations, 2001), the economic sphere is defined in close relation to the flows covered by the conventional System of National Accounts (SNA). Thus all flows related to the three types of economic activity included in the SNA (production, consumption and stock change) are referred to as part of the economic system. On the other hand, the environmental sphere comprises all resources other than products traded within the market system. Therefore, for MFA at the national level, two main boundaries for resource flows can be defined. The first is the boundary between the economy and the domestic natural environment, from which resources (materials, water, air) are extracted. The second is the frontier with other economies with imports and exports as accounted flows.

3.1 Types of Material Flows

In its methodological guide, EUROSTAT’s (2001) advice is to distinguish the various types of material flows according to the following scheme:

Direct Versus Indirect

Direct flows refer to the actual weight of the products and do not take into account the life-cycle dimension of production chains. Indirect flows, however, indicate all materials that have been required for manufacturing (up-stream resource requirements) and comprise both used and unused materials.

Used Versus Unused

This type of used materials is defined as the amount of extracted resources which enter the economic system for further processing or direct consumption. All used materials are transformed within the economic system. Unused extraction refers to materials that never enter the economic system and this can be described as physical market externalities. This category comprises excess and separating materials by mining, catch and wood harvesting, losses from biomass extraction and soil excavation, as well as dredged materials from construction activities.

Domestic Versus Rest of the World

This category refers to the origin and destination of the flows. Combining these three dimensions in one table shows the 5 categories of material inputs relevant for economy-wide MFA (See in Table 1)

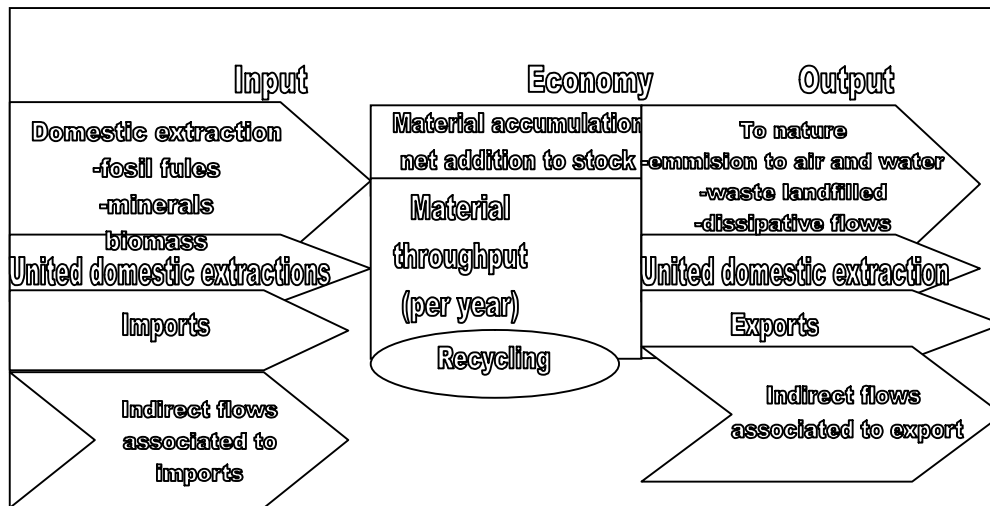
Table 1: Types of material inputs for economy-wide MFA

Weight	Economic Treatment	Origin	Term to be used
Direct	Used	Domestic	Domestic extraction (used)
Not applied	Unused	Domestic	Unused domestic extraction
Direct	Used	Rest of the world	Imports
Indirect	Used	Rest of the world	Indirect input flows
Indirect	Unused	Rest of the world	Indirect input flows associated to imports

Source: EUROSTAT (2001)

3.2 Scheme for Economy-Wide MFA

A general balance scheme including all relevant input and output flows is presented in Figure 2.



Source: Eurostat (2001)

Fig. 2.

The material balance reveals the composition of the physical metabolism of an economy and depicts domestic material extraction, imports and exports in physical units, the physical growth of its infrastructure as well as the amount of materials released back to nature. Material inputs to the economic system comprise used domestic extraction of various material groups (fossil fuels, minerals, ores and biomass). In addition, material inputs include so-called “unused domestic extraction (UDE)”. UDE comprises materials that had to be moved during extraction activities, but do not enter the economic system for further processing such as cover material or excess from mining and residuals from harvest in agriculture. Consequently, unused flows do not have an economic value. These flows have been termed “hidden flows” as they are not visible in the monetary economy (Adriaanse et al, 1997). Finally, material inputs include physical imports and indirect flows associated with them.

Material inputs are (i) accumulated within the socio-economic system, which means net additions to stock, such as infrastructure and durable consumer goods; (ii) consumed domestically within the accounting period, meaning crossing the system boundary as waste and emissions back to nature or (iii) exported to other economies.

3.3 Indicators Derived from Economy-Wide MFA

Within the internationally harmonised classification systems for environmental indicators, like the “pressure-state response” framework of the OECD (1994) or the extended “Driving Forces Pressures- State- Impact-Response” system of the European Union (EUROSTAT, 1999), material flow based indicators are part of the pressure indicator group. A large number of resource use indicators can be derived from economy-wide material flow accounts as shown in Figure 2, providing a comprehensive description of the biophysical metabolism of societies. These indicators can be grouped into (i) input, (ii) output and (iii) consumption indicators and have been developed through international cooperation in the course of the last 10 years (Adriaanse et al, 1997). The following are the main indicators of each indicator group and are based on the suggestions in the methodological guide, published by EUROSTAT (2001).

Main input indicators:

-Direct Material input (DMI) comprises all materials which have economic values and are directly used in production and consumption activities. DMI equals the sum of domestic extraction plus imports.

-Total materials input (TMI) is the DMI plus the unused domestic extraction.

-Total material requirement (TMR) includes - in addition to TMI - the indirect (used and unused) flows associated to the imports of an economy. TMR thus is the most comprehensive material input indicator, comprising all input flows illustrated in Figure 2.

Main output indicators:

-Domestic processed output (DPO) equals the flow “outputs to nature” in Figure 2 and comprises all outflows of used materials of domestic or foreign origin. DPO includes emissions to air and water, wastes deposited in landfills and dissipative flows. Recycled materials are not included in the DPO indicator.

-Total material output (TMO) also includes, in addition to the DMO, unused domestic extraction. This comprises all three categories of output flows shown in Figure 2.

Main consumption indicators:

-Domestic material consumption (DMC) measures the total quantity of materials used within an economic system, excluding indirect flows. Thus DMC is the closest equivalent to aggregate income in the conventional system of nation accounts. DMC is calculated by subtracting exports from DMI.

-Total material consumption (TMC) includes, in addition to DMC, also the indirect flows associated with imports and exports and can be calculated using either life cycle assessment (LCA)-orientated or input-output techniques. TMC equals TMS minus exports and their indirect flows.

Physical Trade Balance (PTB)

A PTB is an expression of whether resource imports from abroad exceed resource exports, have a country or world region, and to what extent domestic material consumption is based on domestic resource extraction or on imports from abroad. A PTB for direct material flows equals imports minus exports of a country or region. A comprehensive PTB can also be calculated including indirect flows associated to imports and exports. Net addition to stock (NAS) describes the annual accumulation of materials within the economic system and thus could also be termed “physical growth of the economy”. Materials forming the stock mainly consist of construction materials for new infrastructure and durable goods, such as cars and industrial machinery.

3.4 The Input-Output Based Approach for Calculating Indirect Flows

One of the most important applications of input-output analysis is the calculation of total input requirements for a unit of final demand. By doing so, one can assess not only the direct requirement in the production process of the analysed sector itself, but also all indirect requirements resulting from intermediate product deliveries from other sectors. Thus the total (direct and indirect) input necessary to satisfy final demand such as private consumption, exports, etc. can be determined (Miller and Blair, 1985). Input-output calculations of resource use can be based on both monetary input-output table (MIOTs) and physical input-output tables (PIOTs) and are, in principle, better suited to calculate indirect resource requirements, as the attribution of direct and indirect resource inputs to the different categories of final demand flows from the physical structure of the economy, which differs substantially from the monetary structure (Hubacek and Giljum, 2003). By using a PIOT, final demand sectors with the highest material flows, such as agriculture and mining also have attributed to them the highest materials inputs, whereas by using a MIOT, sectors with high monetary values, e.g. high-tech and service sectors, obtain the major share of materials inputs in the input-output analysis. The major advantage of this approach is the fact that for studies at the national level only material inputs and physical imports have to be known and linked to the monetary input-output table in order to calculate direct and indirect material inputs and resource productivities of all sectors of the economic system. At the global level, the task becomes even easier, as only material inputs of the primary extracting sectors have to be assessed. The economic model then calculates indirect flows of imports.

The major goal shared by these approaches is to change the fundamental nature of the economy so that material flow has lower physical levels of impact and demand upon the natural environment whilst maintaining, or preferably increasing, high levels of economic welfare. This is thought to be possible by focusing efforts upon dramatic reductions in the environmental impact of the value of each ‘unit’ of output rather than reducing output itself. The primary means of ecological modernisation is the implementation of appropriate changes leading to a less environmentally intensive pattern of output together with changes in the closely associated technologies for producing and consuming society’s output. A central but contentious premise is that the contextual environment can be shaped and encouraged by the state to promote industrial competitiveness and suitable consumer preference changes that increase real income and yet simultaneously reduce environmental pressure. This context may include technological, innovative, organisational, socio-cultural and motivational influences

requiring appropriate institutional changes and the substantive use of regulation and economic policy instruments. The targets and strategies of ecological modernisation are constructed as adaptive responses and preventative measures for coping with physical scale limits set by Earth's resources. Appropriate industrial or societal restructuring will undoubtedly depend upon an understanding gleaned from holistic and system-wide perspectives that frame and track material and energy flows. In view of this, MFA is an area of great interest, relevance and promise for economic, environmental, and social policies over the next few decades. By definition, the systematic analysis of the physical environmental consequences of 'livelihood' activities is perhaps the only logical and practical way to identify how and where the socio-economy can be transformed into a more sustainable form. MFA as a technical methodology is likely to serve as the most important methodology for eco-restructuring strategies that offer the best prospect for the efficient operation of sustainable development. This promising future for MFA highlights the relevance of examining its complementary relationship with Islamic economics.

4. Islamic Economics, Ecological Modernisation and MFA

The overarching aim of MFA methodology is to provide an information basis for restructuring the economy along lines which are less material and energy intensive, and which aims at a greater degree of sustainability. A common goal of the new sustainability approaches is the achievement, maintenance or improvement of high economic welfare levels over the long term. However, a finite and fragile natural environment is recognised as a key concern in the achievement of this goal and 'carrying capacity' limits are seen to justify the need to keep natural capital fully intact for future generations of humanity.

The principles of the Islamic economy in the light of the Qur'an and the sayings of the Prophet Mohammad (PBUH) is to improve the quality of the economy by encouraging good and forbidding the harmful. The main aims of the Islamic economic system are to increase justice, decrease extravagance, increase welfare, decrease exploitation, increase equality and fairness, and undermine discrimination. In verses 17:27 and 7:31, the Qur'an condemns *Israf*, or wasteful expenditure. The prohibition of *Israf*, or the sanction against wasteful expenditure/consumerism, is an important founding principle of Islamic political economy. As Ahmad (1980) argues, the goals of development policies in an Islamic economy are: human resources development, expansion of useful production, improvement of the quality of life, balance development, new technology and greater integration within the Muslim world. These development policies and processes might be directed through *Tazkiyah* (purification and growth) in order to improve the quality of life and welfare of human beings in this world and hereafter. The quality of life and welfare of human beings are determined by many elements and not only is economic development an issue here, but also human development (Ahmad, 1980).

The foundation of the Islamic approach to development is *Tawhid*, *Rububiyyah*, *Khilafah* and *Tazkiyah*. The Islamic concept of development is derived from its concept of *Tazkiyah*, as it addresses itself to the problem of human development in all its dimensions and is concerned with growth and expansion towards perfection though the

purification of attitudes and relationships. We may call it sustainable development, and the term sustainable development is becoming familiar to many people and is on the political agendas of governments of the Islamic countries as well as other countries. Besides these, a convenient list of definitive features of Islamic economics would probably include:

- (a) The Islamic transformation of economic modes of production, growth and development - especially the need to restructure the labour process and the nature of work and related organisational, social relations and technologies so that human welfare is maximised both during, and as a result of, a cooperative, creative and rewarding productive 'livelihood' activity.
- (b) As part of the humanisation of 'labour' activity, Islamic economics would embrace the pronounced shift toward more labour intensive 'intermediate technologies' based on profit and loss sharing work units, less capital inputs, communal ownership and regional workplaces. Capital is used in the service of humans.
- (c) In terms of consumption and material use and accumulation, the Islamic approach is most accurately identified with moderation. Basic prerequisites, needs and securities are a priority for inner peace and spiritual development, but the true path to long-term happiness is not the endless pursuit of craving, rather attained *via* adherence to the pervasive Islamic way with its themes of kindness, compassion, tolerance, and simplicity with respect to the human and the natural world.
- (d) Islamic economics rejects the simplistic 'positivist' assumption that welfare or happiness has a direct positive and linear relation with individual material accumulation. It emphasises the need for a far more intensive analysis of the true nature of ultimate ends and desirable means, and calls for fundamental re-examination of the nature, and product, of human livelihood activity within the norms of Islam.

4.1 Islamic Economics vis-à-vis MFA

It is now necessary to examine the similarities and differences of the major themes of Islamic economics and MFA as a common thread tying together the new age of sustainability-based approaches. This involves a closer look at the intent and implementation of relevant technological, social and economic dimensions.

Islam is a revealed religion whose world view emphasises the need for humanity to revere, care for, and live in harmony with the natural environment. Arguably, it is the most 'environmentally-friendly' of the world's major religions and stands in direct contrast to the dualistic depiction of man and nature that has legitimised a fear-based, conflict-relation which promotes human control, exploitation, replacement and the subjugation of natural systems. Nasr (1990) states that this manipulative and conflictual relationship between humans and nature extends to dominate relations in the social world. The growth of interest in Islam (and its economic actualisation) may be partly explained by its principles of environmental harmony and their compatibility with environmentalist social movements, and international growth in support for sustainable

development policies and programmes. Indeed, the positive social and economic consequences of the Islamic view of the natural environment is the underlying basis of the proposed links between Islamic economics and MFA tools for reducing the socio-economics metabolism.

4.2 The Interconnectedness of the Universe

The interconnectedness of the three spheres of God-created human existence (individual, society and nature) underlines the natural order and violating God's natural principles that explains the centrality of compassion in the Islamic world view and highlights the importance of careful reflection upon the full, long-term consequences and intent of production, consumption and other human actions. As every action affects the whole universe and the self only exists in relation to others, actions that exploit the social or material world are self-injuring. The unified and interconnected nature of the universe suggests that violent action or intervention that consumes the material world will have adverse repercussions in direct proportion to the extent of intervention. This view has many obvious parallels in the conceptual frameworks and assumptions behind the new wave of sustainability approaches. Examples include materials balance and 'spaceship Earth' models of human economy-environment relations, concerns about the un-sustainability of current systems based on the use of non-renewable or fragile renewable resources, and the perception of current modes of production and consumption as destructive, low-entropy conversion rather than involving the creation of true value or benefit. The material balance perspective is embraced by most of the new sustainability approaches. Adherence to thermodynamic principles and closed-system, reciprocal flows in material balance assumptions are consistent with the operation of Islamic order.

The interconnected nature of the universe and the existence of a God's natural order engender a pervasive and extensive compassion that guides human action in the Islamic world view. This precept is considered to have a favourable influence across the inter-related levels of individual spiritual development, social and regional relations, and out and through the natural environment in which society is embedded. All three levels of influence are based on the recognition that 'non-consumptive' activities can increase well-being and that action guided by endless craving and selfish material attachment will lead to further suffering rather than happiness. With specific regard to the natural environment, this change in belief, attitude and motive should have a beneficial impact by minimising, or at least moderating and managing consumption so that material and energy consumption would act to decrease the overall scale of material output consumed as well as instigating fundamental changes in the nature or composition of economic output. Changes in the consumption mix would be linked to shifts in preference favouring non-interventionist goods and a structural shift toward spiritual development and other human activities that do not rely on significant material and energy put up such as mediation, education and meaningful communication. The scope of appropriate changes is not outrageously Utopian. There already appears to be a substantial shift in 'consumer' preferences in recent decades toward environment friendly consumption activates (including spiritual) based on amenity and the direct 'services' of the natural environment.

At individual and social levels, less motivation for material accumulation and greater security in a more compassionate social system would lead to an improvement in the quality of life *via* lower levels of psychological stress, conflict, and crime. The possible transition towards an Islamic economic order and system of production and consumption comprises more personal and nurturing environments that lower the social costs linked to unemployment and reduce anonymity and alienating contractual employment relations in favour of promoting the humanistic nature of work. In turn, the more fulfilling and secure nature of work should enhance commitment and productivity.

Besides, an economy pervaded by Islamic ethics would have other resource-efficiency advantages tied directly to economic aspects of the social system (Naqvi, 2003). For example, the conducive economic environment of trust, collective concern, and reliance upon Islamic cooperative virtuous intent and action would generate “X-efficiency” gains. In addition to resource savings derived from greater security, community care and lower crime and vice, an economic context founded on trust, consensual agreement, harmonious internal and external relations, fair trading, true worker motivation and support, and the longer-term welfare of all, would act to substantially lower transaction costs that restrict economic efficiency. In the same way, Islamic investment choices made in the collective interest of society would be an inherent part of an Islamic economy. The God-fearing spirit and inter linked Islamic-nature view of the universe would also work to augment co-productivity, holistic problem-solving, and help direct research and development investment to those areas with the greatest social return. Greater peace and stability would mean the redirection of the current enormous expenditure on defence (military) production into more socially useful investment. Therefore, production and consumption guided by Islamic ethics that incorporate compassion, love, and kindness for all beings would have very significant positive spillovers favouring the attainment of comfortable economic welfare conditions (Hasan, Z; 1986).

4.3 Linkages

On the other hand MFA may be simply a technique for the systematic accounting of physical environmental flows. However, linkages between Islamic economics and MFA become much more concrete when MFA is seen as the outstanding means of providing the system-level information required for achieving the socio-economic metabolism reduction goals shared by all of the major sustainability approaches. MFA is an intrinsic part of the conceptual framework of industrial, or societal, metabolism and materials balance models that now dominate modern strategies for achieving sustainable development. In this viewpoint, Islamic economics and MFA have a number of cogent similarities relating to their underlying world views, intent, and social and technological outcomes. While arguing in favour of Buddhism, Schumacher (1973) states that socio-economic metabolism reduction goals shared by all of the major sustainability approaches which are derived from a shared and deep underlying respect for nature and a belief in its reality, underestimated ‘value’ as a fundamental source of wealth, or at least, of true well-being. In Islamic economics and sustainability approaches such as ecological economics, this value would include not just the benefits of nature to humanity but the intrinsic value of nature in its own right. The over-riding common ground shared by these two perspectives is best explained, not in terms of population or

GDP *per capita*, but the third source of environmental impact in the classic “Ehrlich equation”- the factor generally labelled as ‘technology or environmental impact per unit output’. The full Ehrlich equation is given below:

$$I = P.A.T,$$

Where,

I =total environmental impact,
 P = population,
 A = affluence or GDP *per capita*, and
 T = technology impact per unit output (Ehrlich and Ehrlich, 1970)*.

However, this term should actually be conceived as having both technological and structural dimensions. The composition of economic output, together with the related production and consumption technology that applies to this output, configure the socio-economic ‘metabolism’ required for a given person and his existing level or total value of consumption. In this regard, Islamic economics would tend also emphasise the need for moderation of the affluence factor in the ‘Ehrlich equation’ (GDP *per capita* and population) though this inference is moot if affluence is better defined in broad welfare terms.

4.4 Axiomatic Link

The important axiomatic link between Islamic economics and MFA is that both are predicted upon the reduction of the metabolism of human economies. The view of an Islamic social order is that of an interconnected universe, where every action has widespread and long-lasting ‘spillover’ effects, and it clearly calls for the minimisation of environmental intervention and human-induced material flows and transformations. MFA provides the metabolism-reducing framework to support an ‘ethos of sustainability’ that characterises many of the contemporary system-wide environmental management approaches such as integration of economics, ecology and ethics in ecological economics (Edwards, Davies & Hussain; 2000). Therefore, principles of Islamic economics covering environment and sustainable development, which are also based on these axioms, would be very supportive of technological and consumption-related saving of material and energy, recycling of products and waste and reduced toxicity and physical flows of pollution-all central features of the application of the MFA methodology.

4.5 Some Fundamental Differences

From the foregoing comparative analysis, we find that both ‘Islamic economics’ and modern ‘sustainability approaches’ have a number of very significant similarities in their intent, design, and appropriate strategic implementation. But the two frameworks possess some fundamental differences concerning the assumed or ideal nature of:

- the motivations of individual human beings;
- the scale of the human economy; and
- the primacy of humanitarian outcomes.

(*) While the affluence source (A) is undoubtedly very relevant to the nexus between Islamic social order and sustainability approaches, their perspectives are more likely to be different on this factor as growth in economic welfare is considered a major aim.

The human is the most favoured of God's creation. Everything in existence was created by God for the use of humans. God has made subservient to humans all animal life, bird life, plant life, water bodies, inanimate objects, and other creations. The human's duty is to deal with these as a loving and caring friend would deal with another friend, so that he can benefit from it, without preventing others enjoying this benefit, and to place the common good ahead of personal benefit. Al-Qur'an says, "He it is who sends down water from the sky, and therewith we bring forth buds of every kind; we bring forth the green blade from which we bring forth the thick-clustered grain; and from the date-palm, from the pollen thereof, spring pendant bunches; and gardens of grapes, and the olive and the pomegranate, alike and unlike. Look upon the fruit thereof, when they bear fruit, and upon its ripening. Lo! Herein verily are signs for a people who believe." (al-Qur'an 6: 99).

5. Conclusion

The similarities between Islamic economics and modern sustainability approaches constitute more than an idle curiosity. Some variant of ecological modernisation vision will almost certainly comprise a viable means of achieving a desirable existence for humanity on Earth. However, faith in the ecological restructuring of the world's sustainable economies seems to be missing something. It can be argued that competitive capitalism, and the strong element of technological determinism that can be attached to MFA will, even with well-meaning strategic government action, be inadequate for achieving the fundamental changes required. On this issue, Einstein (1941) provides one of the best descriptions of this shortcoming in his well-known words, "Science without religion is lame, religion without science is blind". Perhaps the greatest contribution of Islamic economics to addressing the cogent economic and environmental problems faced by humanity may be the insight it offers into understanding the nature of happiness, in particular, the nature of the causal relations between intent and activity, and resulting well-being. There is no doubt that Qur'anic education focused upon the holistic nature of human-environment relations would help the gradual inculcation of Islamic values.

The Islamic faith lays great stress on improving the condition of Earth at the hands of humans, as humans are described as the *khalifah* (vicegerents) of God on Earth. What is hoped to emerge from this improvement is a guarantee of bliss in the eternal life after death. This is when we utilise the laws of matter for the benefit of humanity and its happiness with justice and fairness. Islam also considers the creation of the universe an open book, a guide inviting observation which increases the faith of the observer, and takes him to the point of unshakeable faith in the Great Creator of this existence. Al-Qur'an states, "In the creation of the heavens and the earth, and the difference of night and day, and the ships which run upon the sea with that which is of use to people, and the water which God sends down from the sky, thereby reviving the earth after its death, and dispersing all kinds of beasts therein, and the ordinance of the winds, are signs for people who have sense" (2 :164).

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الاقتصاد الإسلامي والبيئة: تحليل انسياب المواد في إطار العلاقة بين المجتمع والبيئة

أبو الحسن

باحث

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المستخلص : ظهرت في السنوات القليلة الماضية مجموعة متنوعة من "الاقتصادات الحسية" التي تستخدم نوعاً من تحليل انسياب المواد لتحديد اتجاه استخدام المواد والطاقة في الاقتصاد. إن تخفيض حركة الاقتصاد أصبح من مجالات البحث الحديثة في الاقتصاد والبيئة، مركزاً على طرق تحقيق تنمية مستدامة وشاملة. وإن تخفيض الحركة الاقتصادية والاجتماعية للإنسان وإجراء التغيرات المناسبة في التكنولوجيا والاستهلاك، يتماشيان نظرياً مع نظام الاقتصاد الإسلامي. وبالتالي، فإن تحليل انسياب المواد يعتبر وسيلة قيمة لتشجيع وتطبيق طرق الاستدامة التي تساعد على تحقيق النتائج التي توفرها رؤية الاقتصاد الإسلامي.

هذه الورقة تهدف إلى مناقشة العلاقة بين التطبيق المحتمل والمناهج الرئيسية في نظام الاقتصاد الإسلامي.