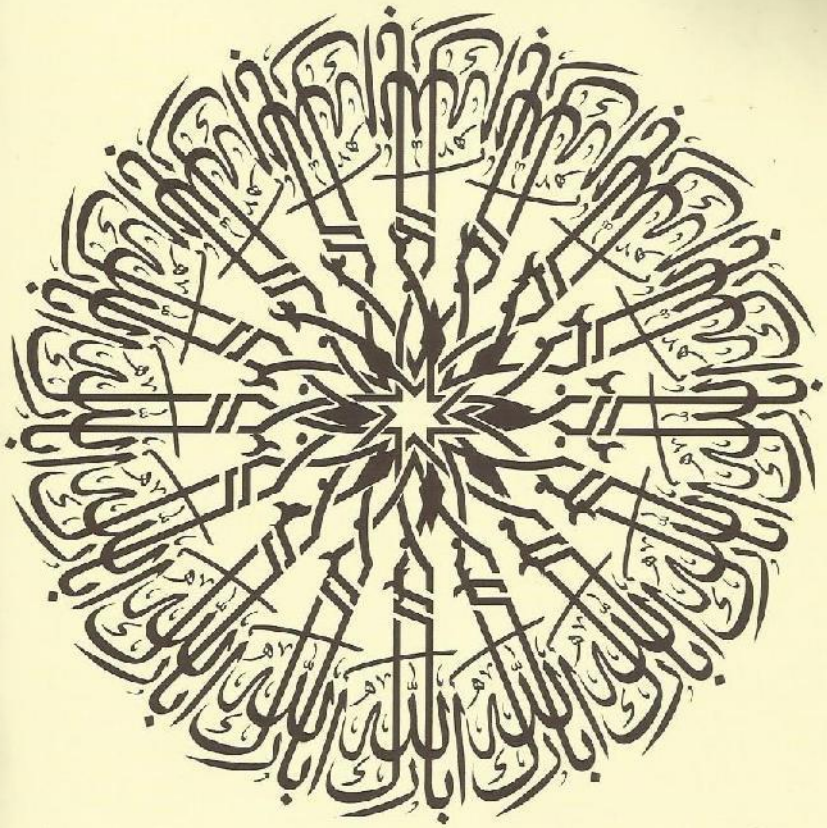

Integrating Islam and Knowledge
Social Sciences and Technology

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Islam and Environmental Protection

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Abstract : Recently the correlation between human beings and the earth is ever more complicated and vital. There are many bad stories of pollution, wastes, global warming, greenhouse effect and even disappearance of animals. All of them become more important to be discussed day to day and all people in the world put their effort to solve such those problems. Moreover chemical industries are often alleged to be responsible for the environmental damage. New technologies of chemical processes has also been improved to reduced the wastes and save the planet. Substantively Islam is responding with views on the environment. In the Qur'an Surah Al-Room [30]:41-42, Muslims are instructed to look after the environment and not to damage it. Another ayah, Surah Al-Araf [7]:56-58 stated to care to the environment. It is part of a human's duty to Allah beside to worship Him. Due to this passage, people see themselves as being **responsible** for the world which Allah created.

Keywords: Islam, environmental protection, pollution prevention.

Introduction

The religion of Islam is considered a comprehensive way of life, teaches us all of things and covers directly or indirectly, for every possible human relationship including that with the environment. The Qur'an and the Sunnah are the main sources of revealed knowledge. There remains two other sources, the Ijma' and Qiyas.

The Qur'an as a book of guidance is presented at the beginning of Surah al-Baqarah: "This is the Book; In it is guidance sure, without doubt, to those who fear God" (Al-Baqarah [2]:2). Moreover, Allah S.W.T shows that the Qur'an encompasses the foundations for knowledge and ethics, He says: "... Nothing have We omitted from the Book..." (Al-Anaam[6]:38).

Islam as a Din has been perfected by Allah SWT. It is considered as comprehensive way of life which accommodates every aspect of it. The Islamic world-view is established upon the very notion of Islam as a perfect religion. "... This day have I perfected your religion for you, completed My favor upon you, and have chosen for you Islam as your religion" (Al-Maidah[5]:3).

Surely it is no wonder that Quran also mentions about the environment. For example the khilafah (vicegerency). As a vicegerent, the human being is perceived as the trustee of the earth. She/he is not supposed to cause corruption in any form on earth i.e. the environment. Life on earth entails great responsibilities. It is followed by either reward or punishment.

Therefore there is an organic connection between proper knowledge and right behavior. Knowledge becomes a tool that renders humanity morally responsible. Vicegerency is based upon knowledge that enables the human being to be a caretaker of the environment. Humanity should behave in such a way that would maintain the balance that exists within the environment.

Other example is taskhir (subjection). The earth is made available for human use, without abuse or misuse. The circle of things available for the benefit of humanity is much greater than that of the environment. In the Qur'an Surah Al-Jathiya[45]:13, "And He has subjected to you, as from Him, all that is in the heavens and on earth: behold, in that there are Signs indeed for those who reflect."

It is a point to the temporal nature of the subjected elements. The reason behind highlighting the temporality of things is to remind people of the Hereafter. It is hoped that once people are conscientious of the limitation of life on earth, they will behave in a positive and constructive way. As a result, it is anticipated that the environment itself will benefit from the proper behavior of people.

The subjection of the elements that make up the environment is being spoken of in Qur'an Surah Ibrahim [14]:32, "It is God who has created the heavens and the earth and sends down rain from the skies, and with it brings out fruits wherewith to feed you; it is He who has made the ships subject to you, that they may sail through the sea by His command; and the rivers (also) has He made subject to you."

In addition, the basic role of the human being on earth is to worship Allah SWT.: "I have only created Jinns and men, that they may serve Me." Qur'an surah Adh-Dhariyat [51]: 56. For serving God (or to worship Him) is a comprehensive way that covers every aspect of life. The main indicator of worshipping to Allah is performed in praying, fasting, zakah and hajj. The same could be said for any action that the human being performs in accordance with the Islamic world-view, as long

as it is done for the sake of Allah. For example protecting the environment, if it is done for the sake of Allah, is considered an act of worshipping that generates reward in this life and the hereafter.

There are also many ayah in the Qur'an say about the environment. "Do you see the seeds you sow in the ground? Is it you who make them grow or We? If We wished, We could turn your harvest into chaff and leave you to wail, 'We are burdened with debt; we are bereft.' Do you see the water you drink? Was it you who brought it down from the raincloud or We? If We wanted, We could make it bitter: will you not be thankful? Do you see the fire you kindle? Is it you who make the wood for it grow or We? We made it a reminder and useful to those who kindle it, so [Prophet] glorify the name of your Lord, the Supreme (Al-Waqi'ah[56]: 63-74). A taste warning about the corruption was said, "Corruption (fasad) has appeared on land and sea as a result of people's actions and He will make them taste the consequences of some of their own actions so that they may turn back" (Al Rum [30]:41).

And Prophet Muhammad PBUH said, 'The people asked, "O God's Apostle! Is there a reward for us in serving (the) animals?" He replied, "Yes, there is a reward for serving any animate being." (Sahih Bukhari 3.40.551).

During the prophet's life, it was instructed for Muslims that one could not allow one's beasts of burden (e.g.: camels) to become hungry (through neglect), or even to overburden them (by loading them too heavily). (Sunan Abu Dawud #2543). These were radical ideas for that place and time.

Environmental Protection

Environmental issues become more important in the latter half of the 20th century. Increasing global population enforced to the global decision makers to change the policies of industries to be more environmentally friendly to fulfill human needs. Basically people in the area agreed to stay longer safely in the earth planet rather than to destroy it. UK Government chief scientific adviser Sir David King even said, 'Climate change is a far greater threat to the world than international terrorism.'

Since industrialization era, chemical processes provide a huge range of valuable products and materials used in many applications especially for human needs. However, at the same time, generally these chemical processes also produce substantial quantities of wastes and emissions. Managing these wastes, in fact,

are very expensive. In the face of rising costs and also to obey governance rules, traditional end-of-pipe treatment and waste management have become less attractive and pollution prevention has been gaining prominence.

In term of environmental protection, in Islamic view, it is important for Muslims to take action. There are many reasons as follows:

- ✓ Allah commands people, 'Do not cause corruption on the earth' (Al-Baqarah [2]:11).' Islam teaches Muslims to respect Allah's creation and maintain the balance He created.
- ✓ Everyone in the world needs to help. Muslims make up at least one fifth of the world's population which is great potential to make a move.
- ✓ Most Muslim countries are poor and use far less fossil fuels than rich ones, however many Muslims also live in the rich countries or lead wasteful lifestyles and need to play their part in reducing their consumption of fossil fuels.
- ✓ Many Muslim countries produce oil and so have a vested interest in maintaining the fossil fuel industry. Nevertheless, it's in their interest to keep the price of oil high, to maximize their income from production, and to make the oil last longer before it is all used up.
- ✓ Higher oil prices would create incentives for people to switch to cleaner, greener and more sustainable energy.
- ✓ Oil producing countries should therefore include sustainable energy industries in their long-term investment and diversification plans

One of the most important one for environmental protection is about water conservation. Qur'an says, "If you are still in doubt as to resurrection, consider this: you can see the earth dry and lifeless and suddenly when we send down waters upon it, it stirs and swells and puts forth every kind of lovely plant (Al-Hajj [22]:5)".

The object of water conservation includes:

- ✓ fertility of the soil
- ✓ the unique properties of fresh and sea water
- ✓ the course of rivers
- ✓ the presence underground of springs and aquifers
- ✓ the aquatic origin of life

Water is an essential part of our daily lives. From the domestic use of water to the agricultural and industrial uses, life without water would be unbearable. Moreover, a Muslim is recommended to save water in his ceremonial washing for prayer even if he has a river at her disposal, according to one tradition of the Prophet. "What is this wastage, O Sa' ad?" "Is there wastage even in washing for prayer?" asked Sa' d; and he said, "Yes, even if you are by a flowing river!" – Ibn Majah.

Islamic law requires the establishment of areas within which development is prohibited to safeguard natural resources. These areas could border canals, wells and rivers, to protect aquifers and water from pollution.

All those discussions above will lead on sustainability. It is important to have a meet for the needs of the present generation without compromising the needs of future generations. The green chemistry offers a concept to protect environment from corruption. It is such kind technologies of the invention, design and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances, and where possible utilize renewable raw materials.

Green Chemistry: Preventing Pollution, Sustaining the Earth

Green chemistry is called also 'benign chemistry' or 'clean chemistry' for sustainability. The focus of green chemistry is primary pollution prevention, not remediation. Pollution prevention can be applied for most chemical processes. Chemical products can be prepared in a wide variety of synthesis routes. The designer of chemical process must choose from alternative raw materials, solvents, reaction pathways, and reaction conditions, and these design choices should have a significant impact on the overall environmental performance of a chemical process. Ideal chemical reactions would have attributes such as: simplicity, safety, high yield and selectivity, energy efficiency, use of renewable and recycle able reagents and raw materials [Anastas and Allen, 2002].

Use of chemistry to improve environmental performance refers to the field of chemistry dealing with

- ✓ Synthesis (the path to making chemicals)
- ✓ Processing (the actual making of chemicals)
- ✓ Use of chemicals that reduce risks to humans and impact on the environment

"First, do no harm", as proposed by Paul Anastas (US Environmental Protection Agency) and John Warner (Chemistry, University of Massachusetts-Boston). Realistically, with doing as little harm as possible, is a worthwhile goal for the chemical industry. That is 'green chemistry', also called sustainable chemistry, which defined as the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products [Anastas and Warner, 1998]. The tools of green chemistry are alternative feed stocks, solvents and reagents, and catalytic versus stoichiometric processes. Chemical activities in which hazardous chemicals are neither used nor generated is a final goal, which maybe not be achieved. Nevertheless, chemists and chemical engineers should be striving towards this ideal in all their activities: in research and development, material and product analysis, manufacturing, use and disposal. The emphasis is on eliminating waste at source rather than finding incremental end-of-pipe solutions.

Green Chemistry is more of thought process, not a new branch of chemistry. By using the existing tools of chemistry in a manner which will continue to provide the societal and economic wealth, is expected to protect the environment. There are three of the more important concepts of green chemistry, hopefully chemists of the future will think of daily [Lancaster, 2011]:

- ✓ **Sustainable development.** According to geological prediction, oil production due to decline within the next 30 years. Production methods to get chemicals from renewable resources such as crops will need to be developed.
- ✓ **Atom Efficiency.** It is an obvious statement but every atom that goes into a chemical reaction must come out somewhere. Be developing synthetic methods that maximize the number of atoms going into the reaction that end up in the product waste will be minimized.
- ✓ **Solvent selection.** When preparing an organic chemical most chemists will automatically carry out the reaction in an organic solvent such as toluene or dichloromethane. These solvents are often difficult to recover and purify and often form the major part of the chemical industry's waste. In fact many reactions can be carried out without solvent, in water or in environmentally friendly supercritical fluids such as carbon dioxide. It is sound economic and environmental practice not to use solvents unless absolutely essential.

In more detail, Anastas and Warner [1998] develop 12 principles of green chemistry, i.e.:

1. Prevention

   It is better to prevent waste than to treat or clean up waste after it has been created.

2. Atom economy

   Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product.

3. Less hazardous chemical syntheses

   Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment.

4. Designing safer chemicals

   Chemical products should be designed to effect their desired function while minimizing their toxicity.

5. Safer solvents and auxiliaries

   The use of auxiliary substances (e.g., solvents, separation agents, etc.) should be made unnecessary wherever possible and innocuous when used.

6. Design for energy efficiency

   Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure.

7. Use of renewable feedstock

   A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable.

8. Reduce derivatives.

   Unnecessary derivatization (use of blocking groups, protection/deprotection, temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste.

9. Catalysis

   Catalytic reagents (as selective as possible) are superior to stoichiometric reagents.

10. Design for degradation

    Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.

11. Real-time analysis for pollution prevention

    Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances.

12. Inherently safer chemistry for accident prevention

    Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires.

To understand the principles, consider the following chemical reaction of the type:

$$A + B \rightarrow P + W \qquad (1)$$

In green chemistry, it is more significance to find alternate A or B to avoid W. Let's see some examples below [Abu Elnaga, 2011].

Example (1), disinfection of water by chlorination. Chlorine oxidizes the pathogens there by killing them, but at the same time forms harmful chlorinated compounds. A remedy is to use another oxidant, such as ozone or supercritical water oxidation.

Example (2), production of allyl alcohol CH_2=$CHCH_2OH$. There are possibilities route in the reaction. *Traditional route:* Alkaline hydrolysis of allyl chloride, which generates the product and hydrochloric acid as a by-product. *Greener route,* to avoid chlorine: Two-step using propylene (CH_2=$CHCH_3$), acetic acid (CH_3COOH) and oxygen (O_2). *Added benefit:* The acetic acid produced in the 2nd reaction can be recovered and used again for the 1st reaction, leaving no unwanted by-product.

Example (3), production of styrene (=benzene ring with CH=CH_2 tail). *Traditional route:* Two-step method starting with benzene, which is carcinogenic) and ethylene to form ethylbenzene, followed by dehydrogenation to obtain styrene. *Greener route:* To avoid benzene, start with xylene (cheapest source of aromatics and environmentally safer than benzene). *Another option,* still under development, is to start with toluene (benzene ring with CH_3 tail).

Conclusion

'Where there is a will, there is a way'. It seems this proverb gives the idea to safe our planet. In chemical view, proposed as green chemistry, there are many ways to minimize or even create a zero waste in the manufacturing industries.

Start with ourselves and spread to others, these practices below can be used as guidance in pollution prevention to protect environment:

- ✓ Grow our own food
- ✓ Buy locally grown organic food
- ✓ Donate unwanted items to schools/ others who can use them
- ✓ Take more showers than baths
- ✓ Turn down/up the thermostat/air conditioner to control the temperature
- ✓ Switch appliances off instead of using standby
- ✓ Use low energy bulbs for lighting
- ✓ Reduce, reuse and recycle items around the house
- ✓ Walk or cycle whenever we can instead of using the car
- ✓ Know where to access help, information and grants to assist us in becoming a more environment-friendly family

***Herry Purnama**, Ph.D., senior lecturer at the Department of Chemical Engineering, Muhammadiyah University of Surakarta. Research interest lies on wastewater treatment and water technology. The investigation for decolourization of dye solutions by TiO_2 photocatalysis as an advanced oxidation technology for water treatment has been done. Other research is developing a biological treatment to produce biopolymer (polyhydroxyalkanoates) in activated sludge using tapioca waste. The future researches are to build the foundations to further networks in conjunction with universities, government bodies, and environmental agencies.

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