KNOWLEDGE MANAGEMENT FOR ENVIRONMENTAL SUSTAINABILITY IN AFRICA

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Abstract

Knowledge Management (KM) is interdisciplinary. It is a process of knowledge creation, distribution and application, which can be applied to almost all the eight Millennium Development Goals (MDGs). This paper will discuss how the major facets of KM can contribute to the attainment of the United Nations’ 7th MDG on “environmental sustainability”.

Environmental sustainability refers to the environmental actions of what we do or should be doing in order to maintain a sustainable environment. The focus of this paper is on environmental sustainability in relation to global warming. Environmental sustainability and global warming has become a serious global issue and concern for everyone, which requires efforts from all sectors of society including information professionals. This paper will explore how knowledge management can be applied in reducing the effect of global warming thus, contributing towards a sustainable environment. With a brief discussion of KM facets, the paper discusses causes, effects, solutions and challenges related to global warming with specific reference to Africa. The conclusion suggests a way forward for librarians and information professionals; how they can use KM for environmental sustainability in Africa.

Keywords:
Knowledge management, environmental sustainability, Africa, global warming, MDGs.

Introduction

Sustainability or sustainable development means protecting resources in such a manner that enables people to meet their current needs “without compromising the ability of future generations to meet their own needs” (Resource Renewable Institute, 2000). This paper deals with environmental sustainability, which is one of the four main types of sustainability, the other three being human, social, and economic (Goodland, n.d.).
In response to global environmental change, global warming is the greatest environmental challenge in the 21st century. It could lead to the ultimate end of existence of earth and man. Its devastating effects on the environment and for human life are one of the biggest concerns and most widely discussed issues in the world.

Climate change and “growth and responsibility in Africa” headed the agenda of the June 6 – 8, 2007 G8 summit in Heiligendamm, Germany (Global Policy Forum, 2007). In 2006, EnviroInfo’s 20th anniversary was celebrated in Graz (Austria) and the conference aimed at exchanging environmental knowledge amongst scientists, public administrations, non-governmental organizations, companies involved in environmental informatics, and the end-users of environmental information systems.

The well-known “Kyoto Protocol” is a legal agreement, monitored by the United Nations, in which the signatory nations have agreed to reduce six, dangerous anthropogenic [man-made], key greenhouse gases (carbon dioxide, methane, nitrous oxide, hydro fluorocarbons, per fluorocarbons, and sulphur hexafluoride). The target is to achieve this reduction between 2008 and 2012 (UK Weather, 2008).

Global warming is “gradual increase in the earth’s surface temperature” (Zfacts.com, 2008). It is not just limited to Earth, it spans to neighbouring planets, Venus and Mars. Greenhouse gases in a planet’s atmosphere can radically affect the climate. On Earth, the majority of carbon lies in the oceans and rocks. Still, this little carbon dioxide, along with water vapour and other small amounts of greenhouse gases can raise the average surface temperature of Earth by around 30°C. Without which, Earth would be frozen (UK Weather, 2008). The “greenhouse effect” is the heating of the Earth due to the presence of greenhouse gases. It is named after a greenhouse, since a similar effect is produced by the glass panes of a greenhouse.

Burgeoning information is available on climate change and global warming to make us all aware of what has been happening around the world. Still, many questions need answers: Are we all aware of what we need to know? What are the causes and effects of global warming? What can be done to reduce the global warming? Information professionals can play an important role in answering all or some of these questions and by doing so contribute towards environmental sustainability. This paper is an attempt in this direction namely: how information professionals can use knowledge management to foster a sustainable environment in Africa.
Knowledge Management (KM): Knowledge refers to information put into context and includes both explicit and tacit knowledge. In the framework of this paper such knowledge means information on environmental sustainability and global warming. KM can be defined as a purposeful management process to capture, exploit, share and apply both implicit and explicit knowledge for the benefit of diminution of global warming to bring environmental sustainability. Emphasis is on taking global warming related knowledge to all walks of society and communities and turning it into actionable knowledge.

Practitioners and researchers have come up with different KM facets. In literature, KM facets are defined in two ways: (1) faceted classification or taxonomy (Smith & Associates, 2007) and; (2) aspects of KM. In this paper KM facets refer to aspects/dimensions of KM. Wiig (2002) categorised KM facets into four groups: KM as a Technology, KM as a Discipline, KM as a Management Practice and Philosophy, and KM as a Societal and Enterprise Movement.

KM as Technology refers to methods, best practices, systems, and processes. IT is a mechanism to help people create knowledge: tacit to tacit knowledge via socialization; tacit to explicit knowledge via externalisation; explicit to explicit knowledge via combination, and; explicit to tacit knowledge via internalisation (Nonaka and Takeuchi, 1995). IT can also be used for sense making activities to support innovation by the decision makers. A “good IT infrastructure is not a sufficient condition for the success of KM but a necessary condition for it” (Arora, 2002). This facet is tangible; since its main focus is on the application of “How-To” use knowledge for various operational purposes.

KM as a Discipline is a basis to conduct research, develop educational curricula and provide training, or new and effective methodologies and approaches. It is considered multidisciplinary, since it deals with psychology and cognitive sciences, learning theory, philosophy, management sciences and theories, economics, social sciences, information technology, and broad artificial intelligence (AI) etc. The KM discipline facet focuses on knowledge-related phenomena and mechanisms affecting KM (Wiig, 2002).

KM as a Management Philosophy and Practice refers to management practices. KM proponents and practitioners consider KM as a management tool, since it is used to improve overall organisational productivity/performance irrespective of whether business is service or production based. KM is exploited and used to achieve desired objectives and results. To achieve the optimal benefits, KM is incorporated in business plans to address issues such as organisational needs,
stakeholders, organisational culture, change management, staff motivation, and training to build KM capabilities etc. (Wiig, 2002).

The Societal and Enterprise Movement in KM emphasises that globalization makes KM an inevitable necessity to sustain or improve competitive edge and it has led to the ‘Knowledge Era’. In the knowledge era the fundamental competitive factor is for intellectual capital (IC) to use and apply knowledge effectively. This calls to go beyond competition to the endurance of quality of life, basic personal values, and broad global, societal, and enterprise responsibilities and values (Wiig, 2002).

The Knowledge Management Connection (2007) categorized KM facets as: Products (a hierarchical description of each of the organization’s products); Applications of the product; Organizations, businesses and other groups including a company’s customers and prospects; People both within and outside the organization; Domain objects – the technologies, Events, Publications including Web pages, etc.

Based on Wiig’s (2002) philosophy of KM facets and author’s own observation, this paper focuses on four facets of KM: KM as a Technology, KM as a Discipline, KM as a Management Tool, and KM as a Knowledge Transfer Device.

**Causes of Global Warming:** There are two major debates about global warming. Some believe global warming is a natural cycle of warming and cooling, while others consider it is an unusual phenomenon. However, the majority regards it as unusual and believes human activities are responsible for global warming (Global-Warming.lesinth.com, 2007, National Aeronautics and Space Administration, 2007). Changes in the Sun and volcanic eruptions do not explain the strong warming in recent decades, when the effects of human-produced greenhouse gases became apparent (Science Museum of the National Academy of Sciences, 2008).

Sharing a similar opinion, Langdon (2003) confirms that there is “new and stronger evidence that most of the warming over the last 50 years is attributable to human activities”. And “The evidence that humans are causing global warming is strong, but the question of what to do about it remains controversial. Economics, sociology and politics are all important factors in planning for the future” (National Geographic Society, 2008). In order to stop the devastating effects of global warming, it is imperative to understand the causes of global warming. The major causes can be summarized as follows:
- **Solar activity and cosmic rays**: These are instrumental in determining the warming (and cooling) of Earth (Long, 2007). Cosmic rays trigger cloud formation, and a high level of solar activity suppresses the flow of cosmic rays striking the atmosphere. This results in fewer clouds forming and consequently the planet is warmer.

- **Carbon Dioxide**: Carbon Dioxide is the principal greenhouse gas. Coming from rotting trees, coal burning, natural gases and any other gas emission, it pollutes the air in the atmosphere and as a result, causes global warming. Carbon dioxide traps the sun’s heat and makes the planet warm. About 33% of U.S carbon dioxide emission comes from the burning of gasoline in internal-combustion engines of cars and light trucks. Vehicles with poor gas mileage contribute the most to global warming. In the U.S. coal-burning power plants are the largest source of carbon dioxide, which produce 2.5 billion tons carbon dioxide every year. Buildings structures emit about 12% of carbon dioxide (EcoBridge, n.d.). Aviation (airplanes) causes 3.5% of global warming, and the figure is estimated to rise 15% by 2050 (Natural Resources Defence Council, 2007).

- **Methane**: Methane is the primary component of natural gas and an important energy source and second most important greenhouse gas after carbon dioxide. Its concentration in the atmosphere has almost tripled in the last 150 years. (EcoBridge, n.d.). Its presence in the atmosphere affects the Earth’s temperature and climate system. It is short lived in the atmosphere (9-15 years), yet its global warming potency is 20 times more effective than carbon dioxide in trapping heat in the atmosphere. Reducing methane emissions will lessen climate warming in a short time. Human-influenced sources of methane include landfills, natural gas and petroleum production and distribution systems, agricultural activities, coal mining, stationary and mobile combustion, wastewater treatment, and certain industrial processes. About 60% of global methane emissions come from these sources and the rest are from natural sources (Intergovernmental Panel on Climate Change, 2001), including wetlands, termites, oceans, and hydrates (US Climate Change Science Program, 2006).

- **Traditional cooking stoves**: According to US scientists ‘traditional cooking stoves used in developing countries may have a much greater impact on global warming than expected, as they emit more harmful smoke particles than previously thought’. At the same time, researchers at the University of Illinois revealed that more than 80% of families cook their meals over open wood fires in Honduras. Furthermore, a report published in the American Chemical Society journal ‘Environmental Science & Technology’ main-
tained that stoves produced twice as many smoke particles than had been predicted by previous laboratory studies (American Chemical Society, 2008).

- **Water vapour:** Water vapour is the most prevalent and most powerful greenhouse gas on the planet. It is increasing due to warming caused by carbon dioxide, methane and other greenhouse gases. It contributes to the Greenhouse Effect and leads to global warming. Water vapour makes up 60% of the greenhouse gases; 20% is carbon dioxide and the other 20% nitrous oxide, methane, ozone and other varieties of grasses (What Causes Global Warming, n.d.).

- **Greenhouse gas emissions:** Many chemical compounds found in the Earth’s atmosphere act as “greenhouse gases.” These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth’s surface, some of it is reflected back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere. Over time, the amount of energy sent from the sun to the Earth’s surface should be about the same as the amount of energy radiated back into space, in order to leave the temperature of the Earth’s surface roughly constant. Many gases exhibit these “greenhouse” properties. Some of them occur in nature (water vapor, carbon dioxide, methane, and nitrous oxide), while others are exclusively human-made, such as gases used in aerosols (Energy information administration, 2004).

- **Human activities:** According to Global-Warning.lesinth.com (2007), the following human activities cause global warming:
  
  a) **Driving a car** sends out emissions of carbon monoxide. An average car annually produces 22g CO for every 12,500 miles driven (EPA, 1997), which is multiplied by other vehicles. Motor vehicles generate three major pollutants namely hydrocarbons, nitrogen oxides and carbon monoxide. Hydrocarbons react with nitrogen oxides in the presence of sunlight and can cause eye irritation, coughing, wheezing, and shortness of breath and can lead to permanent lung damage. Nitrogen oxides also contribute to the formation of ozone and contribute to the formation of acid rain and to water quality problems. Carbon monoxide is a colorless, odourless, deadly gas. It reduces the flow of oxygen in the bloodstream and can harm mentally and visually. In urban areas, motor vehicles produce up to 90% of carbon monoxide in the air (National Safety Council, 2008).

  b) **Deforestation** i.e. cutting down large amounts of trees decreases the curative abilities of forests. Trees need carbon dioxide to live, cutting off
large trees in one place imbalances the volume of carbon dioxide. The remaining trees can't absorb all of the carbon floating in the atmosphere. Hence, the carbon rises in volume in the atmosphere and causes global warming. For example, Burundi produces (47.6%), Nigeria (31.1%), and Uganda (21.1%) carbon dioxide. Reasons for deforestation are: clear-cutting for charcoal production; large roads and infrastructure projects, wildfires that destroy the forest canopy, dam construction, volcanic eruptions, chemical defoliants; and, urban expansion etc.

c) **Chemicals** like methane and nitrous oxide when used for different purposes, e.g. rearing of domestic animals such as cows in a congregated mass or the growth of rice in flooded paddy fields, use of artificial fertilizers, can cause global warming.

d) **Carbon dioxide** is produced by human activities when coal, oil, and natural gas (fossil fuels) are burned to produce energy used for transportation, manufacturing, heating, cooling, electricity generation, and other applications.

e) **Changes in land use**, e.g., clearing land for logging, ranching, and agriculture, also increases carbon dioxide emissions (U.S. Global Change Research Information Office, 2006).

**Impact of global warming and climate change**: The major global impacts are discussed below.

- **Spread of disease**: As northern countries warm, disease carrying insects migrate north, bringing plague and disease with them, where malaria has not been fully eradicated (Walker, 2008).

- **Warmer waters and more hurricanes**: hurricanes get their enormous energy from warm waters, so the warmer the water, the more fuel a storm has to either start up or get stronger. This is how there have been more hurricanes in the past decade and will continue increasing (MSNBC.com, 2008; Vergano for USA Today, 2008).

- **Increased probability and intensity of droughts and heat waves**: some areas of Earth will become wetter and others will suffer serious droughts and heat waves due to global warming. Africa will receive the worst of it, with more severe droughts. Water is already a rare commodity in some parts of Africa. According to the Intergovernmental Panel on Climate Change, global warming will aggravate the conditions and could lead to conflicts and war.
- **Economic consequences:** for instance, hurricanes cost billions of dollars in damage, diseases cost money to treat and control and conflicts all will have major adverse effect on economy.

- **Polar ice caps melting:** dangerous in four ways. First, it will raise sea levels. There are 5,773,000 cubic miles of water in ice caps, glaciers, and permanent snow. With the melting of these glaciers the sea level would rise. Second, melting ice caps will imbalance the global ecosystem. The ice caps are fresh water, and when they melt they will desalinate the ocean. The desalinization of the gulf current will disturb ocean currents, which regulate temperatures. Third, temperature rises and changing landscapes in the Artic Circle will endanger several species of animals. Fourth, global warming could increase with the ice caps gone. Ice caps are white, and reflect sunlight, much of which is reflected back into space, which further cools Earth. If the ice caps melt, the only reflector is the ocean. Darker colours absorb sunlight, and that will further warm the Earth (Simmons blogs, 2007).

- **Greenland’s Melting & higher sea level:** Greenland is melting at a rate of 52 cubic miles per year. If Greenland’s entire ice melts, it would lead to a global sea level rise of 21 feet (Hotz, 2006).

- **Giant “Sand Seas” in Africa:** Global warming may unleash giant “sand seas” in Africa, in places where there is no vegetation. Shortage of rainfall and increasing winds may “reactivate” the now stable Kalahari dune fields (Lovgren, 2005).

- **Florida’s National Marine Sanctuary in Trouble:** Global warming is “bleaching” the coral in the Florida Keys National Marine Sanctuary, killing the coral and local fish that live among the coral for protection, and therefore also having an adverse effect on tourism (Washington Post, 2007).

- **Oceans turning to acid:** When CO2 gas dissolves into the ocean it produces carbonic acid “If CO2 from human activities continues to rise, the oceans will become so acidic by 2100 it could threaten marine life in ways we can’t anticipate,” (Caldeira, 2005).

- **Rivers are drying up:** the sacred Ganges River in India is beginning to run dry. Many climate scientists already predict that less rain will fall annually in parts of Africa within 50 years due to global warming. Geologists recently projected a 10% to 20% drop in rainfall in northwestern and southern Africa by 2070. That would leave Botswana with just 23 percent of the river water it has now; Cape Town would be left with just 42 percent of its river water (Appel for National Geographic News, 2006).
• **Volcanic eruptions**: British scientists warn of another possible side effect of climate change – a surge of dangerous volcanic eruptions (Australian Broadcasting Corporation (ABC) News Australia, 2007).

• **Death by smog**: According to Canadian doctors smog-related deaths could rise by 80% over the next 20 years (CBC News, 2008).

• **More heart attacks**: Global warming will bring with it more cardiovascular problems, such as blockage of heart’s arteries.

• **More mould and ragweed meaning more allergies and asthma** (Mitchell, 2004).

• **Spread of Dengue Fever**

  • Starvation & famine because global warming affects agriculture (Economic Times, 2007).

  • Increased border tensions and National Security problems due to increased number of refugees (Revkin and Williams, 2007).

**Issues of global warming specific to Africa**

Global warming poses even greater risks to some nations, particularly developing countries, including Africa, and low-lying countries where sea level rises will cause significant damage.

The issue of global warming has been receiving serious recognition in Africa since the report “Africa – Up in Smoke?” was released and now it is a major concern. It is felt that “any benefit from more aid to Africa will go up in smoke unless rich nations halt temperature rises that are robbing rainfall from a continent reliant on small-scale farming” (McCarthy, M. and Brown, 2005). G8 nations have failed to “join the dots” between climate change and Africa and unless global warming is checked, development gains will disappear. Due to global warming, Kenya’s economy would be affected enormously, as the tea growing climate will become unsuitable – tea provides nearly a quarter of the country’s export earnings. Southern Africa – Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe – could lose about 30 percent of their main crop of corn (Dunham, 2008). The sea level around the coast of Africa is projected to rise by 25cm by 2050 and East Africa’s coastal zone will also be affected. The ice-cap on Mount Kilimanjaro has shrunk by more than 80% since 1900. East Africa’s coral reefs are also in danger of disappearing.
All of these call for a new model of development in Africa, in which strategies to increase human flexibility to cope with climate change and the stability of ecosystems are central. “If carbon pollution is left unchecked, climate change will have a pervasive effect on life in Africa. It will threaten the people, animals and natural resources that make Africa unique” (Desanker, 2002). Therefore, “It is important to understand that Africa and climate change are intrinsically linked, as climate change will affect the welfare of Africans for years to come” (Tutu, 2005). Western countries have a moral duty to act over global warming; these countries have been emitting greenhouse gases more than other countries” (Tutu, 2007).

Global warming has confronted Africa with several challenges; the major Africa specific challenges may consist of:

- Malaria, cholera prevalence: Malaria is climbing the mountains to reach populations in higher elevations in Africa. Cholera is growing in warmer seas. Dengue fever and Lyme disease are moving north. The higher elevations of Africa, the Andes mountains in South America and the Alps in Europe are warming at a faster pace than lowlands (Struck, 2006).
- Intense flooding and droughts;
- Intrusion of saltwater in freshwater zones;
- Rise of sea levels (afrl News, 2008);
- Extreme weather; increased rainfalls at high latitudes and drops in the tropics (Okeowo, 2007);
- Deforestation;
- Shortage of water;
- Giant “Sand Seas” in Africa with no vegetation;
- Famine and starvation;
- Increased border tensions and National Security due to more migration.

Possible solutions to prevent global warming and green gas emissions

Once knowing the causes and effects of global warming, it is critical to come up with solutions to thwart it. According to the report, “Africa – Up In Smoke?” African poverty and climate change are inseparable; the first cannot be solved without the second. Global warming will hit Africa badly. If greenhouse gas emissions continue unchecked, the global average temperature will reach 2°C
above pre-industrial levels by 2050. The first impacts to be experienced will be
droughts and floods, as rainfall increases at high latitudes and drops in the trop-
ics. Some glaciers will disappear, though crop yields in some countries could
rise, scientists believe (Sample, 2008).

The more people realize its importance, the sooner the spread of global warming
can be hampered. These causes are warnings to us to change our ways of living.
Application of knowledge management is an important tool, which can be used
by information professionals to help inhibit or minimize the effects of global
warming. Some of the possible solutions to prevent global warming are:

- Reduction of pollution from vehicles and power plants; by increased reliance
  on renewable energy sources such as wind, sun and geothermal. If you can’t
  afford to buy a new car fuel-efficient, reduce the use of a car, carpool to work
  or ride the bus, walk or ride a bike for short distances. Energy efficiency is
  the cleanest, safest, most economical way to restrain global warming.

- “Reduce Reuse .... ..... Recycle”; Reuse of all is the easiest and the best way
to recycle. Save containers, bags, anything you can use in the future. Also,
the use of toilet and cloth napkins instead of paper, and the use of recharge-
able batteries instead of disposable ones. Recycle is only effective if people
purchase products made from recycled materials (Effects of global warming,
2007).

- Reduction of carbon footprint! Africa’s “carbon footprint”, the total amount
of carbon dioxide and greenhouse gas emission is far smaller than other con-
tinents; still she is blamed for Africa’s current rainy disaster. She has to re-
duce carbon footprint in order to reduce the global carbon dioxide gas emis-
(s (Okeowo, 2007).

- Organise more educative events like African Pavilion fair to market use of

- Development of new crop varieties and expansion of irrigation (Lobell et al.
2008).

- Re-think of aid policies for Africa in terms climate change; because the con-
tinent is uniquely vulnerable to it (McCarthy and Brown, 2005).

- Rich countries must cut their greenhouse gas emissions further, far beyond
the targets laid down in the Kyoto Protocol (McCarthy and Brown, 2005).

- **Use clean wind and solar energy:** Harnessing the clean, abundant energy of
the sun and wind is critical to solve the global warming problem. Solar en-
nergy technology has made remarkable progress. New photovoltaic cells can convert greater amounts of sunlight directly into electricity. Today the costs of wind and solar power are compatible with coal-fired plants (Sierra Club, n.d.)

- Union of Concerned Scientists recommends (2007) “Ten Personal Solutions” to reduce global warming; this can be applicable world-wide:

- **Decision about the car:** It is most important personal climate decision. One should buy a car with better gas mileage; which reduces global warming and it is also cost-effective.

- **Choose clean power:** Switch to electricity companies that provide 50 to 100 percent renewable energy.

- **Look for Energy Star:** Look for the Energy Star label on new appliances (refrigerators, freezers, furnaces, air conditioners, and water heaters use the most energy). They may be expensive but will really make a difference.

- **Unplug a freezer:** Unplug the extra refrigerator you rarely use, this can reduce the typical family’s carbon dioxide emissions by nearly 10 percent.

- **Get a home energy audit:** Home energy audits offered by many utilities are useful. For example, installing a programmable thermostat to replace your old dial unit or sealing and insulating heating and cooling ducts, each can reduce a typical family’s carbon dioxide emissions by about 5 percent.

- **Light bulbs replacement:** In the United States if one regular light bulb is replaced with an energy-saving model, global warming pollution can be reduced by more than 90 billion pounds over the life of the bulbs; which is equivalent to taking 6.3 million cars off the road.

- **Think before you drive:** Use the less fuel-efficient vehicle and join a carpool or take mass transit.

- **Buy good wood:** Check the source of the timber. Forests that are well managed are more likely to store carbon effectively because more trees are left standing and carbon-storing soils are less disturbed.

- **Plant a tree:** By planting a tree one can make a difference, it will store carbon, provide much-needed shade in the summer, and reduce energy bills and fossil fuel use.

- **Let policymakers know about your global warming concern:** It is important to network with policymakers to ensure they get timely and accurate in-
formation in order to make informed decisions about global warming solutions (Union of Concerned Scientists, 2007).

- Encourage government for increased initiatives to form policies to adapt climate change.

**Application of Knowledge Management for Environmental Sustainability:**

As mentioned earlier, Knowledge Management (KM) is an applied discipline in all types of operations, whether business, service, or education including social or cultural issues. KM aims at providing the right information to the right person at the right time. In the context of this paper, KM is used to provide information on global warming and environmental sustainability. KM can be applied in the following four ways in order to bring environmental sustainability in Africa:

**KM as an information and communication Technology (ICT):** To manage, store, retrieve and share knowledge, ICT is an essential and most important dimension of KM. Using the most recent web 2.0 technology, such as, syndicate, blogs, RSS, podcast, information professionals can take global warming and environmental sustainability related information to the whole community faster than ever before.

**KM as a Discipline:** Referring to KM as a discipline, Finneran (1999) argued that KM is ‘helps spread knowledge of individuals or groups across organizations in ways that directly affect performance. Knowledge Management envisions getting the Right Information within the Right Context to the Right Person at the Right Time for the Right Business Purpose’. In this paper business purpose refers to research and managing knowledge on global warming and environmental sustainability issues. Informational professionals are expert in collecting, internalizing, repackaging and disseminating information. If they can make use of their expertise and make this one of their responsibilities, they can bring a revolution in reducing greenhouse gas emission.

**KM as a Management Tool:** According to management perspective, KM proponents consider KM as a management tool because it is used and exploited to improve overall organisational performance and to meet desired goals. KM is aligned with business plans and addresses issues related to organisational needs, stakeholders, culture, change management, training and motivation. In this paper, organisation refers to the whole world, and the desired goal is reduction of global warming effects and bringing about sustainable environments. Business plans incorporate national plans while stakeholders comprise each and every
human being on earth. Organisational needs are global warming related issues such as, reduction of greenhouse gas emissions, reduction of carbon footprints, introduction of strong policies, creation of a culture of flexibility and change of mindset in terms of peoples’ measures towards quality of life and comforts, training to adapt environmental friendly conditions and applying self-assessed measurements, taking responsibility to help our personal surroundings to be environmental friendly. Using all these management techniques, information professional can apply KM to bring a substantial difference in global warming.

**KM as a Knowledge Transfer Device:** To maintain environmental sustainability, it is essential to share and transfer global warming related knowledge to the community to innovate and to work together effectively in order to make a difference. Easterby-Smith and Lyles (2003) have described knowledge transfer as an important facet of knowledge management. Authors provided two models of knowledge transfer: network model and the knowledge transfer model. Using both the models information professionals can use KM as a knowledge transfer device. Network model multiplies knowledge through various networks, while using knowledge transfer model, knowledge can be transferred directly without any networks.

**Conclusion:** Based on the ongoing debate on global warming and environmental sustainability, this paper appeals to all informational professionals to revisit their moral values and attitudes concerning the natural world and other damaging affects of global warming and to contribute towards a sustainable environment by improving accessibility of information about the related issues. Meeting the challenges of global warming will require the following sustained effort over decades:

- Governmental efforts should establish and implement cutting edge climate policies and make them reach the public;
- Industrial efforts must innovate, manufacture, and operate under a new paradigm based on climate change threshold;
- Public efforts to adapt and transform to a more climate-friendly lifestyles, such as, reduction of pollution from vehicles and plants; by increased reliance on renewable energy sources; develop energy provision that does not rely mainly on burning fossil fuels such as coal, which increase carbon pollution (Pew Center on Global Climate Change, n.d.).
- A rethink of aid policy for Africa in terms of climate change;
- Development of environmental management system (EMS); and,
• Development of Environmental Knowledge Management (EKM) systems to filter relevant and useful information on environment and make it reach to public.

All of us contribute to global warming, so we all need to be part of the solution and participate in the above mentioned solutions. If all information professionals can take a pledge to educate and familiarize a larger number of fellow humans who are not aware of global warming causes, effects and solutions, it will reduce the amount of heat-trapping gases that we emit into the atmosphere and the amount of fossil fuels we use and consequently, lead the world towards a sustainable environment. In the absence of it, people would continue to be inadvertently destructive to the environment by their activities and misconceptions about their living style. “To make the information reaching an individual relevant and useful, KM systems generally include a capability to filter information. Environmental Knowledge Management (EKM) systems can intelligently filter environmental knowledge and deliver it to key market actors. Establishing the right knowledge networks is essential to making an EKM system work (Wernick, 2006). In becoming an integral part of global warming information management, information professionals can revolutionise dissemination of that information, taking information to all reaches of society and thereby, have positive impact on global warming. This can be realised in the following ways:

• By changing mind-set of people about style and standards of living through creating awareness of global warming causes, effects and possible solutions using web 2.0 techniques and other medias, such as: personal visits, seminars, exhibitions, videos, radio etc.;

• By collecting, internalising and repackaging information into knowledge to make it reach everyone in the community in a most accessible; user-friendly and understandable format);

• By facilitating the acquisition of a voice for environmental sustainability; where everyone appreciates the need to watch-out for environment pollution;

• By advocacy to Government to become part of the Global Warming Movement and reduce carbon dioxide emissions now;

• Encouraging advertising agencies to advertise more on global warming and possible solutions on the most popular channels by including more anecdotal features on environmental issues;
• By promotion to Ministry of Education to include a programme within the curriculum of schools, starting from primary to educate children on global warming;

• Campaigning for “Reduce Reuse .... ..... Recycle”;

• By encouraging people to plant a tree and asking one to plant a tree;

• By influencing policymakers to make them aware that you are concerned about global warming and encourage them to take more interest in these issues and make policies based on firm and informed decisions.

• Through constant reminders of environmental friendly and unhealthy issues;

• Questioning the validity of unhealthy chemical producing material, such as wrapping clingfilms and related law,

• Commitment to environmental sustainability; people are willing to adapt to an environment-friendly in day to day life;

• By making environmental lessons on how to reduce pollution and emission of carbon footprint simple and easily comprehensible and facilitating local or mobile training centres.

• Through contribution in development of Environmental Knowledge Management (EKM) systems;

• By networking with government to influence aid agencies’ policies

• Through partnership with environmental agencies / lobbyist organisations to collaborate in training the community, and exchanging knowledge.

• By providing open and free access to impact documentaries or films such as the Al Gore film.

The paper concludes with Harfagar’s words (n.d), which place a strong emphasis on the formative role of the library. Formation is “knowledge that you internalise and carry with you to have a more meaningful impact on the community, such as one who studies up on the roots of global warming and effects a more lasting change”.

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