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Research Article

CLIMATE CHANGE AND GLOBAL WARMING

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ABSTRACT

The researcher used the method of reviewing the previous literature, where many of the literature that was discussed in greenhouse gases and global warming was reviewed by the researcher, both globally and locally, and the researcher concluded that the main causes of air pollution with greenhouse gases are the increased activity of factories in major industrial countries leading to an increase air pollution with carbon dioxide gas and nitrogen dioxide gas and the increasing number of cars and their increasing movement is a major reason for the increase in carbon dioxide and nitrogen dioxide responsible for increasing air pollution. To save pollution globally and locally, the researcher recommends a set of recommendations, the most important of which are: the use of remedial devices for pollutants of all kinds and forms and the use of environmentally friendly car exhausts.

INTRODUCTION

Concerns about climate change are global and real, as all communities try to get adapted to the challenges of their local climate, they are today sensitive to its variations. Climate change is defined as fluctuations in the patterns of climate over long. Climate change is result from things, the one of things is greenhouse gases, the gases is carbon dioxide, methane, nitrous oxide, fluorinated gases water vapour and other gases found in little amount. In my face is play in root (climate) then course die for tree (earth), when took speak about greenhouse must be speak about the result of it, is the global warming. Rise of temperature and sea level, melting of ice, disappearance of species, incensement of droughts, floods and wildfires, major economic and environmental problems that can result from global warming, it also affects the ozone layer. Techniques have been worked out to measure the amount of carbon dioxide in the atmosphere naturally, including what is controlled by the conditions and subjecting the plant to hypothetical conditions that can become real if the situation continues to increase the concentrations of greenhouse gases. Now, the researchers go to solve the huge problem or at least avoid aggravating the problem and work to reduce and avoid side effects.

Climate change is expected to increase temperatures and change precipitation patterns. So in this article, the discussion is about one of the most important greenhouse gases that have played a role in climate change and working to generate what is called global warming. In the first place, this article wants to navigate the conversation about the problems that have resulted in global warming, as it is considered one of the most important risks, but the most important facing the world. It has already been mentioned that one of the causes of climate change is a greenhouse gas, there are four main types of gases in addition to water vapor and some little amount of gases, each of which plays a role in climate change in various aspects, it's turn like a blanket, gripping infra-red radiation and preventing it from escaping into outer space.

MATERIALS AND METHODS

Greenhouse gases are gases in earth's atmosphere that trap heat. They let sunlight pass through the atmosphere, but they prevent the heat that the sunlight brings from leaving the atmosphere. The main greenhouse gases are:

Carbon dioxide (CO_2), make up of carbon and oxygen, CO_2 is all around us naturally. It comes from decaying and living organisms, and from volcanoes. CO_2 is released when burning fossil fuels like coal and oil. It's the most important contributor to human-caused global warming.

Methane (CH_4), made of carbon and hydrogen, is a normal gas released from wetlands, growing rice, raising cattle, using natural gas, and mining coal. It traps a lot of heat. Scientists consider it the second contributor to human-caused global warming of all the greenhouse gases.

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Water vapor (H_2O), this is water in gas form, steam above a boiling pot or water evaporating off a lake. It forms clouds and rains back on earth. This can cause a cooling effect. Water vapor blocks heat from escaping, so it gets warmer. That makes even more water evaporate.

Ozone (O_3), up in the atmosphere where the planes fly, the ozone layer blocks the sun's radiation, which helps protect us from the powerful rays. Close to the ground, ozone acts as a greenhouse gas and can be formed by burning gas in cars and factories.

Nitrous oxide (N_2O), is a natural part of the nitrogen cycle. Bacteria in soil and the ocean make it. Nitrous oxide is released by some types of factories, power plants, and plant fertilizer. It damages the protective ozone layer and is a powerful greenhouse gas. Chlorofluorocarbons (CFCs), fluorinated gases are not created in nature. They damage the protective ozone layer and are powerful greenhouse gases.

The clear effect of the greenhouse gases is the stable heating of earth's atmosphere and surface, thus, global warming (Tian, et al., 2016). The ability of certain gases, greenhouse gases, to be transparent to inbound visible light from the sun, yet opaque to the energy radiated from the earth is one of the best still events in the atmospheric sciences. The existence of greenhouse effect is what makes the earth a comfortable place for life. The study also reveals the importance of greenhouse gases to the warming of the planet earth (Porter, et al., 2015). Greenhouse Gases and The Additionally, parts of the earth's atmosphere act as shielding blanket of just the right thickness, receiving appropriate solar energy to keep the global average temperature in an amusing range. The martian blanket is too thin, and the venusian blanket is way too thick. The 'blanket' as stated here, is termed as a collection of atmospheric gases called greenhouse gases based on the knowledge that the gases also capture heat similar to the glass walls of a greenhouse air. The conversation of inbound and outward-bound radiation that warms the earth is often referred to as the greenhouse effect because a greenhouse works in much the same way (Porter, et al., 2015; Anderson, et al., 2016). Inbound Ultra Violet (UV) radiation easily passes through the glass walls of a greenhouse and is absorbed by the plants and hard surfaces inside. Weaker Infrared (IR) radiation, however, has difficulty passing through the glass walls and is trapped inside, that is, warming the greenhouse. This outcome lets tropical plants flourish inside a greenhouse, even during a cold winter.

The greenhouse influence upsurges the temperature of the earth by trapping heat in our atmosphere. This retains the temperature of the earth higher than it would be if direct heating by the sun was the only source of warming (Anderson, et al., 2016; Hotor, et al., 2019). Most Greenhouse gases that are in the atmosphere fascinate and then transmit some of this heat back towards the Earth (Porter, et al., 2015). In fact, without the greenhouse effect the earth's average global temperature would be much colder and life on earth as we recognize it would not be possible. The difference between the earth's actual average temperature 14°C (57.2°F) and the expected effective temperature just with the sun's radiation -19°C (-2.2°F) gives us the strength of the greenhouse effect, which is 33°C way (Porter, et al., 2015). Fig. 1 shows the ratio of greenhouse gases: Carbon dioxide, water vapor (H_2O), methane (CH_4), nitrous oxide (N_2O), and some limited other gases are greenhouse gases (Biraud, et al., 2016). They all are molecules made up of more than two constituents atoms, bound loosely enough together to be able to vibrate with the absorption of heat (Hotor, et al., 2019).

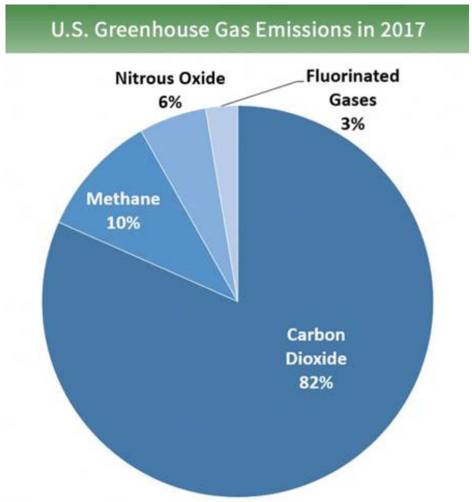

Fig. 1 Total Emissions in 2017=6,457 Million Metric Tons of CO_2 equivalent.

RESULTS AND DISCUSSION

Climate Change

Climate change is a gradual difference in climate, the degree of climate variation depends on the concentrations of greenhouse gases, the varieties deal with climate change in different ways. Climate change is a change in the statistical properties of the climate system that persists for several decades or longer—usually at least 30 years. Global climate varies naturally over time scales from decades to thousands of years and longer. Changes in chemistry of atmospheric (such as the quantity of greenhouse gases). The natural variations can originate in two ways: from internal fluctuations that exchange energy, water and carbon between the atmosphere, oceans, land and ice, and from external influences on the climate system, including variations in the energy received from the sun (the sun which affect the amount of incoming solar radiation) and the effects of volcanic eruptions (Hotor, et al., 2019). Anthropogenic (Human) activities can also influence climate by changing concentrations of CO_2 and other greenhouse gases in the atmosphere, altering the concentrations of aerosols and altering the reflectivity of Earth's surface by changing land cover. The big arrow in Fig. 2 refers to different periods of time–days, months, years, decades and centuries. We can see here that weather refers to hours, days and maybe months; climate refers to months, years and decades, and climate change refers to decades and centuries. Examples of weather are rain storms that might last one or two hours and tropical cyclones that may last days. Climate variability can be defined by climate patterns such as the El-Niño Southern Oscillation and climate change refers to things which happen over centuries, like global warming.

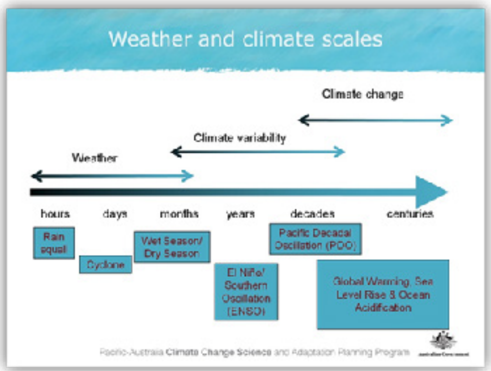

Fig. 2 A guide to the timescales applicable to weather, climate variability and climate change

Global Warming

Global warming is just one aspect of climate change. Climate scientists return the cause of global warming to humans. Global warming occurs when carbon dioxide (CO_2) and other air pollutants and greenhouse gases collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. In fact, they say that global warming refers to the rise in global temperatures due mainly to the increasing concentrations of greenhouse gases (CO_2, CFCS, CH_4, N_2O, H_2O(g)) in the atmosphere. On the other hand, climate change refers to the increasing changes in the measures of climate over a long period of time including precipitation, temperature, and wind patterns (Moore, et al., 1994).

Water Shortage and Drought on Earth

Drought is defined as deficiency of precipitation over an extended time period which results in water shortage for various activities, groups, or environmental sectors. Droughts generally result from a combination of natural factors that can be enhanced by anthropogenic influences. Drought due to natural factors (precipitation, high evaporation rates, inadequacy of inland water resources supplies), inadequate precipitation is usually the major cause of drought. Precipitation anomalies are a naturally recurring feature of the global climate. Anthropogenic factors (Population growth, climatic change and variability, land use, water quality, water demand, legislation and water resource management, international waters, political realities) enhancing drought impacts. The causes of water scarcity are manifold, and human activities contribute to the development of drought conditions.

Water scarcity refers to the relative shortage of water in a water supply system that may lead to restrictions on consumption. Scarcity is the extent to which demand exceeds the available resources and can be caused either by drought or by human actions such as population growth, water misuse and inequitable access to water (Kharraza, et al., 2012).

Water scarcity occurs when limited and/or diminishing water resources cannot satisfy long-term average requirements. It refers to long-term water imbalances combining low water availability with a level of water demand exceeding the sustainable supply capacity of the natural system (Michel, et al., 2015). The distinction between water scarcity and drought events is not an easy task due to the difficulties in differentiating the natural impact of drought from the anthropogenic pressure and the improper management of water (Kharraza, et al., 2012).

The most severe water scarcity in the world is in the middle east, and critical water shortages in the eastern Mediterranean region as a whole affect the region's social and economic potential, increase land vulnerability to salinization and desertification and raise the risk of political conflict around this limited resource (Jägerskog, et al., 2003; Hakan, et al., 2006). The world water development report (2003) classifies jordan as facing an extreme situation of water scarcity. Jordan is overexploiting its water resources by between 10 and 20 percent at the expense of natural ecological systems (Hakan, et al., 2006). In jordan, one of the most water-poor nations, predictions of future droughts depend on the scale of climate change, without reducing greenhouse gases, the future looks dry.

If global temperatures continue to rise, rainfall will increasingly become a beast of extremes: long dry spells here, dangerous floods there and in some places, intense water shortages. As early as 2025, the World Health Organization(WHO) estimates that half of the world's population will be living in water-stressed areas.

Carbon Dioxide

Carbon dioxide is the combination of two atoms of oxygen joined with a single atom of carbon. Its chemical formula CO_2 (O=C=O). At room temperatures (20-25 Co), carbon dioxide is an odourless, colourless gas, which is faintly acidic and non-flammable. Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials, and also as a result of certain chemical reactions (e.g., manufacture of cement). Carbon dioxide is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle. Carbon dioxide is one of the most abundant gasses in the atmosphere. Carbon dioxide plays an important part in vital plant and animal process, such as photosynthesis and respiration. Primary production

(~101.5), plant respiration (~50), decomposition (~50), and additional removal from the atmosphere directly or indirectly, through vegetation and soil and eventual flow to the ocean through the terrestrial processes of weathering, erosion, and runoff (~0.8). Net ocean uptake (~1.6) considers air/sea exchange (~92.4 gross uptake, -90.8 gross releases) (Norby, et al., 2011). As the rate of fossil fuel burning increases and CO_2 released to the atmosphere it is expected that the fraction of this C remaining in the atmosphere will increase resulting in a doubling or tripling of the atmospheric amount in the coming century (Ruddiman, et al., 2003).

Carbon Dioxide Emissions by Humans

Global warming, due to increased concentration of carbon dioxide and other greenhouse gases in the atmosphere by natural means and anthropogenic activities, such as, such as land-use change, agriculture and waste (Tubiello, et al., 1999). The amount of CO_2 released into the atmosphere has been rising extensively during the last 150 years (Blakemore, et al., 2018). As a result, it has exceeded the amount sequestered in biomass, the oceans, and other sinks (Soil is the Earth's greatest carbon store and active carbon sink) (Schimel, et al., 1995). There has been a climb in carbon dioxide concentrations in the atmosphere of about 280 ppm in 1850 to 364 ppm in 1998, mainly due to human activities during and after the industrial revolution, which began in 1850. Humans have been increasing the amount of carbon dioxide in air by burning of fossil fuels, by producing cement and by carrying out land clearing and forest combustion. About 22% of the current atmospheric CO_2 concentrations exist due to these human activities considered that there is no change in natural amounts of carbon dioxide. Fig. 3 shows that he amount of carbon dioxide in the atmosphere (raspberry line) has increased along with human emissions (blue line) since the start of the Industrial Revolution in 1750. Emissions rose slowly to about 5 billion tons a year in the mid-20th century before skyrocketing to more than 35 billion tons per year by the end of the century. NOAA Climate.gov graph, adapted from original by Dr. Howard Diamond (NOAA ARL). Atmospheric CO_2 data from NOAA and ETHZ. CO_2 emissions data from our world in data and the Global Carbon Project.

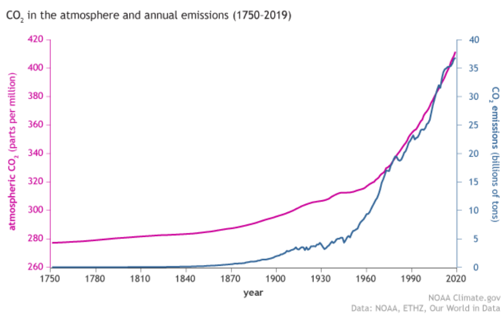

Fig. 3 The amount of carbon dioxide in the atmosphere (raspberry line) has increased along with human emissions (blue line) since the start of the Industrial Revolution in 1750.

Environmental Problems- The Carbon Dioxide Effect

Together with hydrogen, carbon dioxide is the main greenhouse gas. However, hydrogen is not emitted during industrial processes. Humans do not contribute to the hydrogen amount in the air, this is only changing naturally during the hydrological cycle, and as a result it is not a cause of global warming. Increasing carbon dioxide emissions cause about 50-60% of the global warming. Carbon dioxide emissions have risen from 280 ppm in 1850 to 364 ppm in the 1990s. Various human activities that contribute to the emission of carbon dioxide gas have been mentioned of these activities fossil fuel combustion for energy generation causes about 70-75% of the carbon dioxide emissions, being the main source of carbon dioxide emissions. The remaining 20-25% of the emissions is caused by land clearing and burning and by emission from motor vehicle exhausts. Most carbon dioxide emissions derive from industrial processes in developed countries, such as in the United States and in Europe. However, carbon dioxide emissions from developing countries are rising. In this century, carbon dioxide emissions are expected to double and they are expected to continue to rise and cause problems after that. The first person who predicted that emissions of carbon dioxide from the burning of fossil fuels and other burning processes would cause global warming was Svante Arrhenius, who published the paper "On the influence of carbonic acid in the air upon the temperature of the ground" in 1896 (Ruddiman, et al., 2003). In the beginning of the 1930 it was confirmed that atmospheric carbon dioxide was actually increasing. In the late 1950s when highly accurate measurement techniques were developed, even more confirmation was found. By the 1990s, the global warming theory was widely accepted, although not by everyone. Whether global warming is truly caused by increasing carbon dioxide in the atmosphere, is still debated]. Atmospheric CO_2 intensities have increased by more than 40% since the beginning of the Industrial Revolution, from about 280 parts per million (ppm) in the 1800s to 400 ppm today. The last time Earth's atmospheric levels of CO_2 reached 400 ppm was during the Pliocene Epoch, between 5 million and 3 million years ago.

Uncertainty in Projecting Future Global Climate Change

The world is now facing a problem of a gradual increase in carbon dioxide and the effect of this increase on the growth and development of plants. It is possible to obtain the results of carbon dioxide concentrations by subjecting the plant variety to be studied to different types of experiments such as Controlled Environment Closed Chamber and Free-air Carbon Dioxide Enrichment (FACE) experiments. Growth chambers and other enclosures used in plant physiology and growth studies tend to introduce chamber effects that alter the microclimate around the plants compared with the natural environment (Lewin, 1994). When using Growth

Chamber to try it, it does create atmospheric condition responsible for effective plant growth and germination in growth chamber that one can create the desired environment essential for examining the growth among these conditions are temperature, humidity, and light (Post, et al., 1990).

Free-air carbon dioxide enrichment (FACE) provides an experimental technique for studying the effects of elevated p CO_2 on vegetation and other ecosystem components in large unenclosed plots (>20 m diameter). FACE avoids many modifications to the microclimate imposed by chamber methods and therefore provides some of the most reliable estimates of plant response to elevated p CO_2. Control of p CO_2 in large-scale FACE experiments has now been developed to an extent where performance is similar to that achieved with sophisticated closed-chamber facilities. Experience has shown that, when FACE facilities are fully utilized, the cost per unit of usable ground area enriched with CO_2 is significantly lower than alternative methods. The large scale of FACE plots can support a range of integrated studies on the same material, thereby achieving a more complete analysis than has been possible with other methods of elevating p CO_2. FACE results provide a strong foundation for next-generation experiments in unexplored ecosystems and inform coupled climate-biogeochemical models of the ecological mechanisms controlling ecosystem response to the rising atmospheric CO_2 concentration.

Jordan and Climate Change Scenarios

Uncertainty in the climate change scenario projections: Internationally, uncertainty in climate change and scenario projections is acknowledged. Some of the common features in this regard are:

• Temperature projections are relatively reliable; uncertainty is small relative to the trend;

• Precipitation projections are much less reliable at all time and geographical scales. Typically, it is not possible to determine whether mean precipitation is increasing or decreasing, and both outcomes are possible

• For time horizon of 30 years or less, internal climate is the main source of uncertainty about precipitation; and

• Relative uncertainty is higher for smaller geographic areas, and for seasonal versus annual means. By extension, uncertainty becomes very high for projections about extreme events in particular places

Climate change studies conducted as part of the 1st and 2nd National Communication Reports to the UNFCCC, in addition to sector specific studies under the Joint Implementation Program (water, health and food security, and many other climate change research studies face serious problems associated with the availability, accuracy and reliability of data in the country. In the case of Jordan, some of the data time series are too short to identify a definite long-term climatic trend, missing data in the daily and monthly climatological time series at some stations, limited data availability, lack of models and tools specifically designed for local conditions render high uncertainty regarding climate change impacts for Jordan. Trend analysis to the time series of the existing climatological records has been conducted in many studies. The analyses show that there is an increasing trend in the maximum temperature and a more remarkable increasing trend in the minimum temperature and consequently the mean temperature. While the precipitation exhibits a decreasing trend in the majority of the locations in Jordan (Freiwan, et al., 2007).

Projections of Climate Change

Rising Greenhouse gases concentrations are expected to have a wide range of effects, including: rising sea levels, changing weather patterns and extreme weather, pressure on water and food, political and security risks, human health risks and impact on wildlife and ecosystems.

Climate change future scenarios for Jordan developed as part of 2nd NC by interpolating the coarse resolution of the GCM (Global Circulation Models) to the Jordanian part of the Yarmouk River Basin show small discrepancies in the results from different models especially regarding future precipitation levels (GCM climate change scenarios for precipitation are not fully consistent. The scenario projections suggest an increase in temperature of less than 2°C, by the year 2050.

Warming was found to be stronger during the warm months of the year while less warming is projected to occur in the cold months of the year. In a recent study a statistical downscaling model was employed to generate site-scale future climate scenarios at several locations in Jordan from the coarse GCM products for the period 2011–2099 (Freiwan, et al., 2007).

These scenarios reveal an obvious increase in temperature ranges from 1°C-4°C and a decrease in precipitation ranges from 15% to 60% in the majority of the studied sites. These results are consensus to the "findings of similar studies Studies in Jordan (mentioned above) indicate that extreme events (i.e. intense rain, snow storms, drought etc.) are predicted to be more frequent.

Corona's Impact on the Environment

The Corona virus may cause a major health crisis around the world, while forcing economies to close in the face of strict quarantine measures, but it is quite the opposite. It positively affects the environment, as factories stopping and countries restricting movement of vehicles reduce pollution and reduce emissions. China's carbon emissions fell by around 25% over a four-week period. Scientists are witnessing a major difference that occurred during the Corona crisis, which is air quality, as this epidemic appears to actually lead to significant reductions in air pollution in those areas that were heavily affected by COVID-19 such as China and Italy, where industry, aviation and other forms of transportation stopped.

"The levels of air pollution as observed by the satellite show dramatic improvements in many areas that were subject to restrictive quarantine due to COVID-19," Peter DiCarlo, associate professor of environmental health engineering at Johns Hopkins University, told Newsweek.

DiCarlo added, "Both the industrial regions of China and Italy show strong decreases in carbon dioxide (CO_2) and nitrogen dioxide (NO_2) versus a decrease in industrial activity and vehicle traffic, and this is not surprising given that vehicles and industry are the main source of NO_2 and when these sources are mainly diverted, the weather will improve quickly. " The reduction in the number of cars on the roads in some countries is also one of the most obvious effects of home work and social isolation policies. The COVID-19 epidemic is also likely to have a major impact on other environmental factors, including reducing greenhouse gas emissions as the global economy heads into recession.

Fig. 4 shows that the Images by the US space agency NASA are clear, in February the concentration of carbon dioxide (CO_2) and other greenhouse gases fell dramatically in Wuhan, China, the epicentre of the COVID-19 pandemic, passing from an indicator that was red/orange to blue. Greenhouse gases are mainly produced by vehicles, industrial sites and thermal power stations. As China moves past the peak of its crisis, however, recent images by the European Space Agency (ESA) show resurgence in greenhouse gases emissions and in the Fig. 5 shows that the European Environment Agency (EEA) reports a decline in air pollution in Northern Italy during Coronavirus lockdown.

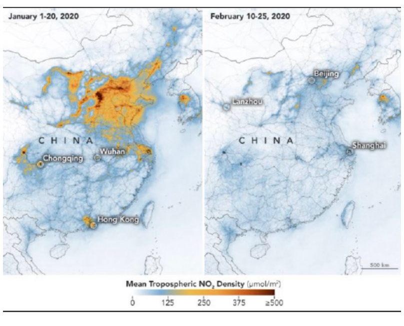

Fig. 4 The European Environment Agency (EEA) reports a similar change in Barcelona and Madrid, where Spanish authorities issued confinement orders in mid March

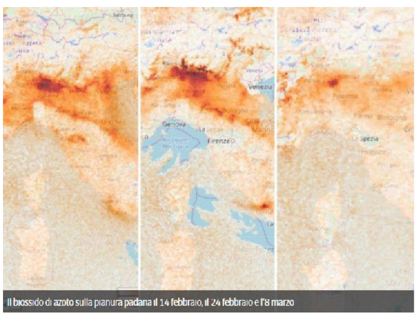

Fig. 5 The European Environment Agency (EEA) reports a decline in air pollution in Northern Italy during Coronavirus lockdown

"NO_2 is a short-lived pollutant, with a lifetime in the atmosphere of about one day," said Vincent-Henri Peuch, from the EU earth surveillance programme Copernicus. "As a result, this pollutant stays near the emissions sources and can be used as a proxy of the intensity of activity in different sectors," he told AFP. Fei Liu, an air quality researcher at NASA's Goddard Space Flight Center, noted the change in China, saying: "This is the first time I have seen such a dramatic drop-off over such a wide area for a specific event." Even during the economic crisis more than a decade ago, the decrease in NO_2 levels "was more continuous in time," according to EEA air quality specialist Alberto Gonzalez Ortiz. In northern Italy, "average NO_2 concentration levels have been almost halved on average," Peuch remarked (Callendar, et al., 1938).

The EEA has received many questions about the impacts of the stark measures to limit the spread of the coronavirus (COVID-19) on air quality in Europe. The EEA's data for recent weeks show how concentrations of greenhouse gases, a pollutant mainly emitted by road transport, have decreased in many Italian cities.

Average concentrations of CO_2 for the two months of 2020 have been around 38% and average concentrations of NO_2 for the two months of 2020 have been around 45% lower than the two months in year 2019.

Recommendations

• Using different devices and means to treat the gases resulting from operating the factories Operation of factories by electric or solar energy.

• Use of environmentally friendly car exhausts.

• Production and use of different means of transportation that are powered by electricity or solar energy.

• Increasing the agricultural area around the world due to its positive impact by eliminating greenhouse gases.

• Keeping forests from burning to reduce harmful gases resulting from their combustion.

CONCLUSION

Greenhouse gases concentration is the most important factors affecting global warming, which in turn contributes to climate change. It is important to recognize and take into consideration experiments that help in measuring the concentration of greenhouse gases. Increasing the movement of different means of transportation, whether by sea, air or land, this leads to an increase in air pollution with greenhouse gases. The increased activity of factories in major industrial countries leads to an increase in air pollution with greenhouse gases.

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