NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATION IN ENGINEERING, RESEARCH AND TECHNOLOGY [IJIERT]
NATIONAL CONFERENCE ON INNOVATIVE TRENDS IN ENGINEERING & TECHNOLOGY-2016
11TH & 12TH MARCH 2016
CONFERENCE PROCEEDINGS ISSN NO - 2394-3696

Paper ID: NITETGEN01

CHEMISTRY OF CLIMATE CHANGE AND PER CAPITA EMISSION OF GREEN HOUSE GASES: A REVIEW

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ABSTRACT

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Global warming is most familiar word of this century. For almost all of 4.5 billion years, natural forces have shaped Earth's environment. But, during the past century, as a result of the Industrial Revolution, which has had enormous benefits for humans, the effects of human activities have become the main driver for climate change. Earth's atmosphere is changing. The current composition of Earth's atmosphere is mostly nitrogen and oxygen. It also contains water droplets, fine particles, argon, and very small amounts of carbon dioxide (CO_2), nitrogen oxides (NOX),methane, and other gases. Most of these substances have been present in the atmosphere for millions of years and come from natural sources like volcanoes, forest fires, plants, animals, and decaying organic matter. But in today's atmosphere, the amount of some of these substances is much higher than it was hundreds of years ago due to pollution from our industrial revolution.
In this paper we reviewed different pollution causing per capita emissions from day to day activities and suggested measures to control per capita emissions.

KEYWORDS: Climate change, per capita emission, carbon dioxide, green house gases

INTRODUCTION

The Earth's environment has changed naturally and dramatically many times during its 4.5 billion year history. Humans have been changing the environment for the last few thousand years. We domesticated animals for food, transportation, and labor. We invented agriculture that changed the surface of the planet and reduced the percentage of the population required to produce food. This, in turn, allowed the rise of towns and cities and the development of crafts and manufacturing and civilization, as we know it. During most of this period of human history, environmental changes were largely local. In some areas, for example, deforestation occurred to create more agricultural land and to provide firewood for heating and cooking and in others animals were driven to extinction by overhunting for food. But human impacts had not reached a global level. This changed about 250 years ago with James Watt's invention of the steam engine that initiated the Industrial Revolution. Suddenly, enormous amounts of power that did not depend upon human, animal, or water power, were available essentially anywhere, including for transportation (the steam locomotive). All that was required for these engines was an energy source and burning readily, available coal satisfied this need. About a century later, the discovery of fossil oil (and natural gas) and then the invention of the internal combustion engine added an even more convenient source of power, especially for transportation (the automobile and airplane). The availability of this power and new raw materials, especially oil, transformed the world. From pharmaceuticals and synthetic polymeric goods to pesticides that make much modern agriculture possible, human ingenuity has capitalized on these resources.
Along with fossil fuels electricity is also a main source of energy for different domestic as well as industrial purposes. Transportation and electricity generation causes for almost three quarters of the carbon dioxide emission.

CHEMISTRY OF CLIMATE CHANGE

According to World Meteorological Organization (WMO) - The global average surface temperature in 2015 broke all previous records by a strikingly wide margin, at 0.76±0.1° Celsius above the 1961-1990 average. For the first time on record, temperatures in 2015 were about 1°C above the pre-industrial era. One key component to our atmosphere that makes this planet livable is the greenhouse effect. This is a naturally-occurring phenomenon in which greenhouse gases—water vapor, carbon dioxide, methane, nitrogen oxides, and ozone—trap heat in Earth's

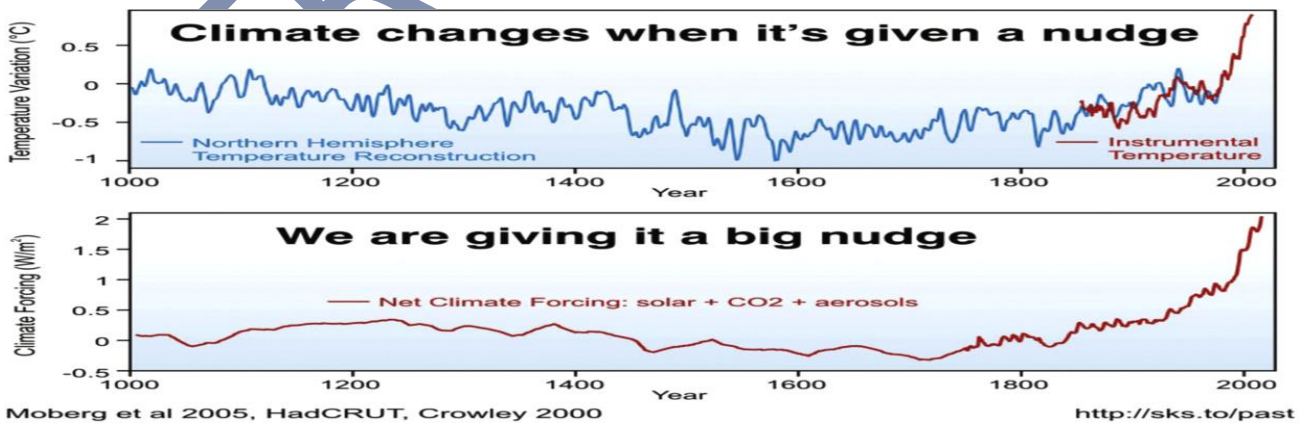
atmosphere. The sun radiates heat toward Earth constantly. Earth absorbs some of that heat, but a large portion "bounces" off Earth's surface back towards space. The green house gases present in the atmosphere trap some of this heat before it is radiated back into space. The greenhouse effect is responsible for maintaining Earth's temperature and is necessary for human survival.

The increasing concentration of carbon dioxide and other gases like chlorofluorocarbons (CFCs) per fluorocarbons, hydro-chloro-fluoro- carbons, hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF_6). These gases are analogous to the glass in a greenhouse, which also leads to the net trapping of infrared radiation, hence the terms "greenhouse gases" (GHGs) and greenhouse effect ." These GHGs act as a partial blanket for the thermal radiation from the surface and make the atmosphere warmer than it would otherwise be. The concentration of CO_2 has increased from about 280 parts per million by volume (ppmv) in the preindustrial era to about 370 ppm in 2000, and is increasing at the rate of about 1.5 ppm/yr (0.4 percent/yr). The atmospheric concentration of CH_4 has increased from 700 parts per billion by volume (ppbv) to 1,720 ppbv, and is increasing at the rate of 10 ppbv/yr (0.6 percent/yr). Similarly, the concentration of N_2O has increased from 275 ppbv to 312 ppbv and is increasing at the rate of about 0.8 ppbv/yr (0.25 percent/yr).The observed environmental changes include increasing sea level as the oceans warm and expand and more water is added from melting land ice, increasing loss of Arctic sea ice affecting the atmospheric jet stream and northern hemisphere weather

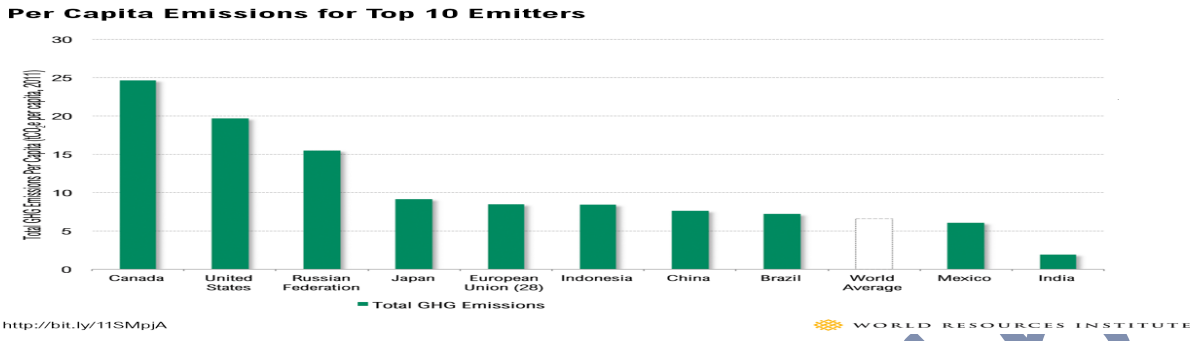
patterns, and increasing average temperature of the Earth's surface – usually characterized as ''global warming.'' This surface warming is shown on the upper plot in Fig.1while the lower plot shows the Earth's imbalance in retention of solar energy in terms of climate forcing, the amount of the energy imbalance at the top of the atmosphere. (See the American Chemical Society Climate Science Toolkit for discussions of planetary energy balance, mechanism of the greenhouse effect, energy imbalance, and radiative forcing.) (American Chemical Society Climate Science Toolkit) Note that the forcing and temperature had a modest downward trend for the first 800 years of the past millennium, but both started an upward trajectory that became ever steeper during the 200 years following the Industrial Revolution as atmospheric carbon dioxide from fossil fuel burning increased, Fig. 1. As fossil fuels continue to be burned, both these curves are very likely to continue their upward climb producing an ever-warmer

Earth and its consequences for the environment. For example, rising seas could inundate low-lying islands and coastal areas such as the Maldives and the Mississippi, Nile, Tigris-Euphrates, and Ganges–Brahmaputra deltas that are home to millions of people. Furthermore, predictions from climate modeling and, increasingly, from observations, include further increases in extreme weather events such as more intense cyclonic storms, wet regions getting wetter, and, ironically, dry regions getting drier and expanding. In dry areas, the problem is exacerbated because aquifers in, for example, the central plains of the United States and the Middle East, are already

greatly depleted. So this is the problem of every individual on earth. Only Humans are responsible for this problem. Science and technology are the engines that drive our economy. Advances in both have given us a higher standard of living.



Use of fossil fuels, electricity is unavoidable in modern lifestyle. Along with Industrialization modernization is also responsible for climate change. We can reduce the use of electricity and fossil fuels as solution to reduce GHGs emission. India is a developing country its per capita GHGs emission is mentioned in following mentioned graph.



India is included in top ten major emitters in world. India is the world's second-largest country by population. It has a rapidly growing economy, of which the transportation sector is a key component. The number of vehicles on India's roads increased by 240 percent over the past ten years and is expected to expand at a similar rate throughout the next two decades. Because of the magnitude of this growth, India's decisions in managing its transportation sector will have important impacts on the environment, public health, global warming, and the international economy.Accordingto Gaurav Bansal and Anup Bandivadekar India has since progressively lowered its permissible vehicular pollution emission limits for new four-wheeled vehicles following the path laid out by the European Union. The Auto Fuel Policy of 2003 laid down a road map for vehicular emission and fuel quality standards for the remainder of the new century's first decade. This road map has been largely implemented.

Along with combustion of fossil fuels CFCs from Refrigeration Industries is also cause of Global warming. In 1974 when for the first time it was identified that these chemicals are one of the most- important causes of stratospheric ozone depletion and greenhouse warming of the earth, but in modern life style Air conditioners for Four wheelers and homes are been essential.

As living standards rise for tens of millions of Indian people, the enormous expansion in room and vehicle air conditioning could strain the country's electric grid, require increased fuel import, and magnify the impacts of global warming as a consequence of emissions of carbon dioxide (CO2) and hydro fluorocarbons (HFCs)—manufactured chemicals currently used in large quantities in air conditioners and various other products. HFCs do not harm stratospheric ozone, but many HFCs are very potent contributors to global warming. The Indian Refrigeration and Air-conditioning Manufacturers' Association (RAMA) reports a 20 percent annual growth rate for the past decade with 30 percent growth likely for the next five years. Based on RAMA and Lawrence Berkeley National Laboratory (LBNL) forecasts, approximately 116 million air conditioning units will be in service by 2030—an increase of 20 times the current number.7 The power consumed by air conditioning will also increase to 50 TWh/year by 2030 more than 10 times the current number. Air conditioning has three impacts on the climate system: the direct emissions of refrigerant greenhouse gases; the indirect emissions from the combustion of fuel to power the equipment; and the embodied emissions of the production, transportation, service, and disposal over the product life-cycle. Life-cycle climate impact (LCCP) calculates all the total direct, indirect, and embodied greenhouse gas emissions as a carbon-equivalent metric.

To reduce greenhouse gas emissions The room and vehicle air conditioning sectors in India are well-informed about alternatives to high-GWP refrigerants and understand that developed and developing country markets are beginning to move to low-GWP alternatives with superior life-cycle climate performance The NOU (National Ozone Unit), with the support of RAMA, has built strong awareness of low- GWP room air-conditioner technology.

Climate change is a major global challenge. But it is not of our making. It is the result of global warming that came from prosperity and progress of an industrial age powered by fossil fuel," Our Prime Minister Shri Modi said while inaugurating the India pavilion at the summit at World Climate Change Conference 2015 (COP21) at Le Bourget, near Paris. (Reuters).

It is everybody's responsibility to reduce carbon emission. As citizens, share in the responsibility to take and support actions to mitigate the causes of climate change and adapt to the changes that have already occurred and will increase in a warming world Polls suggest that much of the world's population is aware of recent climate change, think it is an important issue, undunderstand that it is mainly human caused, but there is too little sense of urgency or motivation to directly confront the causes. Climate scientists have spoken out forcefully in print and electronic media in an effort to alert us to the inevitability of continuing and worsening climate changes from emissions we

have already made and how continuing inaction exacerbates the effects. But there are relatively few climate scientists and people also hear messages from those who still deny the overwhelming judgment of science. As citizens, we must add our voices to support the science. Our interactions in colleagues, students, neighbors, schools, political organizations, and others represent opportunities to engage in respectful and deliberative conversations on the reality of climate change, its present and future effects, and policies and actions individuals, communities, and nations Take a public stand on the issues related to the undesired consequences of climate change and the need for adaptation to these changes and mitigation of their sources. Take advantage of opportunities to make formal presentations on the science of climate change when invited to do so. Encourage and support your local, regional, and national decision makers to adopt policies that are aimed at adaptation to and mitigation of human-caused climate change.

India is already famous for "leapfrogging" to more efficient and economic technologies. It is one of the first countries in the world with companies introducing HC-290 and HFC-32 room air conditioners. Furthermore, India is among the first developing countries to develop HFO-1234yf air conditioners for cars planned to be sold in Europe, where refrigerants with global warming potential (GWP) of less than 150 will be phased out between 2011 and 2017 for car air conditioners.

In case of Vehicle emissions India followed an independent path and regulated emissions in a different manner. In addition to the tighter emission standards, the number of buses and three-wheelers running on CNG increased steadily over the course of the decade, to more than 180,000 in 2010, and these CNG vehicles have contributed to particulate matter (PM) emission reductions in cities where they have been deployed.

According to one of the environmental scientist this earth is not a gift to us but it is borrowed by our future generation. So we have to keep clean environment for our next generation.

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