

# The Role of Information Professionals in Reducing the Effects of Global Warming through Knowledge Management

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**Abstract:** As a result of 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. Potential catastrophic effects on the environment and for human life are one of the biggest concerns and most widely discussed issues in the world.

This paper will explore how Information Professionals can build knowledge management related to global warming and thus make their contribution towards a sustainable environment. With a brief discussion of causes, effects, solutions and challenges related to global warming, the conclusion suggests a way forward for librarians and information professionals.

**Keywords:** Informational Professional, Knowledge management, environmental sustainability, global warming.

## 1. Introduction

Global warming is “gradual increase in the earth’s surface temperature” [1]. It is not an issue 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 gasses can raise the average surface temperature of Earth by around 30°C and without it, Earth would be frozen [2]. 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.

Climate change and “growth and responsibility in Africa” headed the agenda of the June 6 – 8, 2007 G8 summit in

Heiligendamm, Germany [3]. 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.

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 part 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 manage knowledge related to global warming in order to foster a sustainable environment in Africa. Global warming related information cover the following topics.

## 2. Causes of Global Warming

There are two major debates on 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 [4]. 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 [5].

Sharing a similar opinion, Langdon [6] 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" [7]. 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 [8]. 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 gasses 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 [9]. Aviation (airplanes) causes 3.5% of global warming, and the figure is estimated to rise 15% by 2050 [10].

**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 [9]. 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 [11], including wetlands, termites, oceans, and hydrates [12].

**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' maintained that stoves produced twice as many smoke particles than had been predicted by previous laboratory studies [13].

**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 gasses; 20% is carbon dioxide and the other 20% nitrous oxide, methane, ozone and other varieties of grasses [14].

**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 [15].

**Human activities:** According to Global-Warming.lesinth.com [4], the following human activities cause global warning:

- a) *Driving a car* sends out emissions of carbon monoxide. An average car annually produces 22g CO for every 12,500 miles driven [16], 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 [17].

- 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 [18].

### 3. 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 [19].

- **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 [2].

- **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 Arctic 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 [21].

- **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 [22].

- **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 [23].

- **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 [24].

- **Oceans turning to acid:** When CO<sub>2</sub> gas dissolves into the ocean it produces carbonic acid "If CO<sub>2</sub> 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," [25].

- **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 [26].

- **Volcanic eruptions:** British scientists warn of another possible side effect of climate change - a surge of dangerous volcanic eruptions [27].

- **Death by smog:** According to Canadian doctors smog-related deaths could rise by 80% over the next 20 years [28].

- **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** [29].

- Spread of Dengue Fever
- Starvation & famine because global warming affects agriculture [30].

- Increased border tensions and National Security problems due to increased number of refugees [31].

#### 4. 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" [32]. 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 [33]. 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" [34]. 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" [35]. Western countries have a moral duty to act over global warming; these countries have been emitting greenhouse gases more than other countries" [35].

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 [36].
- Intense flooding and droughts;
- Intrusion of saltwater in freshwater zones;
- Rise of sea levels [37].
- Extreme weather; increased rainfalls at high latitudes and drops in the tropics [38].
- 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.

##### **5. 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 tropics. Some glaciers will disappear, though crop yields in some countries could rise, scientists believe [39].

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, car-pool 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 rechargeable batteries instead of disposable ones. Recycle is only effective if people purchase products made from recycled materials [40].
- Reduction of carbon footprint! Africa's "carbon footprint", the total amount of carbon dioxide and greenhouse gas emission is far smaller than other continents; still she is blamed for Africa's current rainy disaster. She has to reduce carbon footprint in order to reduce the global carbon dioxide gas emission [38].
- Organise more educative events like African Pavilion fair to market use of organic products [41].
- Development of new crop varieties and expansion of irrigation [42].
- Re-think of aid policies for Africa in terms climate change; because the continent is uniquely vulnerable to it [32].
- Rich countries must cut their greenhouse gas emissions further, far beyond the targets laid down in the Kyoto Protocol [32].
- **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 energy 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 [43].
- **Light bulbs replacement:** Replacement of a regular light bulb with an energy-saving model can minimise a considerable amount of global warming.
- **Think before you drive:** Use the less fuel-efficient vehicle and join a carpool.

- **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 information in order to make informed decisions about global warming solutions [44]. This may encourage government for increased initiatives to adapt climate change.

## 6. Conclusion

Based on the ongoing debate on global warming and environmental sustainability, this paper appeals to all informational professionals and librarians 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:

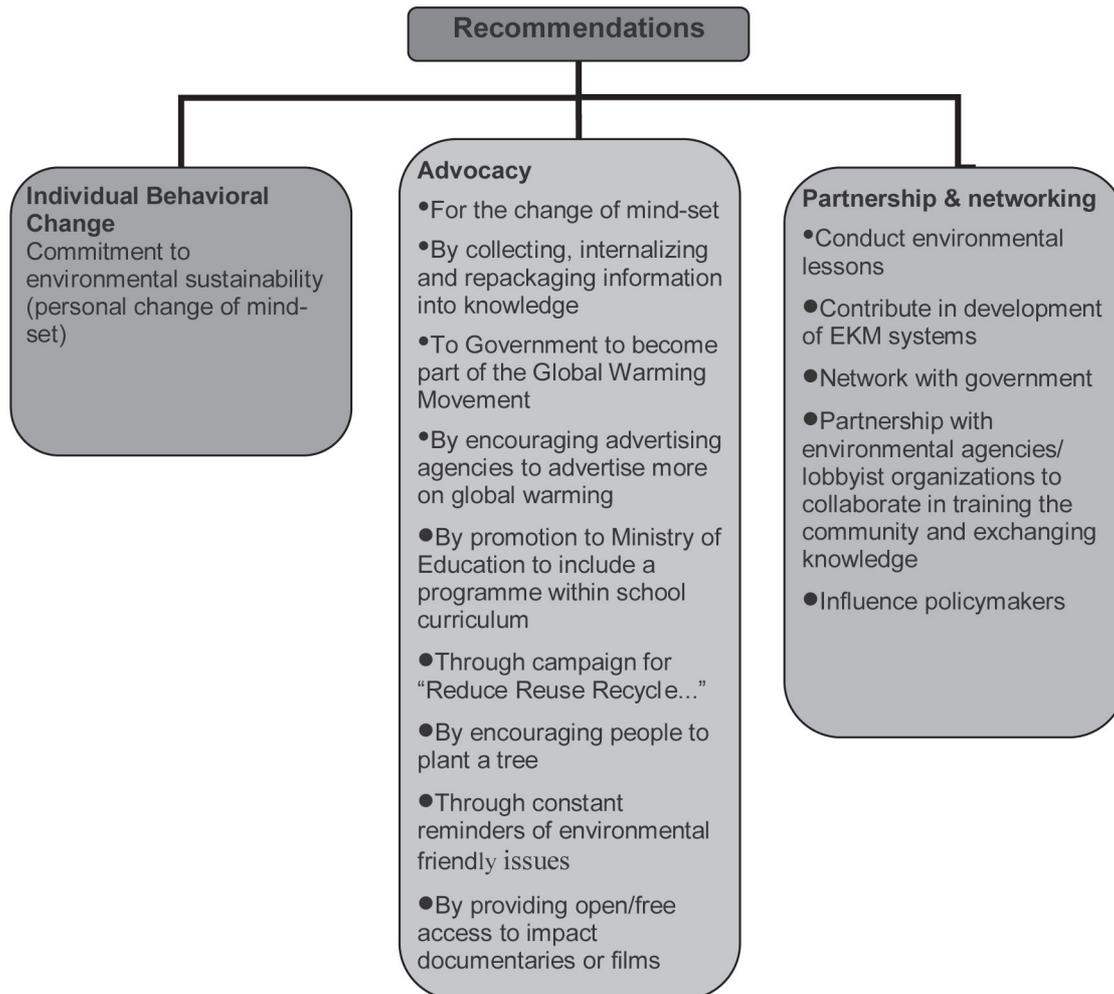
- Governmental efforts should establish and implement cutting edge climate policies and make them reach the public;
- Industrial efforts must innovate, manufacture, and operate under a new paradigm based on climate change threshold;
- Public efforts to adapt and transform to a more climate-friendly lifestyles, 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 [46]. By becoming an integral part of global warming knowledge

management, information professionals can revolutionize the dissemination of that information, taking information to all reaches of

society and thereby, have a positive impact on global warming. This can be realised in the following ways:

*Figure: Recommendations for Information Professionals*



- 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.

Finally, the paper concludes with Harfagar's words [47], 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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