بِسۡمِ ٱللَّهِ ٱلرَّحۡمَٰنِ ٱلرَّحِيمِ

Sudan University of Science and Technology

College of Post Graduate Studies

The Effect of Change Temperature on Volumetric Coefficient of Liquids

تأثيرتغيير درجة الحرارة في معامل التغير الحجمي للسوائل

A thesis submitted for partial fulfillments of the requirement of the degree Master of Science in General Physics

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الآيـــــــــة

قال تعالى

(قَالُواْ سُبْحَـٰنَكَ لَا عِلْمَ لَنَآ إِلَّا مَا عَلَّمْتَنَآ ۖ إِنَّكَ أَنتَ ٱلْعَلِيمُ ٱلْحَكِيمُ ﴿٣٢﴾)

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DEDICATION

All praise to Allah, today we fold the days tiredness and the errand summing up between the cover of this humble work.

To the utmost knowledge lighthouse to our greatest and most honored prophet Mohamed-May peace and grace from Allah be upon him.

To the spring that never stops giving, to my mother who weaves my happiness with strings from her merciful heart…….to my mother.

To whom he strives to bless comfort and welfare and never stints what he owns to push me in the success way who taught me to promote life stairs wisely and patiently , to my dearest father.

To whose love flows in my veins and my heart always remembers them, to my brothers and sisters.

To those who taught us letters of gold and words of jewel of the utmost and sweetest sentences in the whole knowledge, who reworded to us their knowledge simply and from their thoughts made a lighthouse guides us through the knowledge and success path . To our honored teachers and professors.

Abstract

Two types of liquids (water and ethanol) are used to investigate the volumetric change of these liquids with change of temperature in order to find the temperature coefficient for both liquids to relate the volumetric change with global warming. It reveals great agreement with theoretical consideration. So the volume of these liquids increased with increases of temperatures.

المستخلص

تم أخذ عينتان من السوائل(ماء-إيثانول) للتحقق من التغير الحجمي للسوائل عند تغير درجة الحرارة ووجد معامل التمدد الحجمي لكلا السائلين من اجل ربط هذه الظاهرة بظاهرة الاحتباس الحراري التي تنص علي أن الإرتفاع في درجة الحرارة تؤدي الي الزيادة في حجم السائل .و تتفق النتائج التي تم الحصول عليها مع الصياغ النظري.

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Chapter One

1.1 Introduction

Climate change is one of the major challenges of our time and adds considerable stress to our societies and to the environment. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Without drastic action today, adapting to these impacts in the future will be more difficult and costly. This overview deals with the concept of Global Climate Change, the associated terms, causes, consequences, solutions and its potential health impact. It shows the need to act urgently if we are to avoid an irreversible build-up of greenhouse gases (GHGs) and global warming at a potentially huge cost to the economy and society worldwide.

Therefore, addressing climate change requires an “unprecedented level of cooperation, not only between countries, but also between different levels of Governments, private sector and individuals.

The evidence of climate change is compelling: sea levels are rising, glaciers are retreating, precipitation patterns are changing, and the world is getting warmer. According to the Intergovernmental Panel on Climate change (IPCC), the current rate of greenhouse gas emissions is likely to cause average temperatures to rise by 0.2˚C per decade, reaching by 2050 the threshold of 2˚C above pre-industrial levels. Recent evidence suggests even more rapid change, which will greatly, and in some cases irreversibly, affect not just people, but also species and ecosystems.

Climate change indeed is real. Super typhoon Haiyan is the latest natural disaster that has also led credence to the reality of climate change. This sad occurrence hit

land and devastated the Philippines. This record-breaking storm is the strongest storm in history to make landfall. It tore apart buildings and left entire provinces without power or communication. The 370-mile-wide storm packed winds 3.5 times as strong as Hurricane Katrina. Winds reached 195 mph and had gusts of up to 235 mph. Walls of water as high as fifteen feet swept over the country washing away towns on many islands and washed ships ashore where homes once stood. The U.N. says,

"Around 920,000 people were displaced by the storm and a total of 11.8 million people have been affected. Officials said the deadly storm left more than 3850 injured and at least 77 people reported missing across the Philippines.

Climate change is a serious risk to poverty reduction and could undo decades of development efforts. While climate change is global, its negative impacts are more severely felt by poor people and poor countries. They are more vulnerable because of their high dependence on natural resources and limited capacity to cope with climate variability and extremes. Restoring and maintaining key ecosystems can help communities in their adaptation efforts and support livelihoods that depend upon the services of these ecosystems. Moving towards low-carbon societies can help reduce greenhouse gas emissions, improving human health and well-being and creating green jobs.

Climate change is a fact of life. We need to act urgently if we are to avoid an irreversible build-up of greenhouse gases (GHGs) and global warming at a potentially huge cost to the economy and society worldwide.

Organization for Economic Co-operation and Development (OECD) analysis suggests that if we act now, we have10 to 15 years' "breathing space" during which action is possible at a relatively modest cost. But every year of delay

reduces this breathing space, while requiring ever more stringent measures to make a difference. Current financial turmoil is not a reason to delay. Indeed, its macroeconomic consequences will be resolved in a relatively short time, after which growth will resume, while the consequences of inaction on global warming will continue to grow more and more costly over time.

This study presents an overview of Global Climate Change with a view to help appreciate the concept, its urgency and to give an insight to the ways it affects society and the natural environment and proffering solutions.

Throughout its long history, Earth has warmed and cooled time and again. Climate has changed when the planet received more or less sunlight due to subtle shifts in its orbit, as the atmosphere or surface changed, or when the Sun's energy varied. But in the past century, another force has started to influence Earth's climate: humanity [1].

Global warming is the unusually rapid increase in Earth's average surface temperature over the past century primarily due to the greenhouse gases released by people burning fossil fuels.

1.2 Research Goals

1- Full definition of the phenomenon of global warming and its causes and the main factors contributing to it.
2- Stand on the devastating effects of life caused by global warming.
3- Solutions and proposals that help in reaching measures to reduce global warming.

1.3 Research Importance

1- Study components of the atmosphere and important elements of the continuity of life.
2- Take the necessary measures to protect the environment.
3- Stand on the negative effects of human activities on nature.

1.4 Research Problem

Climate change is a fact of life. We need to act urgently if we are to avoid an irreversible build-up of greenhouse gases (GHGs) and global warming at a potentially huge cost to the economy and society worldwide

1.5 Assumptions

1- Human activities, especially in the field of industry Dorman increase in emissions Greenhouse.

2- Atmospheric layers and elements found in nature also play a role in operations

The chemical reaction with the gases, which caused what, is known as the ozone hole.

3- This phenomenon effect on living organisms mainly causing the extinction of some And the displacement of other species to new environments has changed in the vital fitted to adapt.

4 - The largest effect of heat emission is at the North Pole of the planet, causing

Melting ice and thus sank more than a third of the land.

1.6 Literature Review

- A report entitled "to avoid the danger of climate change," published by the British government in hosting the conference Center for Meteorological Studies in Britain in February 2002 Which said that increased emissions caused by global warming, may have a More serious effects than is belief. The report found that emissions caused by global warming survival chances under levels, "Dangerous", very tiny.

  It fears the report from the melting ice in the "Greenland" which may lead to a higher level Seas around 7 meters within the next thousand years. It will be the poorest countries Susceptible to these effects. The report compares the research and evidence presented by scientists at a conference hosted by the Center for the Study Meteorological in Britain. Conference and stopped at two basic objectives knowing when considered Emissions resulting from global warming in a very large proportion of the air, and what are the Possible options to avoid access to these ratios.

  British Prime Minister Tony Blair wrote in a report in preparation: "It seems clear through Published work in this report that the dangers posed by climate change may be the greatest Much more than we thought. "He added:" it is now sure that the emissions caused by global warming,

  In addition to industrial and economic growth in the light of the human increased by six-fold in 200 a year; make up the factors causing the worsening of the greenhouse gas.

- According to a study published by the renowned scientific journal Science, the greenhouse Heat plaguing the land will increase the risk of the spread of epidemics among animals and plants Land and sea with an increased risk of transmission of these diseases to humans.

He says the world(Drew Harvey from the University), Cornell (and head of the scientific research team) What Surprising and surprising that the highly vulnerable to climate epidemics appear across very different types of Generators disease from viruses and germs and parasites, and infect a variety of very Organisms, including corals, shellfish and plants and wild birds and humans (. Researchers have devoted their studies for two years about the relationship between the change in temperature And the growth of viruses and bacteria and other disease factors, with the publication of a study of some factors Diseases such as rodents and mosquitoes and flies, have found that with the high temperature, increasing Activity insect vector and rodent vigorously strike a greater number of humans and animals, It was found that successive winters and moderate heat lost its natural role in the reduction of Bacteria, viruses and vector group, as well as it has been observed that in the summers The last decade of the last century increased temperatures and longer, increasing the period in which the disease To which the move to the living species highly vulnerable to thermal changes especially in the seas and oceans.

The researcher says) Richard Austfeld ((Institute for the Study of environmental regulations in New York)) that The issue is not limited to the problem of coral and white was the color he says conservationists, or some cases Sporadic malaria, which can be controlled, it has many different aspects and we are concerned about (The study dealt with the lives of many birds and animals that have been affected by the high temperatures, the researchers mention, for example, birds) Alokiba (in Hawaii, where these birds live on A height of 700 meters in the mountains of the island), Maui (, Mahatma cold at this height of Mosquitoes and insects that destroy her life,

but the rise in temperature to make up to mosquitoes, such as This rise, bringing malaria germs that hit large numbers of these birds and decimated by of them did not leave only a small number.

Climate change is a fact of life. We need to act urgently if we are to avoid an irreversible build-up of greenhouse gases (GHGs) and global warming at a potentially huge cost to the economy and society worldwide

1.7 Research Layout

Research consists of and five chapters the first chapter an introduction, the second Chapter deals with the mechanism of global warming, the third chapter talks about the causes and dangers and negative effects of this phenomenon, the four Chapter the greenhouse gas causes and solutions and proposals to address the problem ,and chapter five about the experimental.

Chapter Two

The Global Warming

2.1 Introduction

Humans are responsible for producing these gases via cars, electricity, and factories. The main products of these activities that are to blame for global warming are methane and carbon dioxide, and chlorofluorocarbon compounds go farther and farther into the Earth's atmosphere, they deplete the ozone layer.

Global warming refers to extreme changes in the Earth's climate. The term illustrates dramatic increases in atmospheric and water temperatures experienced as a result of growing amounts of greenhouse gas emissions.

2.2 Defining Weather and Climate

Weather is the state of the atmosphere at a specific time in a specific place. Temperature, cloudiness, humidity, precipitation, and winds are examples of weather elements. Thunderstorms, tornadoes, and monsoons are also part of the weather of some places during some seasons.

Climate is defined as long-term weather patterns that describe a region. For example, the New York metropolitan region's climate is temperate, with rain evenly distributed throughout the year, cold winters, and hot summers [1,2].

2.3 Climate Variability and Climate Change

Climate variability refers to variations in the prevailing state of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system, or to variations

in natural or anthropogenic (human-driven) external forcing. Global climate change indicates a change in either the mean state of the climate or in its variability, persisting for several decades or longer. This includes changes in average weather conditions on Earth, such as a change in average global temperature, as well as changes in how frequently regions experience heat waves, droughts, floods, storms, and other extreme weather. It is important to note that changes in individual weather events will potentially contribute substantially to changes in climate variability. Climate change could occur naturally as a result of a change in the sun's energy or Earth's orbital cycle (natural climate forcing), or it could occur as a result of persistent anthropogenic forcing, such as the addition of greenhouse gases, sulfate aerosols, or black carbon to the atmosphere, or through land-use change[1,2 and 5].

2.4 "Global Warming" Is the Wrong Term

Global warming (as well as global cooling) refers specifically to any change in the global average surface temperature.

Global warming is often misunderstood to imply that the world will warm uniformly. In fact, an increase in average global temperature will also cause the circulation of the atmosphere to change, resulting in some areas of the world warming more, others less. Some areas can even cool. Unfortunately, although it significantly misrepresents what really happens, the term 'global warming' is still often used by media and others to describe climate change. Climate change is more than a warming trend (which is why the term "global warming" is an inaccurate description of the phenomenon) [1,2].

2.5 Brief History of International Agreements on Climate Change

For the first time in June 1988 at the World Conference on the Changing Atmosphere in Toronto, politicians and scientists conclude “humanity is conducting an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war.” The conference recommends reducing carbon dioxide emissions 20% by 2005. In the same year IPCC published its First Assessment Report, which highlighted the increasing accumulation of human-made greenhouse gases in the atmosphere. The first Conference of the Parties (1995) in Canada, realized the need of binding commitments by industrialized countries are required to reduce emissions. In December 1997 around 150 countries signed the Kyoto Protocol, which binds

38 industrialized countries (called Annex 1 countries) to reduce greenhouse gas emissions by an average of 5.2%below 1990 levels for the period of 2008-2012. The Kyoto Protocol became international law on 16 February2005.

For any nation, the more urgent priorities like economic development always tends to take over threats like climate change or global environment change and this is why it is so difficult to achieve a coordinated international response to such issues. Recently, United Nations Climate Change Conference in Bali, Indonesia (December, 2007) was attended by representatives from over 180 countries, together with observers from intergovernmental and nongovernmental organizations. Participants agreed on “Bali roadmap”, which provide guidelines to reach a treaty by the end of 2009 to replace the Kyoto Protocol. That year in April during the UN Climate Talks in Bangkok – the first meeting after the Bali conference—an ambitious timetable had been developed to complete the complex

negotiations on a new climate deal in time for the UN Climate Conference in Copenhagen in December 2009[1,2].

Global warming refers to extreme changes in the Earth's climate. The term illustrates dramatic increases in atmospheric and water temperatures experienced as a result of growing amounts of greenhouse gas emissions. Humans are responsible for producing these gases via cars, electricity, and factories. The main products of these activities that are to blame for global warming are methane and carbon dioxide, and chlorofluorocarbon compounds go farther and farther into the Earth's atmosphere, they deplete the ozone layer.

Holes in the ozone are allowing harmful ultra violet rays (that are usually deflected by the ozone layer) to make their way to lower levels of the atmosphere. Greenhouse gases absorb and give off radiation from the UV rays, contributing to extreme temperature conditions

Global warming is the unusually rapid increase in Earth's average surface temperature over the past century primarily due to the greenhouse gases released by people burning fossil fuels[1, 2, and 3].

2.6 Mechanism of global Warming

The major greenhouse gases emitted into the atmosphere through human activities are carbon dioxide, methane, nitrous oxide, and fluorinated gases Greenhouse Gases some of these gases are produced almost entirely by human activities; others come from a combination of natural sources and human activities. Several factors determine how strongly a particular greenhouse gas will affect the Earth's climate.

One factor is the length of time that the gas remains in the atmosphere. A second factor is each gas's unique ability to absorb energy. By considering both of these

factors, scientists calculate a gas's global warming potential, as compared to an equivalent mass of carbon dioxide (which is defined by a global warming potential equal to 1)[2,3].

As greenhouse gas emissions from human activities increase, they contribute to more warming of the climate, leading to many other changes around the world—in the atmosphere, on land, and in the oceans. These changes will have both positive and negative effects on people, plants, and animals. Because many of the major greenhouse gases can stay in the atmosphere for tens to hundreds of years after being released, their warming effects on the climate will persist over a long time [2, 3].

2.7 Comparing of Today's Warming to Past Climate Change:

Earth has experienced climate change in the past without help from humanity. But the current climatic warming is occurring much more rapidly than past warming events [1, 4].

2.8 Scientists Think Current Warming Isn't Natural

In Earth's history before the Industrial Revolution, Earth's climate changed due to natural cause's unrelated to human activity. These natural causes are still in play today, but their influence is too small or they occur too slowly to explain the rapid warming seen in recent decades [1, 4].

2.9 Amount of Earth Warm

Models predict that as the world consumes ever more fossil fuel, greenhouse gas concentrations will continue to rise and Earth's average surface temperature will rise with them. Based on plausible emission scenarios, average surface

temperatures could raise between 2°C and 6°C by the end of the 21st century. Some of this warming will occur even if future greenhouse gas emissions are reduced, because the Earth system has not yet fully adjusted to environmental changes we have already made[1,4].

2.10 RespondofEarth to Warming Temperatures

The impact of global warming is far greater than just increasing temperatures. Warming modifies rainfall patterns, amplifies coastal erosion, lengthens the growing season in some regions, melts ice caps and glaciers, and alters the ranges of some infectious diseases. Some of these changes are already occurring [1,4].

Chapter Three
Effect and Impact of Global Warming

3.1 Introduction

Climate change may result from:

• Natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;

• Natural processes within the climate system (e.g. changes in ocean circulation);

• Human activities that contribute to climate change which include in particular the burning of fossil fuels and agriculture and land-use changes like deforestation. These activities lead to the emission of carbon dioxide (CO2), the main gas responsible for climate change, as well as of other 'greenhouse' gases.

Industrializations, urbanization, the increase of motor transport, apart from social and economic benefits, have resulted in the increase of greenhouse gas emissions, which intensify the natural greenhouse effect. Greenhouse gases are gases that absorb the infrared radiation emitted by the earth, thus preventing the escape of terrestrial radiation into space

The anthropogenic effects on the physical and chemical properties of the atmosphere therefore have the potential to directly influence the climatic system. The three most important greenhouse gases are carbon dioxide, methane and nitrous oxide. Global greenhouse gas emissions have grown since pre-industrial times, with an increase of 70% between 1970 and 2004Greenhouse gases are produced from a variety of industrial activities. The main sources, other than power generation, are those energy intensive industries that chemically or

physically transform materials from one state to another. Energy intensive industries such as oil refining, chemicals and metal production and cement production are the main sources of greenhouse gas emissions after power generation.

Most of these industries, especially the cement industry, are heavily dependent on fossil fuels.

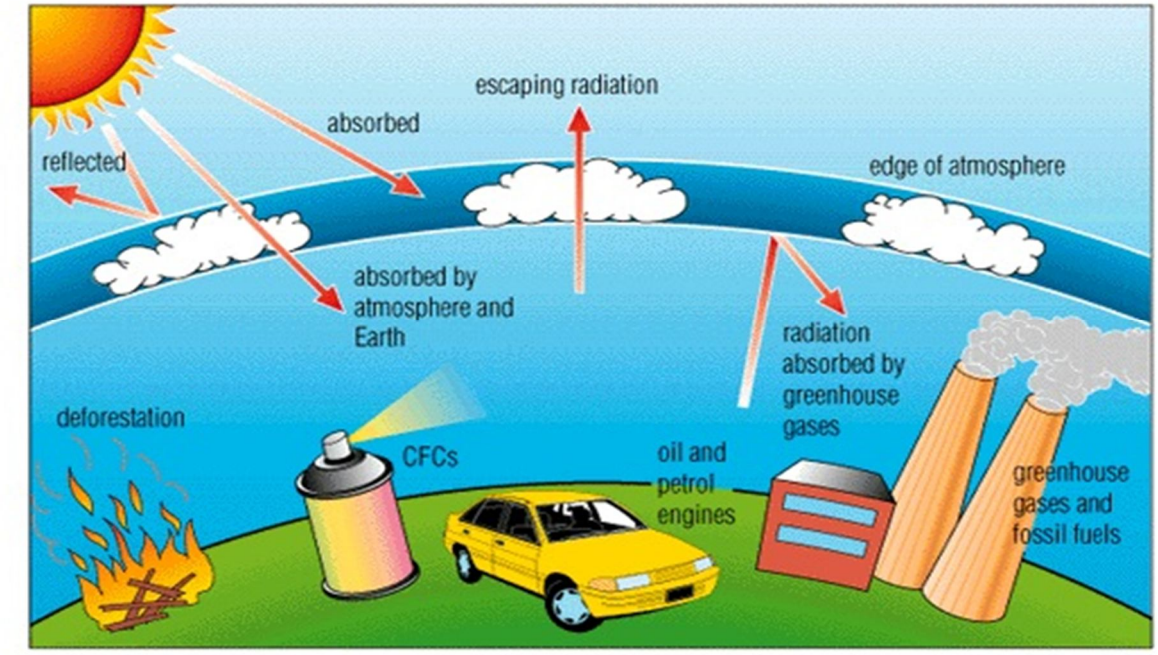

Figure (3.1) Shows Causes of Global Warming

3.2 Study of the problem since 1880

The global mean temperature can be separated into land area temperature (LAT), sea surface temperature (SST), and a combined global mean temperature (MEAN). MEAN is calculated by area weights corresponding to the global sea area (71%) and land area (29%). In 1880, SST was 15.9°C and LAT was 8.6°C, with a global

mean temperature of 13.6°C. Until 1999, SST had increased 0.5°C and the LAT 1.2°C. The corresponding global mean temperature increase was 0.7°C [13].

3.3 Causes of Global Warming

Global warming is a serious issue and is not a single issue but a number of environmental issues. Global warming is a rise in the surface temperature of the earth that has changed various life forms on the earth. The issues that cause global warming is divided into two categories include "natural" and "human influences" of global warming [10].

3.3.1 Natural Causes of Global Warming

The climate has continuously changing for centuries. The global warming happens because the natural rotation of the sun that changes the intensity of sunlight and moving closer to the earth.

Another cause of global warming is greenhouse gases. Greenhouse gases are carbon monoxide and Sulphur dioxide it trap the solar heats rays and prevent it from escaping from the surface of the earth. This has cause the temperature of the earth increase.

Volcanic eruptions are another issue that causes global warming. For instance, a single volcanic eruption will release amount of carbon dioxide and ash to the atmosphere. Once carbon dioxide increase, the temperature of earth increase and greenhouse trap the solar radiations in the earth.

Finally, methane is another issue that causes global warming. Methane is also a greenhouse gas. Methane is more effective in trapping heat in the atmosphere that carbon dioxide by 20 times. Usually methane gas can release from many areas. For

instance, it can be from cattle, landfill, natural gas, petroleum systems, coal mining, mobile explosion, or industrial waste process [10].

3.3.2 Human Influences on Global Warming

Human influence has been a very serious issue now because human do not take care the earth. Human that cause global warming are more than natural causes global warming. The earth has been changing for many years until now it is still changing because of modern lifestyle of human. Human activities include industrial production, burning fossil fuel, mining, cattle rearing or deforestation.

First issue is industrial revolution. Industrial have been using fossil fuels for power machines. Everything that we use is involved in fossil fuel. For example, when we buy a mobile phone, the process of making mobile phone have involve machines and machines uses fossil fuels, during the process carbon dioxide is releasing to the atmosphere. Besides industrial, transportation such as cars is also releasing carbon dioxide from exhaust.

Another issue is mining. During the process of mining, the methane will trap below the earth. Besides, rearing cattle will also cause methane because cattle released the form of manure. However, cattle are important because it make the latter equally responsible for the occurrence of global warming.

Next is the most common issue that is deforestation. Deforestation is a human influence because human have been cutting down trees to produce papers, wood, build houses or more. If human continuing deforestation, carbon dioxide will concentrate in the atmosphere because trees can absorb carbon dioxide from atmosphere. Besides, human also release carbon dioxide when breathe. Therefore the amounts of millions of people breath have release carbon dioxide to the atmosphere. If human continue deforestation, human breathing that release carbon dioxide will stay at the atmosphere [10].

3.4 The Effect of Global Warming

The greenhouse gases will stay in the atmosphere for many years since hundreds years ago. However, the effect that global warming will cause on earth are extremely serious. There are many effects that will happen in the future if global warming continues. That includes polar ice caps melting, economic consequences, warmer waters and more hurricanes, spread of diseases and earthquake

First effect is polar ice caps melting. As the temperature increase, the ice at the North Pole will melt. Once the ice melt the first effect will be raise on sea levels because the melting glaciers become oceans. According to the National Snow and Ice Data Center "if the ice melted today the seas would rise about 230 feet". It affects many low lying areas such as the Netherlands. In future, the Netherlands will be cover by water once the North Pole is melted. However, it is not going to happen so fast but the sea. Another effect is the species loss of habitat. Species that include polar bears and tropical frogs will be extinct due to climate change. Besides, various birds will migrate to other places because animals are not like humans. They cannot adapt the habitat that changes their living or temperature.

Next effect is more hurricanes will occur and economic consequences still affect as well. Hurricane causes damage to houses and government need to spend billions of dollars in damage and people need places to stay or have been killed. Once a disaster happens many people have died and diseases happen. Diseases are more serious because it can spread to other people very fast and more people will get the disease and the disease maybe come more serious because of different weather [10].

3.5 Physical impacts

Main article: Physical impacts of climate change:

Seven of these indicators would be expected to increase in a warming world and observations show that they are, in fact, increasing. Three would be expected to decrease and they are, in fact, decreasing.

A broad range of evidence shows that the climate system has warmed. Evidence of global warming is shown in the graphs opposite. Some of the graphs show a positive trend, e.g., increasing temperature over land and the ocean, and sea level rise. Other graphs show a negative trend, e.g., decreased snow cover in the Northern Hemisphere, and declining Arctic sea ice extent. Evidence of warming is also apparent in living (biological) systems.

Human activities have contributed to a number of the observed changes in climate. This contribution has principally been through the burning of fossil fuels, which has led to an increase in the concentration of GHGs in the atmosphere Another human influence on the climate are sulfur dioxideemissions, which are a precursor to the formation of sulfate aerosols in the atmosphere.

Human-induced warming could lead to large-scale, irreversible, and/or abrupt changes in physical systems. An example of this is the melting of ice sheets, which contributes to sea level rise. The probability of warming having unforeseen consequences increases with the rate, magnitude, and duration of climate change [6].

3.6 Effects on weather

Observations show that there have been changes in weather. As climate changes, the probabilities of certain types of weather events are affected Changes have been observed in the amount, intensity, frequency, and type of precipitation Widespread increases in heavy precipitation have occurred, even in places where total rain amounts have decreased. With medium confidence, IPCC (2012) concluded that human influences had contributed to an increase in heavy precipitation events at the global scale.

Projections of future changes in precipitation show overall increases in the global average, but with substantial shifts in where and how precipitation falls. Projections suggest a reduction in rainfall in the subtropics, and an increase in precipitation in subpolar latitudes and some equatorial regions. In other words, regions which are dry at present will in general become even drier, while regions that are currently wet will in general become even drier, while regions that are currently wet will in general become even wetter. This projection does not apply to every locale, and in some cases can be modified by local conditions [7].

3.7 Effects of global warming on Oceans

The role of the oceans in global warming is complex. The oceans serve as a sink for carbon dioxide, taking up much that would otherwise remain in the atmosphere,

but increased levels of CO2 have led to ocean acidification. Furthermore, as the temperature of the oceans increases, they become less able to absorb excess CO2. The ocean has also acted as a sink in absorbing extra heat from the atmosphere. The increase in ocean heat content is much larger than any other store of energy in the Earth's heat balance over the two periods 1961 to 2003 and 1993 to 2003, and accounts for more than 90% of the possible increase in heat content of the Earth system during these periods.

Global warming is projected to have a number of effects on the oceans. Ongoing effects include rising sea levels due to thermal expansion and melting of glaciers and ice sheets, and warming of the ocean surface, leading to increased temperature stratification. Other possible effects include large-scale changes in ocean circulation [8].

Chapter Four

The Greenhouse Gas Causes and Effect

4.1 Introduction

In response to the threat of global warming a variety of policy measures have been proposed to reduce the emissions of carbon dioxide (CO2), the most important greenhouse gas under the control of human activity. Carbon dioxide, which has been estimated to have contributed 50-60% of the warming in the last century, is released during fossil fuel combustion and deforestation. Proposed national policies and global agreements have focused on reducing carbon emissions from these sources.

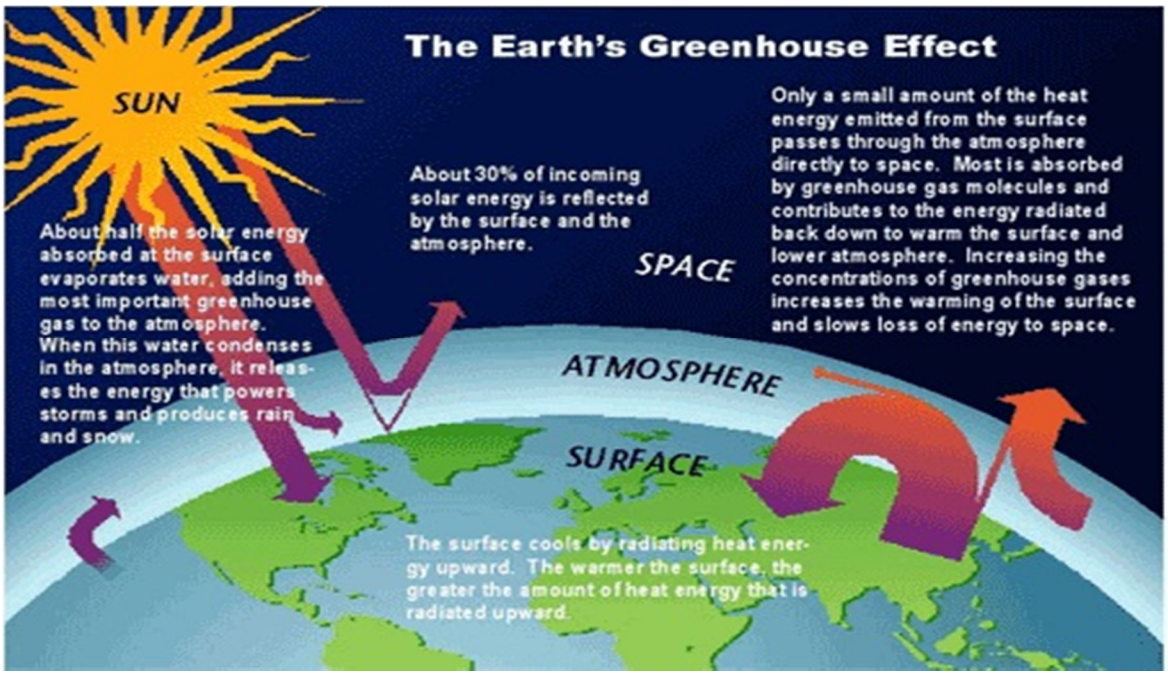

Figure (4.1) shows the Earth's Greenhouse Effect

4.2 Greenhouse Gases

The greenhouse gases and their sources are as follows:

4.2.1 Water vapor: Is the most common greenhouse gas but others are very important too. Some occur naturally and some come from human activity.

4.2.2 Carbon dioxide or CO2: Is the most significant greenhouse gas released by human activities, mostly through the burning of fossil fuels, It is the main contributor to climate change.

4.2.3 Methane: is produced when vegetation is burned, digested or rotted with no oxygen present. Garbage dumps, rice paddies, and grazing cows and other livestock release lots of methane.

4.2.4 Nitrous oxide: can be found naturally in the environment but human activities are increasing the amounts.

Nitrous oxide is released when chemical fertilizers. Nitrous oxide is released when chemical fertilizers and manure are used in agriculture.

4.2.5 Halocarbons: are a family of chemicals that include CFCs (which also damage the ozone layer), and other human-made chemicals that contain chlorine and fluorine [2, 3, and 9].

4.3 Greenhouse Effect

A natural system known as the “greenhouse effect” regulates temperature on Earth. Just as glass in a greenhouse keeps heat in, our atmosphere traps the sun’s heat near earth’s surface, primarily through heat-trapping properties of certain “greenhouse gases”. Earth is heated by sunlight. Most of the sun's energy passes through the atmosphere, to warm the earth’s surface, oceans and atmosphere.

However, in order to keep the atmosphere’s energy budget in balance, the warmed earth also emits heat energy back to space as infrared radiation. As this energy radiates upward, most is absorbed by clouds and molecules of greenhouse gases in the lower atmosphere.

These re-radiate the energy in all directions, some back towards the surface and some upward, where other molecules higher up can absorb the energy again. This process of absorption and re-emission is repeated until; finally, the energy does escape from the atmosphere to space. However, because much of the energy has been recycled downward, surface temperatures become much warmer than if the greenhouse gases were absent from the atmosphere. This natural process is known as the greenhouse effect. Without greenhouse gases, Earth’s average temperature would be −19˚C instead of +14˚C, or 33˚C colder. Over the past 10,000 years, the amount of greenhouse gases in our atmosphere has been relatively stable. Then a few centuries ago, their concentrations began to increase due to the increasing demand for energy caused by industrialization and rising populations, and due to changing land use and human settlement patterns[2, 3 9].

4.4 Greenhouse Gas Emissions Models

In order to evaluate the effect of policies to stabilize emissions, emissions models are needed to study possible future paths of emissions growth. From the previous section we see the need for these models to specify emissions of all greenhouse-relevant gases.

Another important feature of a desired emission model is that the drivers of emissions sources should be endogenous to the model. If emission profiles of greenhouse-relevant gases are specified externally, as in a series of "emission scenarios," changes to model parameters will not result in changes to emissions of

gases which are specified exogenously. A third requirement is that the emission model should be global in scope.

Gases in the atmosphere have no identity of origin, so only global models will be able to evaluate the complete effect of emissions on global warming.

A review of current emissions models reveals that many of them either do not include greenhouse-relevant gases other than CO_2 or if they are included, they are determined exogenously to the model. This deficiency is revealed by the history of greenhouse gas emissions modelling. Most of these models were constructed from energy models of the past because the majority of CO_2 emissions are from energy sources.

Other greenhouse-relevant gases were usually added later. Since the other greenhouse relevant gases have sources from agriculture, industry, and land use, they were either excluded from CO_2 emission models or determined exogenously by a set of scenarios [10].

Some of the recent emissions models include Carbon Emissions Trajectory Assessment or CETA (Weisberg, 1993), Edmonds-Reilly, IDEAS (AES Corp., 1993), GEMINI (Cohan, 1993), Global 2100, Global Macro-Energy (Pepper, 1993), and Guilder (see Beaver, 1993, for a description of models). Several of these models focus only on national issues, including Golder, Global 2100, GEMINI, and IDEAS (Wayans, 1993).

GEMINI and IDEAS were both used in formulating U.S. energy policy. Although these models do contain emissions of greenhouse gases other than CO_2, only energy-related missions are included.

All non-energy sources of greenhouse gases are specified exogenously. The global models include CETA, Edmonds-Reilly, and Global 2100.

However, they either did not include all greenhouse-relevant gases or the emissions of those gases were specified exogenously.

Only a handful of models exist that address emissions of all greenhouse-relevant gases on a global basis. These models include the Atmospheric Stabilization Framework(ASF), the Integrated Model to Assess the Greenhouse Effect (IMAGE), the IntegratedClimate Assessment Model (ICAM), and the Second Generation Model (SGM). These models integrate energy, agriculture, land-use, and industrial activities to determine greenhouse gas emissions from all anthropogenic sources.

We examine these models here, as these models guided the design of GEMS with respect to determining which factors drive emissions of greenhouse-relevant gases. In particular, the ASF incorporated several of the new anthropogenic sources of greenhouse relevant gases which were introduced in IPCC (1992). The ASF, which is based on theEdmonds-Reilly energy model, is the most complete model at this point in time. The others have potential but are as yet still uncompleted [11].

4.5 Greenhouse Gases Effect on Climate

Since Greenhouse Gases Make up Such a Small Percentage of the Atmosphere, Why Do Changes in Their Concentrations Have Such a Big Effect on Climate:

Most greenhouse gases are extremely effective at absorbing heat escaping from the earth and keeping it trapped.

In other words, it takes only small amounts of these gases to significantly change the properties of the atmosphere.

99% of the dry atmosphere consists of nitrogen and oxygen, which are relatively transparent to sunlight and infrared energy, and have little effect on the flow of sunlight and heat energy through the air. By comparison, the atmospheric greenhouse gases that cause the earth's natural greenhouse effect total less than 1% of the atmosphere. But that tiny amount increases the earth's average surface temperature from −19˚C to +14˚C—a difference of about 33˚C. A little bit of greenhouse gas goes a long way. Because the concentration of greenhouse gases in the atmosphere is so low, human emissions can have a significant effect. For example, human emissions of carbon dioxide (CO_2) currently amount to roughly 28 billion tons per year. Over the next century human emissions will increase the concentration of carbon dioxide in the atmosphere from about 0.03% today to almost certainly 0.06% (a doubling), and possibly to 0.09% (a tripling)[3, 4, 9].

4.6 Causes of Global Climate Change

Earth’s climate changes naturally, Changes in the intensity of sunlight reaching the earth cause cycles of warming and cooling that have been a regular feature of the Earth's climatic history. Some of these solar cycles—like the four glacial-interglacial swings during the past 400,000 years—extend over very long time scales and can have large amplitudes of 5˚C to 6˚C. For the past 10,000 years, the earth has been in the warm interglacial phase of such a cycle. Other solar cycles are much shorter, with the shortest being the 11 year sunspot cycle. Other natural causes of climate change include variations in ocean currents (which can alter the distribution of heat and precipitation) and large eruptions of volcanoes (which can sporadically increase the concentration of atmospheric particles, blocking out more

sunlight). Still, for thousands of years, the Earth's atmosphere has changed very little. Temperature and the balance of heat-trapping greenhouse gases have remained just right for humans, animals and plants to survive. But today we're having problems keeping this balance. Because we burn fossil fuels to heat our homes, run our cars, produce electricity, and manufacture all sorts of products, we are adding more greenhouse gases to the atmosphere. By increasing the amount of these gases, we have enhanced the warming capability of the natural greenhouse effect. It's the human-induced enhanced greenhouse effect that causes environmental concern, because it has the potential to warm the planet at a rate that has never been experienced in human history [3, 4, and 9].

The more direct impacts on health include those due to changes in exposure to weather extremes (heatwaves, winter cold); increases in other extreme weather events (floods, cyclones, storm-surges, droughts); and increased production of certain air pollutants and aeroallergens (spores and moulids). Decreases in winter mortality due to milder winters may compensate for increases in summer mortality due to the increased frequency of heatwaves.

In countries with a high level of excess winter mortality, such as the United Kingdom, the beneficial impact may outweigh the detrimental.

The extent of change in the frequency, intensity and location of extreme weather events due to climate change remains uncertain.

Climate change, acting via less direct mechanisms, would affect the transmission of many infectious diseases (especially water, food and vector-borne diseases) and regional food productivity (especially cereal grains). In the longer term and with considerable variation between populations as a function of geography and

vulnerability, these indirect impacts are likely to have greater magnitude than the more direct.

For vector-borne infections, the distribution and abundance of vector organisms and intermediate hosts area effected by various physical (temperature, precipitation, humidity, surface water and wind) and biotic factors (vegetation, host species, predators, competitors, parasites and human interventions),

By reflecting the increased retention of heat energy in the lower atmosphere, global warming also affects the atmospheric heat budget so as to increase the cooling of the stratosphere (Shandell et al., 1998) Should this cooling persist, the process of ozone depletion could continue even after chlorine and bromine loading (by human emission of ozone-destroying gases) starts to decline. If so, the potential health consequences of stratospheric ozone depletion (increase in incidence of skin cancer in fair-skinned populations; eye lesions such as cataracts; and, perhaps, suppression of immune activity) would become an issue for climate change [9].

4.7 Mitigation Solutions

Between 1970 and 2004 global emissions of greenhouse gases rose by 70% mainly as a result of rising energy consumption, The CO_2 emissions of electrical power stations, factories, motor vehicles, homes, offices and other sources grew even greater: by 80%. Developed countries are responsible for half the world's CO_2 emissions.

While the share of emerging economies like China and Latin America in global CO_2 emissions is rising, it is still far less than that of Europe and the United States taken together (both in absolute terms and per head of the population).

If no action is taken, global CO_2 emissions are projected to rise by a further 45% to 110% between2000 and 2030.

In many of the world's regions and countries governments have introduced policies to reduce emissions ofCO_2 and other greenhouse gases. This is often referred to as mitigation policy. A case in point is the Kyoto Protocol, under which industrialized countries have committed themselves to a certain cut in emissions; this has not been ratified by Australia or the US, however. The European Union has an additional policy target of reducing its CO2 emissions by twenty to thirty percent by the year 2020 relative to 1990. One of the key instruments for securing these targets is the European "carbon emissions trading scheme". At the national and local level, too, action is being taken by governments as well as environmental organizations. One example of the latter type of action is Green4sure, a green energy plan presented to the Dutch government in 2007 by the Netherlands' largest environmental and trades unions organizations.

Young people themselves can also take action to limit climate change. The first step is for them to realize that many everyday activities—computer gaming, showering, travel, and so on—consume energy and that energy is also required to produce food, clothing, cars, buildings and all kinds of other products. Everyone uses energy and every unit of energy consumed can further exacerbate climate change. It's therefore important to realize that all of us share some of the responsibility for climate change. What we ourselves can do to tackle climate change depends very much on our personal situation. It therefore makes sense to first work out how high your greenhouse gas emissions are,

1) Use as little energy as possible.

2) Try and ensure the energy you do use comes from renewable sources (wind, water, solar).

3) Compensate for any fossil energy you use by supporting energy efficiency projects or by other means (a variety of schemes are available).

When it comes to reducing emissions of the other main greenhouse gases methane and nitrous oxide—the single best tip is to eat less meat and more organically grown food [9].

4.8 Solution to Stop Global Warming

Now there are solutions that we can stop global warming. However we human and governments need to move forward to implement the global warming solutions. To reduce global warming we can do to reduce the contribution of greenhouse gases to the atmosphere. Therefore, the solutions that we can reduce global warming are reducing gasoline, electricity and our activities that cause global warming.

To reduce gasoline mean we have a choice to choose a hybrid car that reduce using gasoline. Besides, petrol price are increasing. If a person everyday drives to work they need to pump petrol after 3 days and causes carbon dioxide. Another way to reduce gasoline is take public transport or carpool to work. It can help reduce carbon dioxide and save cost.

Another way to reduce global warming is recycle. Recycle can reduce garbage by reusing plastic bags, bottles, papers or glass. For instance, when we buy foods, we can use our own containers instead of plastic bags. Another example is after finish drinking the water from the bottle; we can reuse it or use our own bottle. If all this is being reuse, human can reduce deforestation and help save environment.

Besides, turn off electricity if unused. It can save thousands of carbon dioxide and buy product that have energy saving because it saves cost and save environment.

Finally, human should stop open burning such as burning dry leafs or burning garbage. It will release carbon dioxide and toxic if burning garbage with plastic. Besides, government should reduce deforestation because the earth temperatures are increasing. Trees will help to improve the temperature on earth [10].

Chapter Five

Experimental

5.1 Introduction

Two samples of liquids are prepared in order to determine the volumetric expansion coefficient by means of a dilatometer

The volumetric expansion coefficient is practically independent of the temperature but it does depend on the material. In general, liquids expand more than solids.

A dilatometer consists of a glass flask with a capillary of known radius r at the opening as a riser tube.

The level h of the liquid in the riser tube is read from a mm-scale. It increases when the glass flask is uniformly warmed in a water bath and the volume of the liquid expands.

The change in the liquid level Δh corresponds to a change in volume

$$\Delta V = \pi r^2 \Delta h$$

With r = (1.5 $\pm$0.08) mm.

However it has to be taken into account that the dilatometer itself also expands because of the warming. This expansion counteracts the change in the liquid level. The change in volume of the liquid thus is

$$\Delta V_0 = \Delta V + \Delta V_D$$

Where the volume change ΔV_D of the dilatometer is

$$\Delta V_D = \gamma_D V_0 \Delta\vartheta \quad \text{with } \gamma_D = 0.84 \times 10^{-4}\ \mathrm{K}^{-1}$$

The volumetric expansion coefficient of the liquid is found to be

$$\gamma = \frac{\Delta V}{V_0 \Delta \vartheta} + \gamma_D$$

5.2 Objects of the Experiments

1- Measuring the volume expansion of water and ethanol as a function of the temperature and determining the volumetric expansion coefficient γ.
2- Comparing the volumetric expansion coefficients of water and ethanol.

5.3 Instruments

Dilatometer……38215

Thermometer, -10 to 110 C^0 ……38234

Beaker, 400 ml, as, hard glass…….664104

Hot plate, 150 mm dia., 1500 w……666767

Stand base, V-shape……30002

Stand rod, 47 cm …….30042

Leybold multiclamp ……30101

Ethanol, desaturated …671972

In addition necessary: Pure water.

Dilatometer

Thermometer

Beaker

5.4 Methodology and experimental procedures

So there is still the volumeV_0 of the dilatometer to be determined.

This is done by determining the masses m_1 of the empty, dry dilatometer and of $m_2$the dilatometer filled with pure water up to the lower end of the riser tube. Since the density ρ of water at a known temperature ϑ is known to a high accuracy, the volume is obtained from:

$$V_0 = \frac{m_2 - m_1}{\rho}$$

Measurement of the liquid level h may be considerably distorted by capillary forces of different strengths.

Keep the capillary clean, and, if necessary, clean it with an appropriate purifying solution, then rinse it with distilled water.

5.5 Measuring the volume expansion of water and ethanol

Note: After the hot plate has been switched off, the heating of the liquid continues for some time so that the dilatometer may run over.

Especially when filling in ethanol, switch the hot plate early enough.

The experimental setup is illustrated in Fig. 1.

– Dip the dilatometer into the heating bath so that the riser tube sticks out.

– Switch the hot plate on at the lowest step, and switch it off when the liquid level in the dilatometer is just below the highest mark of the scale.

– Wait until the liquid level has reached its maximum, and then allow the water bath to cool down.

– Let the water bath continue cooling down, and determine the level *h* of the water in the riser tube as a function of the temperature (see Table (5.2)).

– Then fill in ethanol into the thoroughly dried dilatometer, warm it up in the water bath, and repeat the measurement of the liquid level *h* as a function of the temperature (see Table (5.1)).

5.6 Result

Table (5.1) shows change of volume of ethanol with change in temperature:

Temperature change C^0	**Change in volume cm^3**
10	**63.584**
9	**57.933**
8	**51.92775**
7	**45.9225**
6	**39.564**
5	**32.85225**
4	**26.1405**
3	**19.782**
2	**12.717**
1	**6.3585**
0	**0**

Table (5.2) shows change of volume of water with change in temperature:

Temperature change C^0	Change in volume cm^3
28	64.998
27	63.585
26	60.759
25	58.6395
24	55.8135
23	53.34075
22	50.868
21	48.042
20	45.56925
19	43.0965
18	40.2705
17	38.151
16	35.325
15	32.85225
14	30.3795
13	27.90675
12	25.434
11	22.9605
10	20.4885
9	18.369
8	16.2495
7	14.13
6	12.0105
5	9.891
4	7.7715
3	5.652
2	3.5325
1	1.76625
0	0

Table (5.3) show change of volume of water with change in temperature for both water and ethanol:

Temperature changeC^0	Change in volume ethanol cm^3	Change in volume water cm^3
28		64.998
27		63.585
26		60.759
25		58.6395
24		55.8135
23		53.34075
22		50.868
21		48.042
20		45.56925
19		43.0965
18		40.2705
17		38.151
16		35.325
15		32.85225
14		30.3795
13		27.90675
12		25.434
11		22.9605
10	63.584	20.4885
9	57.933	18.369
8	51.92775	16.2495
7	45.9225	14.13
6	39.564	12.0105
5	32.85225	9.891
4	26.1405	7.7715
3	19.782	5.652
2	12.717	3.5325
1	6.3585	1.76625
0	0	0

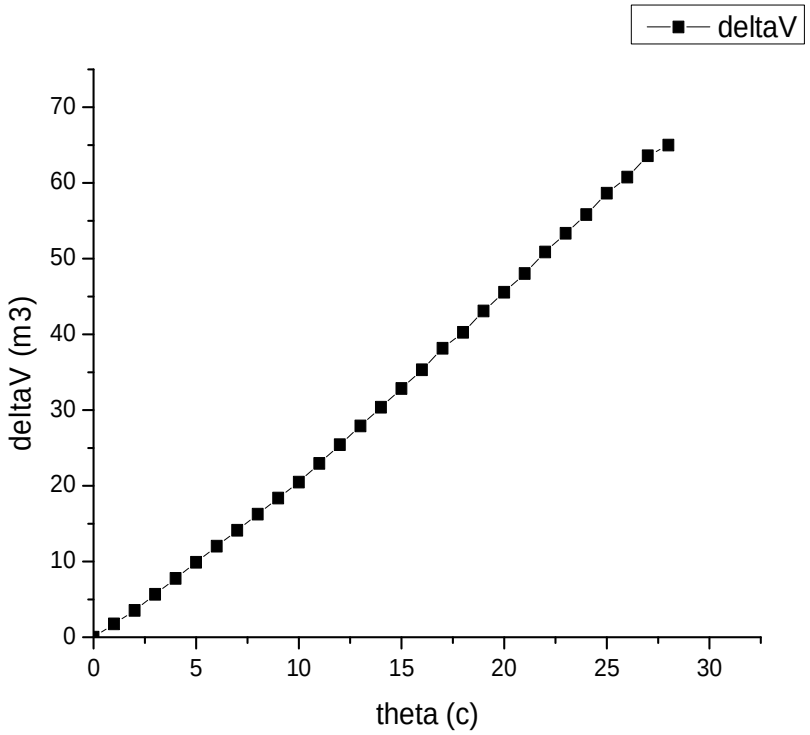

Figure (5.1) shows change of volume of water with change in temperature before fitting

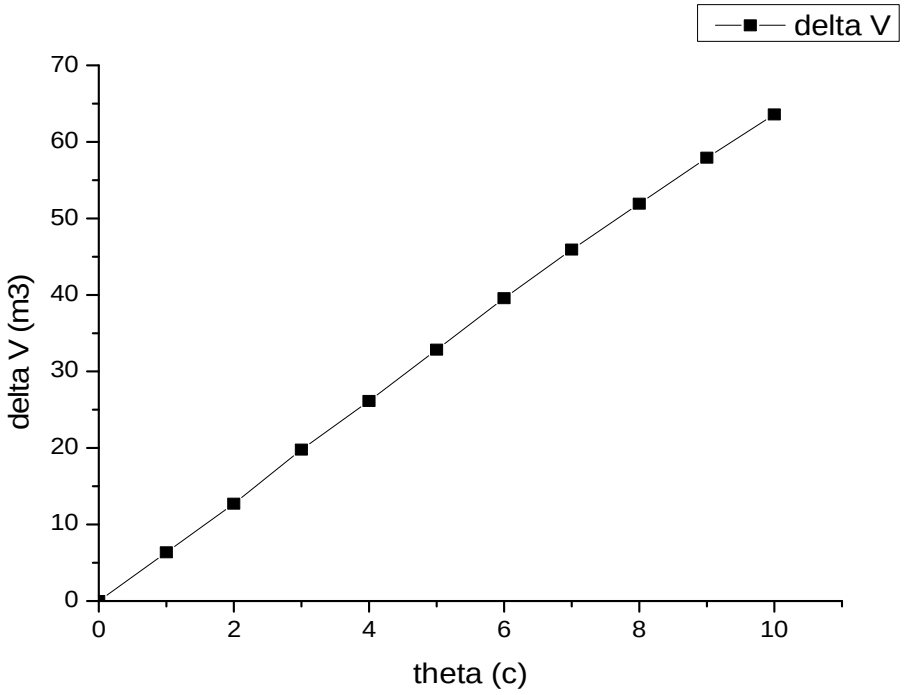

Fig (5.2) shows change of volume of ethanol with change in temperature before fitting

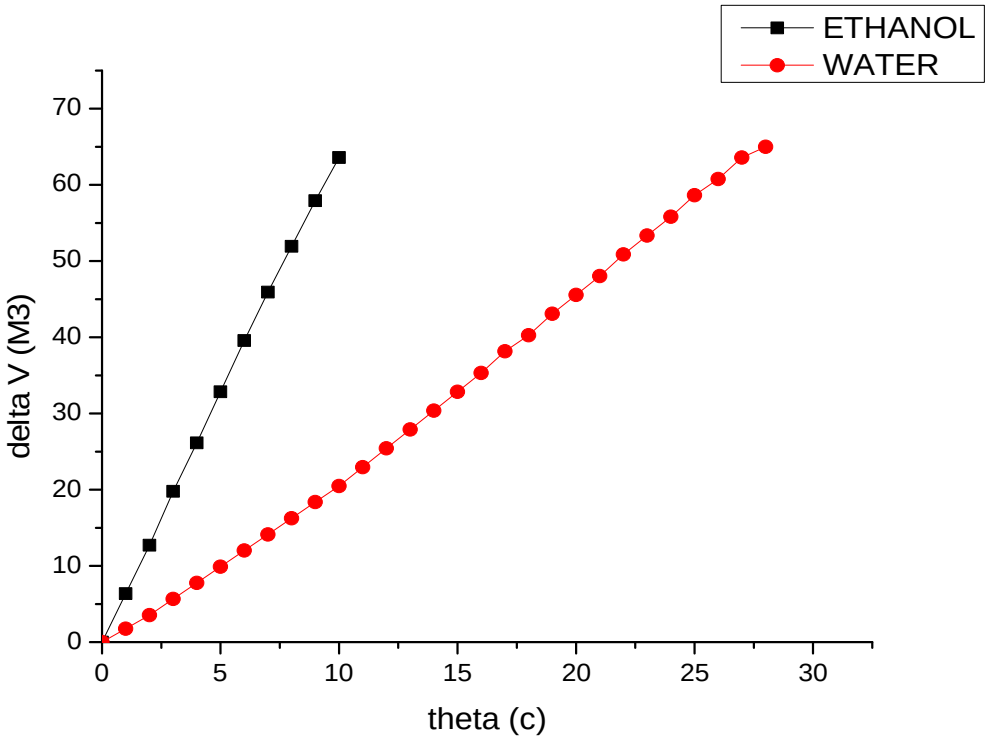

Fig (5.3) show change of volume of water with change in temperature for both water and ethanol before fitting

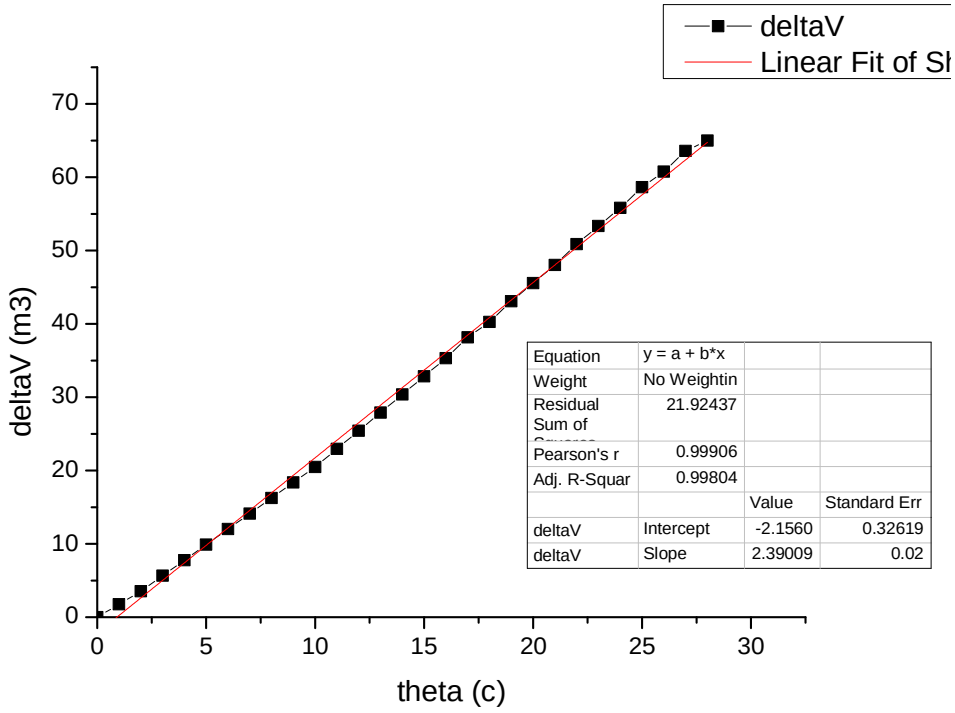

Fig (5.4) Change of temperature versus change in volume for water after fitting the curve

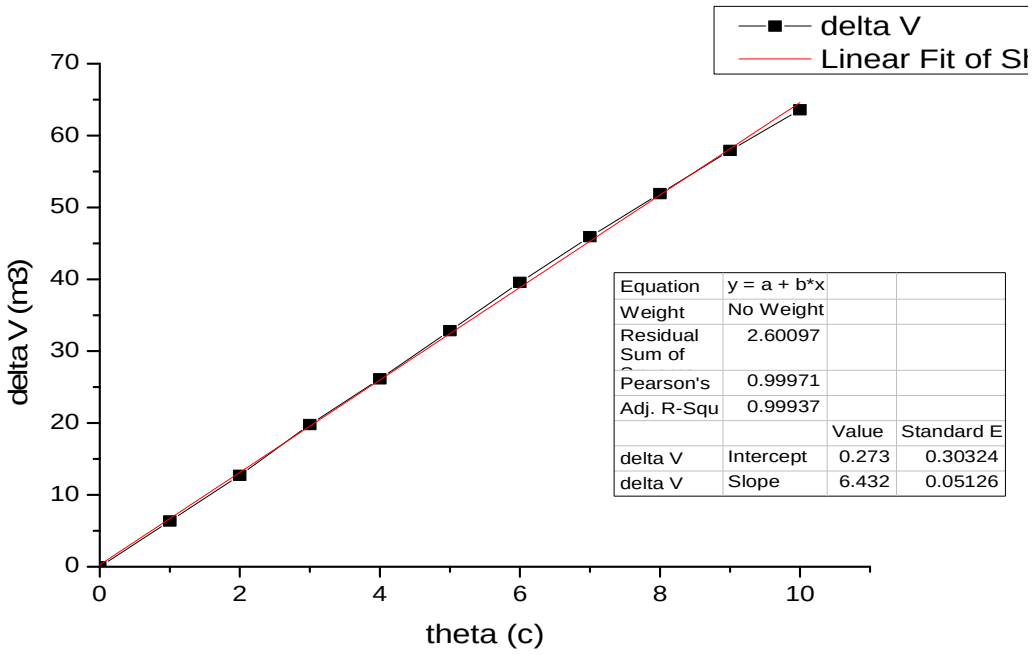

Fig (5.5) Change of temperature versus change in volume for ethanol after fitting the curve

Calibration of the dilatometer:

m_1= 31.29 g m_2 = 88.01 g ρ =0.9978 g cm^{-3} at 22 c^0

$$V_0 = \frac{m_2 - m_1}{\rho}$$

Then:

V_0= 56.85 cm^3

5.7 Discussion

The slope of the straight line drawn through the origin is $\frac{\Delta V}{\Delta \theta}$ = 6.432 cm^3/K for water and $\frac{\Delta V}{\Delta \theta}$= 2.39009 cm^3/K for ethanol

The volumetric extension coefficient is obtained:

γ =5.044 ×10 $^{-4}$ K $^{-1}$ (water), γ =12.1539 ×10^{-4} K $^{-1}$ (ethanol).

In the case of water, there is a systematic deviation of the measuring values from the straight line through the origin. The volumetric expansion coefficient of water is not constant, but increases with temperature in the range between 30 C^0 and 60 C^0 which has been considered here.

The volumetric expansion coefficient of ethanol is considerably larger than that of water. Since it does not change even in wider temperature ranges, it is a suitable thermometer liquid.

5.8 Conclusion

The thermal anomaly of water, that is, the decrease of the volume of water in the temperature range between 0 C^0 and 4 C^0, will be studied in the experiment.

Overall of this assignment, I have understood that our earth is "sick". We humans need to "heal" the earth. Global Warming have causes many problem for human but we human who make global warming happens. Many people have died because of disease or disaster. It also affects the economics of the country. However, we need to be reduce the global warming by using less gasoline, recycle and human should help to reduce global warming instead of making the earth temperature increased. Our generation should start taking care of the earth because in the next generation they will suffer if we do not do reduce global warming. Therefore, global warming is a serious issue now. As a business student we are learning it because we need to understand the effect of climate change that will affect us when we have our business and we can start saving the earth.

5.9 Recommendation

Must get together to tackle the problem of global warming by managing the surroundings around our own houses. We need to find place to plant trees in the jungle of cement that we have created but we can always start with our own house. Terrace gardens are necessary if we have to survive but we also need to device some other methods to cover as much outer surface of buildings as is possible.

Management of jungles has to be our top priority. Recycling of the trees in the jungles by cutting dry trees is extremely important because dry trees cause fire that not only destroy green trees also but also cause release of harmful gases. However,

management of jungles is something that governments have to take care while each one of us can take care of surroundings around us.

We also ought to reduce the consumption of electricity esp. as solar energy and wind energy is still too expensive to be used at mass scale.

Planting of trees, use of more clay and wood in our structures and reduction in the electricity consumption has to be at the top of our agenda.

This is the only way we can deal with the problem of global warming that poses the biggest threat to life on earth. If we do not act now then we will not be there to do anything. Unlike the present solutions being suggested to tackle the problem, these are the ways in which each one of us can make a difference and we must.

This problem is bigger than any other problem that human beings have faced thus far and it requires us to unite and work as one unit. The problem is gigantic and the solution to the problem is quite simple but we need to act now, as any delay will prove to be disastrous. We can and we must unite to save the life on earth.

If there has to be one-line mantra that physics has to give to human kind then it has to be simple three words, ‘Keep it cool’.

It is applicable as much to our mind and body as it is to the objects on and around the surface of the earth.

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ACRONYMS

GHGs-Greenhouse Gases.

IPCC-Intergovernmental Panel on Climate Change.

OECD-Organization for Economic Co-Operation and Development.

LAT- Land Area Temperature.

SST- Sea Surface Temperature.

CETA- Carbon Emissions Trajectory Assessment.

ASF-Atmospheric Stabilization Framework.

ICAGE-Integrated Climate

IMAGE-Integrated Model to Assess the Greenhouse Effect. SGM-the Second Generation Model.

GEMs-Greenhouse Emissions Models.

MEAN- is calculated by area weights corresponding to the global sea area (71%) and land area (29%).