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Effect of Green House Gases and Human Population in Global Warming

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Abstract*—Earth is being heated up rapidly from last few decades due to greenhouse effect. Infrared spectrum of sun rays trapped and emits radiation in same spectrum by greenhouse gases. Human activities have enhanced the concentration of greenhouse gases. A common thinking is that CO2 is mainly responsible for greenhouse effectignoring the influence of other gases. This study shows that even human population is also responsible in increasing the greenhouse gases since the total emission by the world population is2.5 × 109 ton of CO2 per day and same amount of H2O vapors. The combined effect of greenhouse gases due to human activities and greenhouse gases emitted by human population has been presented.

Key Words: Greenhouse effect, greenhouse gases, human population, global warming

I. INTRODUCTION

Energy reaches on the surface of earth in the form of radiation containing two parts, one is heat energy and second is light, the multiple reflections from the different surfaces it also converted into the heat energy. Various chemical compounds present in Earth's atmosphere allow direct sunlight (relative short wave energy) to reach the earth unimpeded. As the shortwave energy heats the surface, longer wave (infrared) energy (heat) is reradiated to the atmosphere. Green House Gases (GHGs) absorb this energy, thereby allowing less heat to escape back to space, and trapping it in the lower atmosphere, this process is known as GREENHOUSE EFFECT [1].

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The mechanism is named after the effect of solar radiation passing through glass and warming a greenhouse[2] & [3]. Same phenomena can be applied by taking GHGs in a closed container, with one end covered with transparent glass sheet that will absorb solar energy and can maintain high temperature for long time. This energy can be utilized as hot junction of thermocouple for electricity production. Generally we assume that GHGs especially CO2 traps the direct sun heat, however, solar rays contain very small component of IR, CO2just stop the reflected IR from the surface of earth back to space. CO2 is not enough for the green house effect that was observed. The mechanism is named after the effect of solar radiation passing through glass and warming a greenhouse [2] & [3]. Same phenomena can be applied by taking GHGs in a closed container, with one end covered with transparent glass sheet that will absorb solar energy and can maintain high temperature for long time. This energy can be utilized as hot junction of thermocouple for electricity production. Study of the simple laboratory experiment, where some bottles filled with CO2 and some filled with the simple atmospheric combination of the gases and then placed in front of a electric bulb (we know that it contain a huge part of the IR as compared to direct sun ray) [4].

II. ROLE OF GREEN HOUSE GASES

In 1970, NASA launched the IRIS satellite that measured infrared spectra between 400 cm-1 to 1600 cm-1. In 1996, the Japanese Space Agency launched the IMG satellite which recorded similar observations. Harries 2001[5] & [6] .compared both sets of data to discern any changes in outgoing radiation over the 26 year period.

What they found was a drop in outgoing radiation at the wavelength bands that GHGs such as CO2 and methane (CH4) absorb energy. The change in outgoing radiation over CO2 bands was consistent with theoretical expectations. It also shows that only CO2 is not responsible for Earth's greenhouse effect, graph shows the greater contribution of methane in absorption pattern.

Naturally occurring GHGs contributes a mean warming effect of about 330 C [7]. The major greenhouse gases are water vapor, which cause about 36-70 percent of the greenhouse effect; and ozone, which cause 3-7 percent [8], [9] & [10]. Effects of clouds are also their but ultimately they are building up of water vapors.However, if we consider the influence over the absorption of the spectrum of solar radiation, methane is an extremely effective absorber of radiation in spite of its atmospheric concentration less then CO2 and its life time in the atmosphere is brief (10-12 years), compared some other GHGs (such as CO2, N2O, CFCs). Methane has both natural and androgenic sources. It is released as a part of the biological process in low oxygen environments, such as swampland or in rice production(as the root of the plants). The total emission estimated of 442-542 million tons of carbon from methane (CH4). The total emission ranged from 12.3-22.8 million tons of N2O-N, with more than half of natural resources [11].

The concentration of Greenhouse molecules H2O vapors, CO2, N2O, CH4, CFC-12 and CFC-11 had sharply increased from 1979-1996. The surface and global temperature had also increased during this period. The variation of both the surface and the global temperature bear high positive correlation with the variation of concentrations of above greenhouse molecules for this period. In spite of the comparatively less concentrations of N2O, CH4 and CFC molecules, they had played an important role in global warming.

Human Influence in increasing concentration of Green House Gases Human influence in increasing concentration of GHGs in two ways, first in natural manners like berating, human exhausting and other is the man made reasons to fulfill human needs like agriculture, industrialization, daily activity and needs.

Natural Ways

The body produces approximately 2.3 pounds (1 kg) of carbon dioxide per day per person [12]. The world population is 7.021 billion estimated by the United States Census Bureau (USCB) [13]. Human activities, through the fossil fuel burning releases 24.136 × 109 tons per year. Human breathing process contributes to about 10% of CO2 and huge amount of GHGs from human exhausting.

Average global birth rates are declining slightly, but vary greatly between developed countries (where birth rates are often at or below replacement levels) and developing countries (where birth rates typically remain high). Different ethnicities also display varying birth rates. Death rates can change unexpectedly due to disease, wars and other mass catastrophes, or advances in medicine.

The UN has issued multiple projections of future world population, based on different assumptions. From 2000 to 2005, the UN consistently revised these projections downward, until the 2006 revision, issued on March 14, 2007, revised the 2050 mid-range estimate upwards by 273 million [14]. The total CO2 emitted by human population in 2050 will be 682.5 x 1015 ton.

Man Made Reasons

The main sources of GHGs due to human activities are presented in Fig 2. Over the last 50 years, human activities such as growing rice, raising cattle, using natural gas and mining coal have added to the atmospheric concentration of methane [11]. Burning of fossil fuels and deforestation has lead to higher CO2 concentrations in the air. Land use change (mainly deforestation in the tropics) account for up to one third of total anthropogenic CO2 emissions.

Livestock enteric fermentation and manure management, paddy rice farming, land use and wetland changes, pipeline losses, and covered vented landfill emissions leading to higher methane atmospheric concentrations. Many of the newer style fully vented septic systems that enhance and target the fermentation process, use of chlorofluorocarbons (CFCs) in refrigeration systems, and use of CFCs and halons in fire suppression systems and manufacturing processes also are sources of atmospheric methane. Agricultural activities, including the use of fertilizers has lead to higher nitrous oxide (N2O) concentrations [1].

GHGsare emitted into atmosphere while using the biogasplants. Biogas is a combination of CH4 (60-70%) + CO2 (20-30%) + H2O (5-10%) + CO2 and H2O (vapors) directly go to the atmosphere and CH4 after burning produce CO2 as by product, ultimately go to atmosphere.

III. Experimental Set up

An experiment was carried out under the sun light to show that global warming is not only due to one gas but the combination of all the gases Fig 1. AnAluminum container of cylindrical shape with its diameter and length are of comparable size, upper end of the container is open and covered with transparent sheet so that sun radiation can enter the container. Thisbecame a Greenhouse. On one side of it tap is fixed for entering the GHGs and a barometer on another side to measure the gas pressure inside the container and on other side a thermometer is fixed to measure the temperature variation.

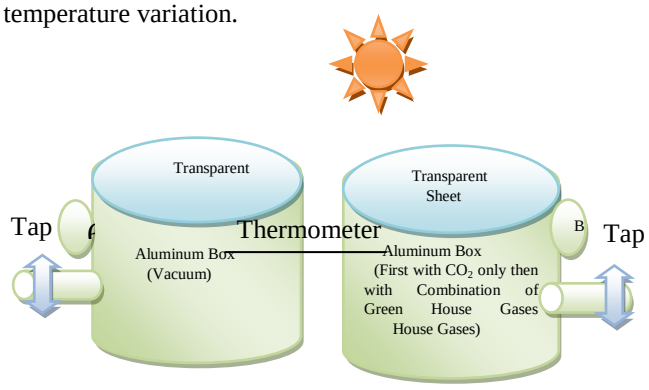

Fig 1. Experimental set up to show combined effect of all the GHGs

Both the containers are covered with wooden blocks and only upper transparent sheet remains open. Temperature is measured in open, Vacuum, and container filled with CO2.

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The results are shown in Fig 2.

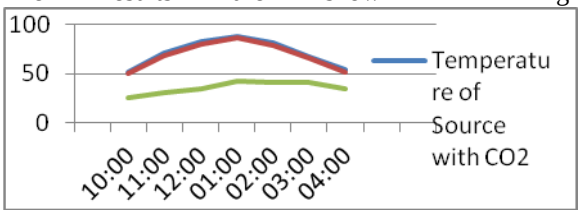

Fig 2. Temperature variation in open, empty source and CO2 filled container

Temperature is measured in open, Vacuum, and container filled with GHGs (CO2, CH4, N2O and Water Vapors). The results are presented in Fig 3.

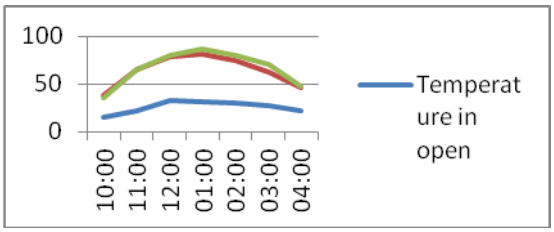

Fig 3. Temperature variation in open, empty source and GHGs filled container

Thermometers run showed the expected enhanced ΔT of the CO_2 filled bottle. First run with thermocouples, though, showed no average difference, but was fraught with co - founding influences. Temperatures were displayed at the whole number resolution because of the digital readout. Run 3 thermocouples read with a digital display having 0.1◦C resolution and showed the largest effect in bottle with no CO_2. Thermopiles were read with a bench DMM having 10μV resolutions

When this experiment is set-up according to the prescription on the NOAA webpage, it is quite possible to get a difference of temperature of 10C between or among thermometers even if none of them contain any CO2. Properly randomized experiments will likely results in no discernible difference among thermometer readings irrespective of CO2 in bottle or not. The issue is one of not enough magnitude of effect to resolve on typical lab thermometers. An instrument as sensitive as a Moll-type thermopile can detect a small difference in radiation passing through bottles filled with CO2 as compared to an identical bottle not filled. The amount of IR power re - directed by a two-litre CO2-filled bottle appears to be about 100μW/m2.

Fig 2 and Fig 3 show that for single gas CO2the results are approximately same as for vacuum,this is because the negligible spectrum covered by the single gas is not sufficient to add up the heat trapped by transparent glass sheet. However with combination of GHGs a large portion of spectrum covered hence a sufficient feedback to the heat trapped by transparent glass sheet. This becomes more effective and maximumtemperature variation observed is up to 70 C for combined GHGs.

IV. Conclusions

Rise in global mean temperature is not only due to industrialization but also due to increase in population which puts a significant influence on it by its natural process that is approximately 10%. The process of global warming is not only due to the increase in CO2but increase in combination of all GHGs generated at high extant in last few decades. Secondly a vehicle (like Car) without any passengers will be heated less than the passengers sited inside it, as there will be feedback to the greenhouse by the glass windows by CO2+H2O generated with every second by breathing of passengers in closed vehicle.

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