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Green Technology Management in the Muslim World

Farahwahida Mohd Yusof[a*], Arieff Salleh Rosman[a], Salwa Mahmood[b], Siti Hajar Mat Sarip[c], Teh Ubaidah Noh[c]

[a]*Centre of Research for Fiqh Science and Technology (CFiRST), UTM Johor Bahru*
[b]*Faculty of Mechanical Engineering, UTM Johor Bahru*
[c]*Faculty of Chemical Engineering, UTM Johor Bahru*

*Corresponding author: farahwamy@utm.my

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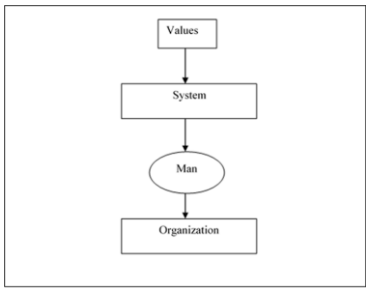

Abstract

Green technology or clean technology is recognised as the application of environment science to conserve the natural environment and resources for the purpose of curbing the negative impact of human activities. In this paper, the correlation between management and green technology will be discussed and construed in accordance with Islamic perspectives. This paper explores the problems on how to implement green technology in management and the way to solve human activities that give negative impacts to the natural environment in the Muslim World. In addition, the comparison of waste disposal system management, the production of an electricity energy by renewable resources and wastewater management system are made between Islamic countries and non-Islamic countries. Islam urges humanity to be kind to nature and not to abuse the trust that had been placed on human shoulders. This finding includes both the authorities of the Quran and hadis which emphasize the accountability and responsibility of humans towards protecting and maintaining God's balanced creation.

Keywords: Green technology; management and green technology; Islamic world

Abstrak

Teknologi hijau atau teknologi bersih diiktiraf sebagai aplikasi sains alam sekitar untuk memelihara alam sekitar dan sumber semula jadi bagi tujuan membendung kesan negatif daripada aktiviti manusia. Dalam artikel ini, hubungan antara pengurusan dan teknologi hijau akan dibincangkan dan ditafsirkan selaras dengan perspektif Islam. Karya ini meneroka masalah tentang bagaimana untuk melaksanakan teknologi hijau dalam pengurusan dan cara untuk menyelesaikan aktiviti-aktiviti manusia yang memberi kesan negatif kepada alam sekitar dalam dunia Islam. Di samping itu, perbandingan pelupusan sisa sistem pengurusan, pengeluaran tenaga elektrik dengan sumber yang boleh diperbaharui, dan sistem pengurusan air kumbahan dibuat antara negara-negara Islam dan negara-negara bukan Islam. Islam menggesa manusia untuk berbuat baik kepada alam semula jadi dan tidak menyalahgunakan amanah yang telah diletakkan atas bahu manusia. Penemuan ini termasuk kedua-dua sumber primer dalam Islam; iaitu al-Quran dan hadis yang mana ia menekankan akauntabiliti dan tanggungjawab manusia ke arah melindungi dan mengekalkan ciptaan Allah yang seimbang.

Kata kunci: Teknologi hijau; pengurusan dan teknologi hijau; dunia Islam

1.0 INTRODUCTION

As we all know, the term "global warming" is associated with global temperature rise. The world is said to be increasingly warm. The Temperature-rise phenomenon around the world is closely related to human activities that upset the balance of the Earth systems, especially the atmosphere. From the point of heat balance, the phenomenon of global warming means there is an imbalance in the heat budget, being input heat received by the system compared to the output over Earth. Among the human activities that cause the global warming are industrial activities, deforestation for various purposes, the release of chlorofluorocarbon (CFC), discharge of vehicles, nuclear testing that has higher impact on the environment compared to any other activities, and open burning.

Those activities mentioned above are the cause of the rise in temperature at all scales either micro or macro. Since 1990, the Intergovernmental Panel on Climate Change (IPCC), a scientific agency established under the auspices of the United Nations, has issued periodic assessments of the scientific literature that attempts to represent the consensus of scientists with expertise in the issues related to the causes and effects of greenhouse gases. According to the IPCC reports, greenhouse gases are almost certain to raise global temperatures by 1.0-3.5 degrees Celsius in the next century (Titus, 2000).

Hence the emphasis on the 'green technology' is the right solution in addressing the problem of the greenhouse effect. It is also consistent with the main agenda of governments around the world today that give priority to environmental issues, particularly the phenomenon of global climate change. Man should be responsible to jointly play a role in making this world a better place to live in.
Bakar (2011) elaborates that green technology is an initiative evolving various kind of methodologies and material enhancement, from techniques for generating energy to non-toxic cleaning products. But, there is little research about implementing green management in order to achieve the goals for green technology especially in the Muslim World. As for the Muslim World, Khaliq (2008) expressed that leaders should implement green management to achieve green technology. Without proper management, great ideas cannot be implemented in order to achieve green technology. Muslim societies should not have any problems in implementing green management if the principles of Islam are adhered to. Muslim countries would be more advanced if their people lead their life according to the principles of Islam. Al-Buraey (1988) emphasized that Islamic principles include striving for perfection, seeking rewards in life, afterlife and exerting effort without excess. It is highlighted that the social, economic and environment as well as religious duties need to be considered in relation to green technology management.

In addition, leadership plays an important role in enhancing motivation, commitment and predisposition of the workforce in the field of management in order to achieve green technology. There are several principles listed such as trustworthiness, responsibility, sincerity, discipline, dedication, diligence, cleanliness, co-operation, good conduct, gratitude and moderation that are supported by verses from al-Quran and the hadiths (sayings of Prophet Muhammad (p.b.u.h.)) (Branine & Pollard, 2010). These principles can all be related to management system of green technology management.

2.0 GREEN TECHNOLOGY ISSUES

In Malaysia, since the year 2000 the Ministry has started to conduct awareness programs on Energy Efficiency and Renewable Energy (one of the branches of green technology), through the establishment of the Centre for Education, Training and Research in Renewable Energy and Energy Efficiency (CETREE) by Universiti Sains Malaysia. These programs are targeted at Malaysian professionals, schools, tertiary institutions and the public. In 2009, the Ministry of Energy, Green Technology and Water (KeTTHA) was established to promote sustainable development and conservation of environment for future generations as well as to enhance public education and awareness. It also aims to encourage practice of sustainable development and conservation of environment, (KeTTHA, 2009).

In addition, the Ministry of Energy has also implemented at the national level program monthly to raise awareness about renewable energy and to promote energy efficiency practices among the public and private sectors. Among the activities conducted during the Energy Month program are talks related to energy efficiency, the publication of a booklet called "Energy Efficiency at Home", and publication of a series of articles in newspapers and the mass media to promote energy efficiency (KeTTHA, 2009).

In future, the Ministry will implement a "Green Technology" campaign which will involve the stakeholders, including those from the public as well as the ministries and departments of Government, non-governmental organizations and other relevant agencies to educate and increase awareness and knowledge of all parties on the importance of green technology in our lives. This ensures that other programs carried out by the Government in promoting and developing the local green technology will be implemented effectively and appreciated by all walks of life (KeTTHA, 2009).

The Governments' efforts to implement green technologies should be viewed from two aspects. First, innovation as the effort to create or develop green technology. It does not necessarily mean the creation of something complicated or complex, but simple products that are environmentally friendly and practical for our country are sufficient. It is important that students are encouraged from school level to create something better. At higher levels, researchers can create technology that can produce products with no extra resources such as energy and water. The new design should be a practical design that can be commercialized for local consumption and for export purposes.

Another simple example in applying green technology can be seen in our daily life. People must adopt green practices as much as possible, starting from the simplest things that can be done. For example, bringing drinking water in a container instead of buying bottled water. Using self-owned food containers to take away food instead of using *styrofoam* or plastic containers that are not environmentally friendly. It is crucial for everyone to start with the easiest and cheapest steps in order to practise the green lifestyle.

3.0 GREEN TECHNOLOGY AND MANAGEMENT

At present, there is increasing pressure to take care of the environmental issues, and the developed countries such as Europe, United States of America, and Japan have established several environmental protection policies subsequently creating an urgency to establish green environmental enterprises and manufacturing companies (Lenschow, 2002; Madrigal, 2011; Jordan-Korte, 2011).

Muslim countries should be greener in management, business and world ecosystem since they are taught about the equitable law in Islam whereby the correlation between the equitable law and greenness is very close. The success of any organization depends on its leadership. Leadership will still be the ultimate element of success even though the organisation may be flooded with cash.
Muhummad (2011) presents research about Muslim institutions is applying Quality Function Deployment (QFD) and Analytic Hierarchy Process (AHP). From the research, it was revealed that strong family institutions can contribute toward developing a healthy Muslim society. There are five most basic important requirements in family institutions management, which are: moral character, knowledge of basic principles of Islam, fairness and justice, discipline in the family and Islamic education and manner. To achieve these requirements, the roles of parents are important to provide Islamic teachings in family institutions management. A strong family institutions and practicing Islam properly according to the teachings can lead or shape a character of a Muslim that will be able to practice cleaner and greener management.

3.1 Importance of Management in Green Technology

Green technology need to be properly managed in order to enable it to be implemented in our daily life. Without proper management, the technology may easily fall apart. As vicegerents of Allah (*khalifah*) in this world, we need to preserve the wonderful creation made by Allah. Anything that can corrupt the Earth such as destruction of land, living areas, animals and plants are forbidden in the Quran. As the Quran states:

> "*Do no mischief on Earth after it has been set in order.*"
> [Surah Al-A'Raf 7: 31]

We should now change our lifestyle to be more eco-friendly since preservation of Earth is encourage in Islam. Learning, understanding, and preserving the balance on Earth are our Islamic duty and obligation. It is hoped that green technology can help people to manage this Earth to be greener and not cause any Earth mischief on it.

3.1.1 Reducing Waste

Islam teaches us to live in a clean and balanced environment. Allah Almighty has given us a wonderful place to live at no cost to us. As human beings, our responsibilities are to take care of His creation for our future generation. One of the ways is to reduce the amount of wastage, whether from manufacturing or from household or the use of any product that can potentially end up in a landfill called wastage. The Quran states:

> *"O Children of Adam! Wear your beautiful apparel at every time and place of prayer: eat and drink: but waste not by excess, for God loveth not the wasters."*
>
> [Surah Al-A'Raf 7: 31]

According to the World Health Organization in 2001, about 6.378 million tons of solid wastes were generated from 170 recycling centres throughout Malaysia (WHO, 2005). Increasing population and tremendous urbanisation growth and other factors influence directly the municipal solid waste (MSW) generation in Malaysia. The huge quantity of MSW generation, particularly in Peninsular Malaysia, has increased from 16,200 tonnes per day in 2001 to 19,100 tonnes per day in 2005 or an average of 0.8 kg/capita/day. The amount increases yearly and seems to grow in parallel with the urban areas in many Asian countries which are estimated to produce approximately 8 million tonnes per day (Tarmudi et.al, 2009).

The conventional method to manage waste disposal in Malaysia is the method of landfill. This can threaten the ecosystem with adverse consequences for human well-being and health such as by the contamination of groundwater. Going green by using technology such as incineration, composting etc., can help to reduce waste, in addition to decreasing consumption, recycling all potentially recyclable material and doing composting for kitchen waste for soil health.

3.1.2 Environmental Benefits

Proper management to achieve green technology can increase environmental benefits. There is no joy in life unless three things are available: clean fresh air, abundant pure water, and fertile land. In effort to preserve these three criteria, the implementation of green technology in environment is compulsory. It can help minimize waste and reduce the amount of pollution in the water and air by using reusable material and biodegradable product. By using eco-friendly electrical appliances at home, less energy is consumed compared to the conventional technology. Green buildings also use materials more efficiently. By minimizing the energy use, it indirectly helps to reduce the harmful emissions into the atmosphere, and help air to be cleaner as well as preserve water sources.

3.1.3 Energy Conservation and Improvement of Human Health

The primary sources of energy nowadays are from non-renewable resources, including petroleum oil. This source will continue to deplete each year and we must find other sources to manage this shortage. Green technology, by using wind turbine and solar [panels, can generate energy for industrial and individual consumption. Innovation of eco-friendly vehicles and energy saving home appliances can also save energy. As a result, more money can be saved for the benefits of the future and finances.

Minimizing household product consumptions can also save the Earth. Self-planted vegetables and homemade organic cleaning products are some of the things that can replace the ordinary products sold at the groceries which contain toxic chemicals.

3.2 Problems on Applying Green Technology

Green technology has a great positive impact on mankind and the environment, but there are limitations on its management which affect its realisation. While certain negative factors were able to be eliminated by this technology, some factors of green technology can potentially be a drawback for those who adopt this type of lifestyle. In the implementation part, support from the technology, financial and other relevant organizations must be strong enough as to ensure that the positive impact of green technology is materialised. The obstacles in green technology management are:

3.2.1 Cost

Green technology projects require a lot of funding for installation and implementation. For example, Solar panel needs specific installation manuals, and the costs for yearly maintenance are very high. In addition, the costs of spare part for green products are higher than established non-green products found in the market. There is also a need of specific training for technicians to help maintain the equipments as well as the need for experience workforce to diagnose any problems with them. Indirectly, the use of solar panels can potentially save the money on your energy bills, but they can cost thousands of Ringgit to make installation.

Energy saving appliances such as energy-saving washing machines, air conditioners, lamps and lightings etc. are designed to use minimum energy power and water but they often come with a high price tag compared to other non-green products in the market. Another popular way to go green is by eating organic food and using organic products, but the food and products usually have a higher price tag in the market compared to usual non-green product.

3.2.2 Time

Time factor is another issue in green living. The first is that adopting a green lifestyle can often be time-consuming for those who are fully committed to green living. Time consuming as preparing homemade cleaning products will take up much more time compared to purchasing then from a store. Selection of organic products also can be time consuming if one lives in an area with a limited supply of organic materials. It also takes a long time to see any results of eco-friendly equipments. For new scientific products and chemical products it takes long time for commercialization to materialise, due to the process of research work and trials. It may give rise to complicated processes and new findings that would require advanced expertise and education level to understand.

3.2.3 Environmental Impact

Although the green technology has positive impact, it may also potentially have negative impact to mankind and our planet. For instance, the development of alternative fuels is an innovation in the green movement, in an effort to reduce reliance on non-renewable natural resources. While these fuels are intended to reduce the toxic emissions caused by the burning of traditional gasoline, they may have unintentionally caused the opposite effect.

One of these alternative fuels, known as E85, actually releases more ozone into the atmosphere than traditional fuel. While ozone is a natural part of the Earth's upper atmosphere, if it becomes concentrated in the lower atmosphere, it can potentially increase air pollution in areas where smog is a concern, which in turn affect the health of those living in these areas.

3.2.4 Awareness

Many people are not aware about the benefit of green products for a healthy lifestyle, typically because the price is slightly high and the stock was limited. Most people find purchasing cheaper products without knowing the content as the easier option. Awareness amongst the public to go green must be driven by organizations through advertisements, education and the media.
Certain material and household products have chemical content that are toxic to the environment. This is clearly against the Islamic teaching which offers unhealthy life for the humans. Awareness amongst the people of their responsibilities as Muslims is needed. Education from parents to the young generation at home may help this problem. Awareness programmes by government to the public and in schools may also contribute to show the benefit of going green to the planet generally and to man specifically. The Quran proves:

> *"To the Thamud People (We sent) Salih, one of their own brethren. He said: "O my people! Worship Allah. ye have no other god but Him. It is He Who hath produced you from the Earth and settled you therein: then ask forgiveness of Him, and turn to Him (in repentance): for my Lord is (always) near, ready to answer."*
>
> [Surah Hud 11:61]

Imam Ali says: 'God has sent Adam to make the earth flourish by the help of his offspring'. Imam Ali in a letter to his governor said: 'You should be more concerned with the construction (physical development) of the land than collecting the land tax. As a mankind in this planet, the responsibility to take care of the earth placed on each shoulder.

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■4.0 GREEN TECHNOLOGY MANAGEMENT IN MUSLIM COUNTRIES

In recent time, many Muslim societies all over the world are experiencing problems either caused internally or externally. Farooqi (2007) shows in a survey conducted in 1996 by United Nation Development Program (UNDP), that Muslim societies were pictured as backward. The situation would be far worse for countries with a lower level of technological know-how and financial capabilities.

In Malaysia, besides new regulations and policies, a significant amount of investment has been directed to green technology application. For example, the building of proper sewerage facilities centralised hazardous waste treatment and disposal, incineration and sanitary landfill for solid and hazardous waste, and river rehabilitation (Ujang and Buckley, 2002).

Another example is in the Republic of Iran, where regulations and policies pertaining to the green technology application had been developed. The management of technology there is far more advanced compared to other Muslim countries. Iran emphasized green management in every aspect, and has strategic information which is needed for long term planning especially in water and wastewater management system (Faramarzi *et al*., 2009).

In the case of the Republic of Indonesia that has 230 million people and is one of the world's major emerging economies and producers of greenhouse gases (GHG), they will need more strategies in order to overcome the situation (Jupesta, 2011). Reducing Emission from Deforestation and Forest Degradation Plus (REDD+) programme had been established in 2009 which entails a moratorium on deforestation and promote reforestation programmes. This type of program aims to reduce emission from peat fire and deforestation. Based on the successful implementation of the Energy Mix Policy, Indonesia's National Climate Change Council has calculated that Indonesia has the potential to reduce GHG emission by 2.3 Gt by 2030, equivalent to 7% of global GHG emission reduction.

Current and future policies are needed to coordinate the exact system of implementing the green technology at the national level in order to ensure a pathway to sustainability in achieving green technology management especially in the Muslim world. Muslim countries should not have difficulties in green technology management (Nasir, 1995). It has been widely reported in the media that a large number of Muslims are not practicing Islam (Muhummad, 2011). In order to verify this, Muslims need to learn the basic principles of Islam. There are many causes for this deficiency for under developed Muslim countries, including: low literacy rate, corruption, lack of motivation to work hard, poverty, unemployment, indifference toward modern knowledge and poor leadership.

Developed Muslim countries also have problems, for example, a lack of environmental awareness amongst policy makers. Insufficient expertise leads to the gap between ideal policies and their implementation. Insufficient funding and inappropriate management system also can slow the Muslim countries' advance in green technology.

■5.0 COMPARISON OF GREEN TECHNOLOGY BETWEEN MUSLIM COUNTRIES AND NON-MUSLIM COUNTRIES

In developed countries such as Japan and Europe, environmental protection programmes such as the establishment of environmental standards and pollution control measures are chronologically implemented. According to Ujang (2010) it is generally acceptable to say that appropriate technologies are already available to treat series of pollutants. United Arab Emirates (U.A.E) is one of the Muslim countries that practise green technology management properly. In this section, the comparison of waste disposal system management below is made between Japan and U.A.E. The comparison between Japan and U.A.E in waste disposal system management is summarizes as in Table 1.

Table 1 Comparison of waste disposal management system between Japan and U.A.E

Japan	U.A.E
1.Environmentally friendly waste disposal system The technological system creates a vortex which aims to separate waste water from rain water that flows into the river. This system is made by stainless steel so it can last for many years. This can help to improve the disposal system and resolve the problem. Vortex function is to separate household waste after they flow into the waterways. Waste Disposal system can reduce the waste that is washed up to 70%. This waste disposal system will be applied to other areas in Japan to maintain an Environmental balance to keep the waterways clean from pollution **2.Incinerator System** Incinerator system is one of the technologies to manage abundance of waste. In Japan about 75% of Municipal Solid Waste (MSW) is incinerated. It can decrease the use of landfill space because Incineration allows a drastic reduction amount of volume. This method is the best solution for hazardous organic wastes and is widely used among the countries. It can reduce weight by 75% and 85% volume reduction. Benefit from this Incineration system is that it can minimize the use of land space of disposal site, and the weight of waste can be reduced to 25 percent of initial value. Volume can also be reduced by 10%. Harmful gases produced at final stages of this process is cleaned and emitted through the stack into an environmentally friendly form because if all the waste is dumped in its untreated form it can poison underground water and the gas can harm our air resulting in a greenhouse effect. The location for incineration can also be close to residential area, where waste is produced. This can reduce energy and cost for waste transportation.	**1.Environmentally friendly waste disposal system** Solid waste is divided into three principle streams: dry recyclables (cans, plastics, cardboard, papers, etc), wet recyclables (food and other organic waste) and residuals (e.g. toothpaste tubes, empty food containers and other common waste that is not clearly one of the other two). A fourth stream, which represents a small percentage of the total, includes bulky waste, hazardous wastes and other special wastes, such as batteries. Buildings in the city have three waste chutes to allow for easy separation into the three main waste streams. **2. New facility speeds up waste disposal** The new facility has helped recycle thousands of litres of water at its truck-washing station over the past three weeks, besides improving waste disposal operations. The facility has several eco-friendly systems including the truck-washing station which recycles 60 per cent of the water it uses for washing about 200 trucks daily.

Japan is a rapidly growing country. In 2011, the local government of Tokyo successfully developed new technologies for environmentally friendly waste disposal. The new technology was designed to prevent the disposal of household waste from washing into the river through the exhaust system of the city. On the other hand, the oil rich region of the Middle East is on its way to becoming a trend setter for establishing projects and developing state of the art facilities that are environmentally friendly. Various initiatives are already underway and cutting edge methods are simply impressive. U.A.E is one of the world's richest cities and one of the highest per capita greenhouse gas emitters.

Currently, the production of electricity energy by renewable resource gets attention in green technology management field. These renewable sources should be applied in most countries in order to reduce consumption of fossil fuel, also known as non-renewable resource, for the sustainability of green technology. The utilisation of other energy sources is a crucial factor in ensuring the increasing in total capacity of energy sources in various growing economies of the world where clean energy is unavailable (Gabbasa *et al*., 2013). Since the radioactive waste from nuclear power plants are hazardous to handle and remediate, this technology is rarely used in development countries (Khan *et al*., 2007). Considering this hazardous situation, Khan and Islam (2007) emphasized that attention must be given to bio-fuel and pro-nature (a process that entails natural process) processes. The development of renewable energy sources such as solar, wind, geothermal, biogas and biodiesel is attracting attention (Khan *et al*., 2007; Coltrain, 2002).The various kind of energy sources listed will be developing based on the geographic condition of each country (Armaroli *et al*., 2007). For renewable energy, comparison is made between China and Turkey. The comparison between China and Turkey in renewable resource used for electricity power is summarizes as in Table 2.

Table 2 Comparison of renewable energy used for electricity power energy between China and Turkey

China	Turkey
Wind Energy China is a land with abundant wind resources and now Chinese government has given its full support to this technology to support energy consumption. Producing electricity using wind energy has substantial benefit to the environment. There are many advantages of this technology, since they use a simple technology with short construction time, is environmentally friendly with no emission in the atmosphere, does not involve any changes in temperature and is zero cost without any fuel to operate the machine. The disadvantages of this technology are related to seasons and the availability of wind, the distance between wind centre with consumption centre and ecological objections. Having said that, the price of wind-made electricity will continue to decrease on the long term, making it an increasingly stronger competitor for traditional technologies. In addition, this technology will be able to satisfy the residential electricity need of almost all citizens of the Republic of China and reduce utilization of fuel and gas (Changliang *et al*., 2009).	**Hydroelectricity Energy** Electricity used by this technology is subject to the availability of water source. The water-control systems and the turbo-generators to extract the power are standard items and many existing installations cover a power range from hundreds of watts to thousands of megawatts. The reason lies in the combination of heavy front-end loading and extremely site-specific construction costs. In other words, the dominant factor in determining the total cost per unit of output is the initial capital cost, and a major part of this can be the civil engineering costs which vary greatly from region to region in Turkey. Hydroelectricity is a well established technology to produce energy, and its application at developing country rises every year. There are 436 sites available for hydroelectric plant construction, distributed on 26 main river zones in Turkey. The power of the energy produced varies based on the dams' location and the size of the river. The total gross potential and total energy production capacity of these sites are nearly 50 GW and 112 TWh/yr, respectively. As an average, 30% of the total gross potential may be economically exploitable (Kaygusuz *et al*., 2002).

As for wastewater management system, comparison is made between Singapore and Iran. Singapore is considered as an advanced country especially in wastewater management system since the size of Singapore is smaller compared to other countries. According to Khdier (2003), most Muslim countries have limited and threatened freshwater resources. That is why Muslim countries need to treat the wastewater for recycling, and thus reduce the potential of water pollution. A sustainable wastewater management system is important in light of the impact of continuous exploitation on the environment, long term economic growth and social development. The comparison between Singapore and Iran in wastewater management system is summarizes as in Table 3.

Table 3 Comparison of wastewater management system between Singapore and Iran

Singapore	Iran
Recycled wastewater reused Singapore is one of the most advanced nations when it comes to water recycling. It already has a program on the mainland, called NEWater for reintroducing waste water into the stream for human consumption Most NEWater is currently used for industrial cooling but could safely be introduced into the drinking water supply prior to final purification. NEWater is gaining increasing public acceptance and will eventually supply up to 50% of Singapore's water needs. The city is also improving its sewer and sanitation system to get waste water to processing plants more efficiently. In Singapore, the use of membrane technology is used widely. Microfiltration process is applied to remove microscopic contaminants as small as one millionth of millimetre and this exceeds Singapore's drinking standard. By using membrane technology, hazardous chemical can be eliminated hence the potential for water pollution in the country is reduced. Compared to traditional wastewater management system, membrane technology is expensive but very effective.	Recycled wastewater reused Out of 1000 cities in Iran, only 200 has wastewater collection network which are operational or are under design and construction. In many cities, wastewaters from seepage pits, infiltrates through layers of the ground ultimately reaching and recharging underground aquifers. Because of rapid industrialization and population increase, there are small communities and industries within city limits that draw their water from these underground strata. Direct use of untreated wastewater from sewage outlet, where wastewater is directly disposed of on land where it is used for crop production, is not a common scene in Iran. More commonly used is treated or partially treated wastewater used directly for irrigation without being mixed or diluted, practiced in many plants. There is no exact estimate about the amount used by this method to irrigate fodders, cereals, fruit trees, and vegetables eaten cooked or uncooked. In the meantime, it is very common to have diluted wastewater mixed with the rain water or for small streams or tributaries of larger water bodies (polluted) to be used for irrigation, especially downstream of urban centres, where treatment facilities are inadequate. In this way, a self-purification process takes place in full scale while effluents are flowing in streams, mixing with the stream water or diluted with *qanat* (underground tunnels, with a canal in the floor of the tunnel, which carries water).

In order to improve management systems in Islamic countries, Muslims need to participate and provide good ideas to their country. On the other hand, the management such as the government needs to scrutinize the ideas for implementation of green technology management. The green technology management of Muslim countries can be achieved if every party takes his role seriously.

6.0 ISLAMIC PERSPECTIVE OF MANAGEMENT AND GREEN TECHNOLOGY

According to Abbasi (2010), Islam created a unique management paradigm that nurtures civility, prosperity, diversity and happiness among people of different creeds and ethnic origins around the globe for more than 1000 years. Muslims in today's global scenario must commit themselves to building the organization that implement cleaner or greener Islamic management model in order to improve green technology efficiency. Khan (2004) emphasized that good management comes from good leaders.

Both *al-dunya* and *al-akhirah* are two fundamental elements in Islam, where they are both inter-related. *Al-dunya* in this context is the preparation for Muslims to face *al-akhirah.* Khaliq (2008) stated that Islamic revealed knowledge sources are clear on the nature of human behaviour. The Quran provides extensive references to show what is needed to be implemented or be omitted. As for cleaner or greener Islamic organization, what is needed to be implemented in managing the green technology is the practice of Islamic fundamental values to reach the excellent management. Figure 1 below illustrated Islamic values as a system in managing an organization.

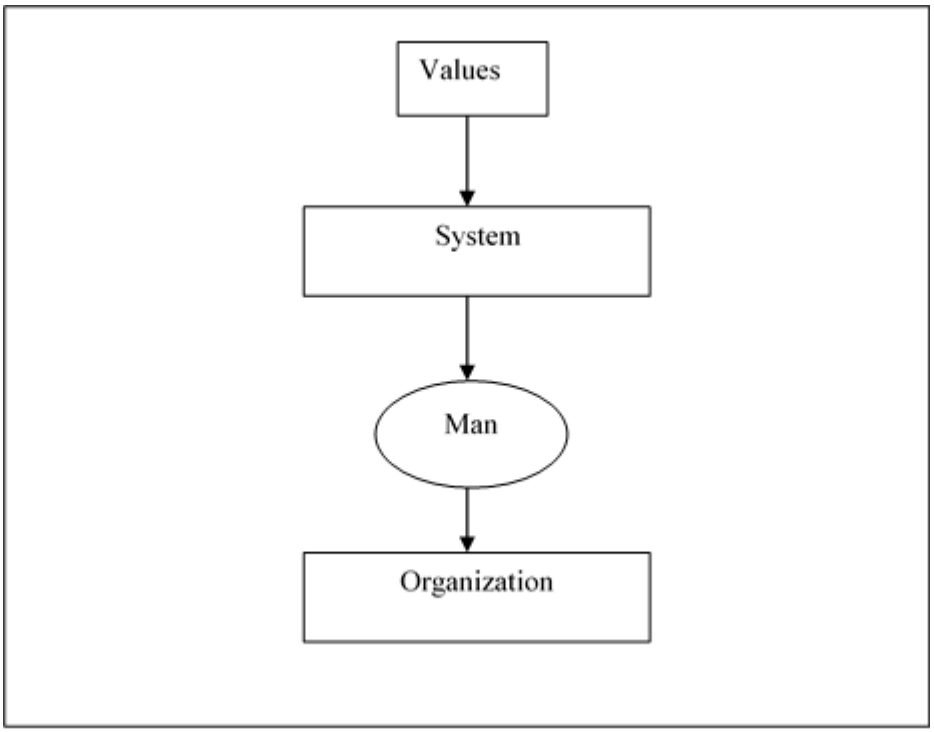

Figure 1 Islamic value as a system in managing an organization (Khaliq, 2008)

Khaliq (2008) suggests including religious requirements into human management practice with emphasis on value-based on management in Islamic Worldview that promotes *taqwa, akhlaq, itqan* and good universal values. *Taqwa* derived from the word 'waqa' which means self defence and avoidance. It includes godliness, devoutness, piety, and uprightness. The word *akhlaq* is the plural for the word *khulq* which means innate disposition, inner thought, feeling and attitudes. While the word *itqan* derived from word '*atqana*' means to make things thoroughly or to dispose of things in perfect order.

Khaliq (2008) added that the basic strategy intent for development of human capital development for excellent must have value-based management system model. It includes human values that are consistent with the Islamic worldview and morality based on *taqwa*, *akhlaq* and *itqan*. The examples of core values on *taqwa*, *akhlaq* and *itqan* are as shown in Table 4.

Table 4 Examples of core value (Khaliq, 2008)

Dimensions of Core Value		
Personal		**Organizational**
Piety (Taqwa)	Moral (Akhlaq)	Quality (Itqan)
Trustworthiness	Caring	Effectiveness
Justice	Cooperation	Efficiency
Sincerity	Courtesy	Innovativeness
Honesty	Humility	Discipline
Gratefulness	Tolerance	Commitment
Courage	Respect	Learning

Many ways to improve or implement the cleaner or greener Islamic management system are related with practising the Islamic way of life. All the morality based and *akhlaq* claimed in Islam is according to sources of Islamic knowledge, al-Quran and Hadith. According to Abbasi (2010) Al-Quran is the central religious text of Islam. In Islamic teaching, al-Quran is the book of Allah's guidance and direction for mankind. Al-Quran is the most comprehensive divine book in the world which has solutions to every problem. Green management is considered to be one of the most important subjects to be learned. Hadiths is regarded as an important source of teaching in Islam, and also an oral tradition relating to the words and deeds of Prophet Muhammad.

It is the duty of all Muslims to practise the knowledge given by Prophet Muhammad (blessings of Allah and peace be upon him) as ordained by Allah Almighty. These instructions are enshrined in al-Quran and Hadith. This includes management concept for Muslims. In respect of cleaner or greener management concept for Muslims, it is affected by the organizational cultures and workers as influenced by leaders. Leaders can be considered as role models for followers to show ability in management, and three important elements which are humility, responsibility and accountability. Abbasi (2010) stated that in Islamic management model, leaders have to subrogate their authority to the instructions consecrated in al-Quran and Hadith. Figure 2 below shows the Islamic Management Model.

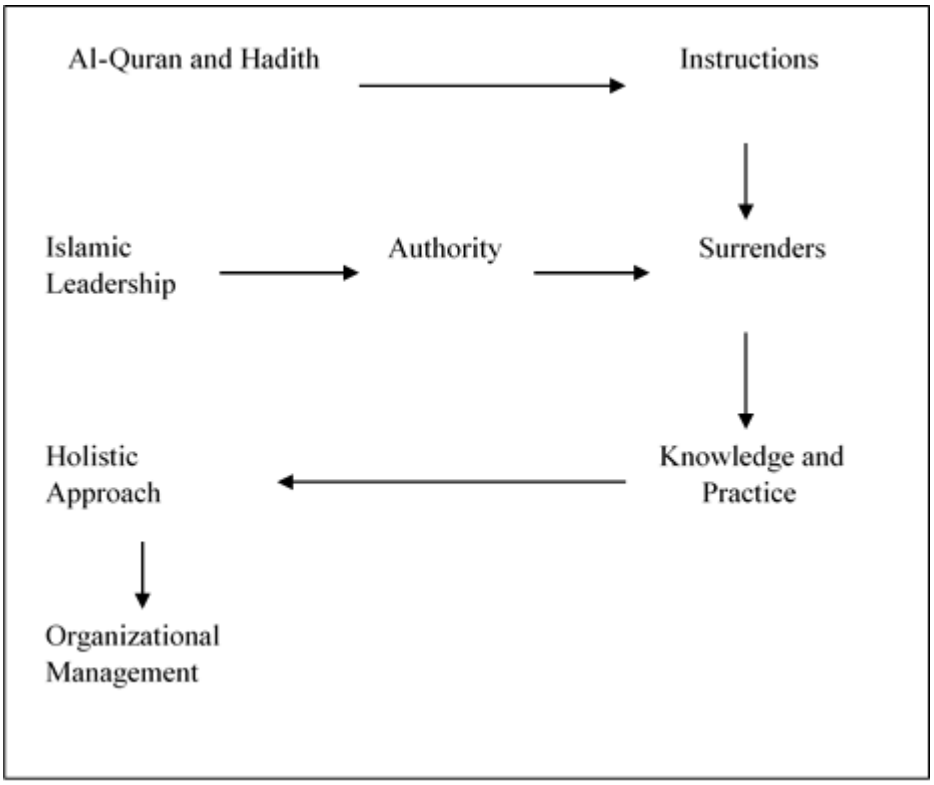

Figure 2 The Islamic management model (Abbasi, 2010)

To implement the green management concept for green technology in Muslim countries, leaders should be knowledgeable to manage and have the mental and physical strength. As for knowledge, managers should be conscientious in making decisions, understanding the reasons problems occur and possess basic education skills to solve problems. The mental and physical abilities should be balanced such as skills, actions and behaviour. To obtain this knowledge, and the balanced mental and physical state, one must turn to al-Quran and Hadith.

Zia (1995) put forward 10 concepts in order to achieve green technology in Muslim world. Out of these, four are standing alone and three acts as opposing pairs. The 10 concepts are: *Tawheed* (unity), *Khalifah* (trusteeship), *ibadah* (worship), *ilm* (knowledge), *halal* (praiseworthy) and *haram* (blameworthy), *adl* (social justice) and *zulm* (tyranny) and *istislah* (public interest) and *dhiya* (waste) (Zia, 1995).

Tawheed articulates the larger Islamic unity of thought, action and value across humanity, persons, nature and God. The *Khalifah* concept asserts that it is God who has ownership of Earth. Human functions are as stewardship, trustee capacity, taking care of Earth and not to damage it. The goal of Islamic worldview is *adl*, social justice, and based on the larger needs of the people or *istislah*. To reach these goals, *ibadah*, or specifically worship or contemplation is the first and necessary step. *Ilm* or knowledge of self, others and nature, will rise from deep reflection as well as inner and outer observation. One's action then is *halal*, praiseworthy and not *haram* or blameworthy. Moreover with this framework, *dhiya* (waste) of individual and collective potentials is avoided as is tyranny, the power of a few, or one over many or the power of a narrow ideology over the unity within plurality that the Islamic paradigm advocates.

7.0 CONCLUSION

The cleaner or greener management in developed Muslim country will be improved if the Muslims learn the basic of Islam and practise its principles properly to achieve green technology. If the understanding of the basic of Islam is solid, the implementation of leadership skill to manage an organizational towards green technology should not be a problem. The Muslim managers should apply the principles concept which derived from al-Quran and Hadith of Prophet Muhammad (p.b.u.h.) in managing green technology.

In addition, Muslims should be taught to practise good universal values in green management concept. For the future of Islam, Muslims need to involve in creating the better future; and not weighed down by technological advances and globalisation. The Muslims must engage in the global science and technology revolution but within the values and terms of Islamic science. Change in the lifestyle and mindset will lead towards the appreciation and practice of green technology.

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