Review Article

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2024.56.008837

Climate and Its Relation to Greenhouse Gases

Jesús Rivas Gutiérrez*, Luz Elena Aguayo Haro, Blanca Gabriela Pulido Cervantes, María Elisa Escareño Espinosa, Elizabeth Aguirre Medina, Martha Patricia de la Rosa Basurto and José Ricardo Gómez Bañuelos

Universidad Autónoma de Zacatecas, Mexico

***Corresponding author:** Jesús Rivas Gutiérrez, Universidad Autónoma de Zacatecas, Mexico

ARTICLE INFO

Received: April 15, 2024

Published: April 25, 2024

Citation: Jesús Rivas Gutiérrez, Luz Elena Aguayo Haro, Blanca Gabriela Pulido Cervantes, María Elisa Escareño Espinosa, Elizabeth Aguirre Medina, Martha Patricia de la Rosa Basurto and José Ricardo Gómez Bañuelos. Climate and Its Relation to Greenhouse Gases. Biomed J Sci & Tech Res 56(2)-2024. BJSTR. MS.ID.008837.

ABSTRACT

Humanity is currently suffering the consequences of its own civilization and development. The generation of comfort and growth has caused an accumulation in the atmosphere of toxic and harmful gases known as greenhouse gases or GHG. These gases, directly or indirectly, have been gradually altering the balance, stability and continuity of the climate, generating what is currently known as climate change, which manifests itself in overheating and/or cooling in different and large land areas, and although these climatic alterations do not occur in a generalized manner, their effects and consequences are felt in one way or another all over the planet. The most serious aspect of this situation is that people, animals, insects and terrestrial and marine plants are being affected and altered in their way of life and health as well as in their habitat in general. As an alternative, attention has been focused on science and technology as the possible solution to this problem that has put flora, fauna and everything we know today at risk of disappearing.

Keywords: Climate Change; GHG; Technology

Abbreviations: GHG: Greenhouse Gases; UN: United Nations; HFCs: Hydrofluorocarbons; PFCs; perfluorocarbons; IPCC: Intergovernmental Panel on Climate Change; UV; ultraviolet; LPI: Living Planet Index; CCS: Carbon Capture and Storage

Introduction

Almost all human activities generate garbage or waste that is released into the environment, among them are waste that goes into the atmosphere and deteriorates air quality, balance and climate stability. Regarding climate instability, a few years ago it only caught the attention of scientists, but nowadays it is very common for us to find in the vox populi, in newspapers, magazines, newscasts and electronic media, information that hurricanes are increasingly more intense, that the rainy and drought seasons are increasingly irregular and that the summers are increasingly hotter and the winters colder and more unstable, attributing the responsibility for these events to the so-called climate change, climatic instability caused largely by the enormous amounts of greenhouse gases (GHG) that are produced and released into the environment and the atmosphere. But what is climate change? In short, climate change has been defined as any change in the climate over time as a result of natural variability or human activities. These changes can occur throughout the year both on land as well as air and sea. In order to understand how climate change occurs and what causes it, it is necessary to understand mainly the phenomenon known as the greenhouse effect, which is partially responsible for the variation in the planet's temperature, along with two other factors, the Sun and the distance from our planet. him. Among the gases that make up the atmosphere (mainly nitrogen and oxygen), those that have the greatest impact on the temperature imbalance are the so-called GHGs.

A GHG is one that has the property and capacity to absorb radiation, returning it to the Earth's surface, thereby causing an increase in temperature, particularly where these gases are concentrated and in general and gradually throughout the planet, producing the phenomenon known as the greenhouse; This result is a phenomenon produced by these gases that are found in the atmosphere and that retain part of the solar energy reflected by the ground, preventing it from going out into outer space, absorbing it and transforming it into an internal molecular movement that produces the elevation of the ambient temperature (CEPSA [1]). In November 1997, at the convention on climate change, organized by the United Nations (UN) in the

city of Kyoto, Japan, what is known as the Kyoto Protocol was agreed upon, which had the objective of reducing emissions of these gases to 5.2% below normal levels. from 1995 depending on the gas being treated; In that document, the main GHGs were established: carbon dioxide (CO_2), ozone (O_3), methane (CH_4), nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6) and although Water vapor was not included in this list, it is the one that produces the most greenhouse effect, due to its ability to retain the heat emanating from the earth's surface. Currently, the activities carried out by human beings over the years have generated enormous quantities of GHG, concentrating these gases in large population centers, where industrial, agricultural and livestock activity is very high.

These gas concentrations cause variations in those areas the atmospheric composition influencing and altering sooner or later this climatic composition. Certain GHGs arise naturally, but are influenced directly or indirectly by human activities while others are entirely man-made; those that arise naturally are: water vapor ($H2_0$), carbon dioxide (CO_2), ozone (O_3), methane (CH_4) and nitrous oxide ($N2_0$) and those that are completely artificially produced for the benefit and/or comfort of the living things are: chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs) (collectively called halocarbons), and fully fluorinated species, such as sulfur hexafluoride (SF_6). As mentioned, water vapor produced naturally or as a result of some human activity is the gas that most contributes to the greenhouse effect and is the one most directly linked to the climate; This is because the evaporation of water depends mainly on the high temperature of the surface and because this vapor passes through the atmosphere in very rapid cycles and with a duration in the atmosphere of approximately eight days; According to the Intergovernmental Panel on Climate Change (IPCC), water vapor, fog and haze are responsible for between 36% and 70% of the greenhouse effect, which together with the byproducts of burning Fossil fuels are mainly responsible for global warming. Furthermore, this warming causes a feedback loop, that is, the higher the temperature, the more water vapor is produced when it evaporates, which in turn generates a greater greenhouse effect, which in turn raises the temperature and consequently greater water vapor and so on.

Carbon dioxide (CO_2) is a byproduct of cellular respiration and the burning of fossil fuels; ozone (O_3) in the stratosphere with the passage of time and due to the effect of other gases has caused the thinning of the ozone layer, causing the passage of harmful ultraviolet (UV) rays over time and in the troposphere where there are A higher concentration of this gas contributes to the generation of the greenhouse effect; Methane (CH_4) is a gas produced as a result of the digestion of food consumed mainly by cattle and cattle. The emissions and concentrations of other GHGs depend directly on the quantities of these chemicals produced at the expense of demand for the benefit and comfort of people. Regarding their elimination process, all GHGs depend to some extent on the climate and are largely eliminated through chemical or photochemical reactions within the atmosphere. Only CO_2, which is the most abundant and most researched GHG, is eliminated. through temporary reservoirs or storage deposits, such as the atmosphere itself, terrestrial plants, soil, water, ice and ocean sediments (Henry Oswaldo Benavides Ballesteros H O, León Aristizabal G E [2]). In the last two centuries, 2.4 billion tons of CO_2 have been produced and expelled into the atmosphere, which is the equivalent of what 522,000 million cars would emit annually to this day, massive quantities of the main GHG that in turn represents the soul of human civilization but also in these times its nightmare. According to scientists, there is very little time left for this extreme climate situation of high temperatures and historic high cooling to be irreversible and that if nothing is done to reduce this type of gas emissions, it is certain that the climate will worsen, as well as its consequences (Howe Verhovek S [3]).

Measuring the impact that GHGs have produced to date on the environment and climate is a complex task; however, various ways have been proposed to do so, including the Living Planet Index (LPI) and the Environmental Sustainability Index (ESI), of all these ways of measuring it, the best known is through the Ecological Footprint proposed by the Canadian Ecologist William Rees and Mathis Wackernagel in 1996. The Ecological Footprint is an environmental indicator of an integrative nature of the impact exerted by a certain community (country, region or city) on its environment, both the necessary resources and the waste generated for the maintenance of the community's production and consumption model are considered (Rees and Wackernagel, 2000). In Mexico, based on the National Inventory of GHG Emissions, it was calculated that in 2018 873 million tons of these gases were emitted. The panorama was extremely worrying if we added that emissions increased by 45% more than the estimated in 1990 (Secretariat of the Environment and Natural Resources SEMARNAT [4]). In this case, the sector that emitted the most and continues to emit the most emissions and waste of these gases is the producer of fuel for all types of transportation, because it mainly includes the use of fossil fuels, and is also responsible for the generation of Electrical energy is another highly polluting sector, especially this second sector since it is responsible for producing around 70% of GHG emissions, due to the excessive use of fossil fuels to produce the energy necessary to supply human consumption.

Other industrial processes such as the production of cement, glass, steel, paper, food and beverages also emit a large amount of GHG into the atmosphere; The total emissions from this type of industries represent 9%. On the other hand, agricultural activities generate two types of greenhouse gases methane (CH_4) that add up to 8% of the emissions from these activities and nitrous oxide (N_20). These gases are generated by fermentation in the digestive system of livestock or directly from manure and its handling, as well as from crops and decomposing soil, since the microorganisms present in it promote their production and release into the atmosphere. The waste generated in homes also emits GHG, representing approximately 12% of the total production in Mexico. On the other hand, municipal and industrial

wastewater, as well as livestock, emit methane (CH_4) and nitrous oxide (N_2O) when as well as the burning of hazardous waste such as corrosive, reactive, explosive, toxic, flammable or infectious biological materials (CRETIB), especially outdoors. The correct management of this waste and the adequate treatment of wastewater have undoubted benefits, however, despite everything, they generate secondary products, among which are GHGs. GHG emissions due to these situations and others such as the disposal of solid waste in inadequate garbage dumps increased 96% between 1990 and 2002. The most serious thing about this situation is that despite the improvement of infrastructure and the acquisition of more and better inputs to correctly carry out these activities, emissions continue to increase, estimating that by 2025 they could increase by 140%.

Regarding the search for comfort and benefit of modern societies, certain GHGs have been produced such as trifluoromethane (CHF_3), also known as fluoroform, which is used in the manufacture of silicon chips and as a fire suppressant, it is the most abundant hydrofluorocarbon (HFC) gas, remains in the atmosphere for 260 years and traps heat 11,700 times longer than carbon dioxide (CO_2), hexafluoroethane (C2F6), used in the creation of semiconductors, remains in the atmosphere up to 10,000 years, this longevity, together with its ability to retain heat 9,200 times more than carbon dioxide CO_2, has sparked the interest of the IPCC to follow closely, sulfur hexafluoride (SF_6), which is an inert gas widely used in the electronics industry as an insulator; The IPCC considers it the most powerful GHG in the world, with a capacity to trap heat 22,200 times more than carbon dioxide (CO_2) and trichlorofluoromethane (CFC-11), this refrigerant causes several negative effects on the environment, in addition Retaining heat 4,600 times longer than carbon dioxide (CO_2), it reduces the ozone layer (O_3) faster than any other refrigerant, without forgetting the environmental impact of chlorine. The list could expand as scientists study the phenomenon more; is the case of sulfuryl fluoride (SO_2F_2), used as a fumigant against termites, its capacity as a GHG has been announced in March by scientists from the Massachusetts Institute of Technology (MIT) and it has a useful life of 40 years and is capable of trapping heat 4,800 times more than CO_2, although in the atmosphere it is only found in 1.5 parts per billion, this amount increases by 5% per year according to a recent article published in the Journal of Geophysical Research (ECODES (s/f) [5]).

Natural Elimination of the Main and Largest GHG (Carbon Dioxide, CO_2)

Forests, jungles and mainly plankton and algal forests of the seas and oceans participate in the flow of carbon by capturing it because it is necessary for them to carry out photosynthesis and subsequent storage in their biomass, which is why they become sinks. coal; However, when vegetation is removed and burned to convert the land into pastures or crop fields or its reproduction is reduced (as in the case of plankton and kelp), the vegetation is eliminated and a large part of the stored carbon is quickly converted into CO_2 and released back into the atmosphere or it is not absorbed and it is then that they inversely become a source of CO_2 emissions, thereby increasing pollution by generation and emissions of GHGs into the atmosphere. An alarming fact is that, until the end of the 20th century, 87.7% of global CO_2 emissions were generated by the United States alone, which emitted 30.3% of the total, Europe generated 27.7%, the Soviet Union 13.7% and the region of China and India 12.2%. South and Central America contributed just 3.8% of the world total; Currently, these figures have been increasing alarmingly due in some cases to the improvement in purchasing power, which is why more electrical household appliances are purchased and consequently greater consumption of electrical energy or the purchase of more automotive units, to the creation and urbanization of new and large population centers generated a greater carbon footprint and, on the other hand, political indifference to face the commitment accepted when signing the wide variety of global agreements regarding the reduction of GHGs and the lack of maintenance of equipment. responsible for incinerating and/or treating wastewater correctly, as well as the lack of vigilance or corruption when it comes to monitoring the correct application of the rules for soil change and livestock management and feeding (European Parliament News [6]).

Effects of Climate Change

The degradation, pollution, alteration and imbalance of the gases that make up the atmosphere generates adverse effects and consequences on the climate, causing disorders and alterations on ecosystems in general, all elements of the habitat and biosphere environment have complex relationships and interactions among themselves. Therefore, altering some causes changes in the remaining elements, sometimes imperceptible and other times very obvious. Vegetation, for example, can only reproduce and grow successfully only within a specific range of temperatures and respond to certain amounts of rain and humidity. Animals, for their part, also need certain ranges of temperature and rainfall. Throughout history the Earth has had changes in the climate that have even caused the extinction of species, however, when the change in climate does not occur gradually and is accelerated like what is currently happening, they are magnified, accelerated and They generate impacts linked together. Currently, due to climate change, for example, more intense hurricanes occur in greater numbers, causing flooding and destruction in coastal populations, an increase in global temperature and of the oceans and seas, causing glaciers to melt more quickly and increasing the level of the sea and consequently change in the pH of the water and affectation of marine flora and fauna, in other places intensifying and prolonging droughts and their consequences, these are only some consequences of climate change without considering all the effects produced and their consequences.

While drought seasons intensify in Africa, at the same time in other parts of the world there are reports of more intense rains and storms, as well as frost and/or snowfall; In recent years, atypical

meteorological phenomena have occurred that have to do with the warming of the seas and that have caused greater loss of human life and property. A recent study shows that in recent years an increasing number of intense hurricanes have been recorded, that is, those that were commonly category 3 have become category 4 or 5 on the Saffir-Simpson Scale, characterized by winds higher than 250 kilometers per hour and destruction of housing infrastructure in general, flooding of population centers near the coast causing the population to be evacuated due to the mortal risk of remaining in their homes. Regarding rainfall, there is a tendency towards greater precipitation where the rain was constant and regular, while where the rains depend on the meteorological phenomena that occur in the Pacific Ocean, the trend seems to be in the opposite direction, generating uncontrollability. in the agricultural and fishing season cycles with the economic and social consequences that such climatic alterations produced in the communities that depend directly and indirectly on these activities and the products generated. As a consequence of global warming, changes have been observed in regions as distant as the poles, since in just under 40 years, the accelerated disappearance of the Arctic ice sheet has been observed, with close to 20% of its surface loss, which would be equivalent Half of the Mexican territory has thawed.

At the other pole, on the Antarctic continent, in 2002 the Larsen B platform fractured, causing an ice surface of 3,240 square kilometers to detach and melt (United Nations [7]). These thaws have not only affected the Arctic and Antarctic, directly altering not only the habitat of polar fauna, but also that of the seas and oceans; On the other hand, the cold areas with perpetual ice found in the high areas of mountains and volcanoes are also affected by the same consequences of global warming, for example, the glaciers of the Swiss Alps have lost more than a third of its surface and at least half of its mass between the year 1850 to the present and scientists have calculated that, by the year 2050, 75% of the glaciers in the Alps could disappear. In Mexico there are also glaciers and they are mainly found in the high areas of Iztaccíhuatl, Popocatépetl and Pico de Orizaba and although their reductions have not been so great, they are very important, for example, the glaciers of Iztaccíhuatl have suffered reductions of up to 55% Between 1960 to date, in Pico de Orizaba and Popocatépetl, the trend has been similar, but in the latter the reduction has been more accelerated due to the volcanic activity that has occurred in recent years. Experts have estimated that if current rates of shrinkage of Mexican glaciers continue, they may disappear completely in less than 30 years. During the 20th century and as a result of the melting of the polar caps and glaciers that flow into the seas and ocean, its level rose at an average speed of 1 to 2 millimeters per year, which is equivalent to a total rise of 10 to 20 centimeters in the century, this increase might seem minimal to us, but in fact it is worrying for many countries since there are numerous cities located in low coastal areas that can be flooded or are already in that process and many are even below sea level , as is the case of Amsterdam where the risk is greater, whose altitude is 4 meters below sea level.

This implies that many millions of people are susceptible in the near future to suffering more serious consequences than they already have from flooding due to rising levels, cities such as Cairo, Lagos, Maputo, Bangkok, Dhaka, Jakarta, Bombay, Shanghai, Copenhagen, London, Los Angeles, New York, Buenos Aires or Santiago de Chile, among others, could have serious repercussions in the immediate future due to overflows and/or floods of the oceans and seas. Likewise, biodiversity in many regions is already suffering severe and critical adverse changes due to the effects of climate change, many species of flora have migrated or have disappeared or are in the process, likewise species of fauna or flora that do not They can migrate, either due to movement, physiological or behavioral limitations, they could disappear. Austrian scientists found that some species of animals and plants from alpine areas have moved up to four meters per decade from their original areas to higher places in the mountains or volcanoes they inhabit, this is explained and is due to the increase in temperature, since the lower parts of the mountains and volcanoes have increased their temperature and the alpine species that depend to survive on low temperatures present in the higher parts have migrated to increasingly higher altitudes to find suitable habitats to survive; Changes in temperature also have effects on the feeding strategies of some species that depend on ice shelves to hunt their prey. For example, the population of Adelie Penguins in Antarctica went from 1990 to 2004 from a population of 320 pairs with offspring down to just 54 (and continuing to decline), in a place where the average temperature has increased by almost 5.5°C in fifty years.

The polar bears of Hudson Bay, on the southern limits of North America, do not fully meet their nutritional needs, since the period in which they hunt seals annually has been reduced or they have been migrating to other colder regions, which previous because the ice shelves from which they hunt fracture at least three weeks earlier than usually occurred, in addition to the already described examples of polar bears and penguins, these changes will also surely harm seals, walruses and other marine mammals. Coral reefs have been suffering from so-called coral bleaching due to global warming; This condition is due to the fact that a coral can be made up of one or many tiny polyps, small circles that cover its surface and through which they feed. Within these polyps, the corals shelter certain microscopic unicellular algae from which they obtain nutrients. and to which they offer protection and waste that they use as food, when the sea temperature increases or the sea water is contaminated, sediments are deposited on the corals and the algae are detached from the polyps, which leads to the loss of their color. and allows us to observe its white skeleton built of calcium carbonate beneath the tissue; The loss of coral reefs is not only important because of their tourist attraction, but because extraordinarily diverse ecosystems are consolidated around them. In the Indian Ocean, for example, 46% of corals have bleached, while in the Pacific, coral mortality has been recorded that fluctuated between 50% and 70%.

In early 2007, the world's attention was directed to the IPCC, which presented a preview of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, stating that if the necessary policies are not adopted to minimize the causes of climate change , mainly due to the emission of GHGs, in the year 2100 the global concentration of carbon dioxide (CO_2) will be between 540 and 970 parts per million, currently it is almost 380 and in pre-industrial times it was 280 parts per million. This evaluation report predicts that, for the last decade of the 21st century, the temperature could increase between 1.8 and 4°C and with it the sea level could rise from 18 to 59 centimeters, causing serious and extensive flooding, mainly in core areas. coastal populations; A temperature increase of this magnitude can be accompanied by drought conditions in some places and intense rains in others. In the case of turtles and other species of reptiles, such as crocodiles and alligators, the sex ratio could be altered as a result of the increase in temperature, since in this group of animal's temperatures is key to defining the sex of the offspring. Between two and three degrees of difference are enough to define whether the calf is female or male. This change in sexual proportions alters the structure of populations, since competition for a mate increases and many individuals may be left without a partner to reproduce. The volume of plankton can also be further affected and reduced and because it is found at the beginning of the food chain of all marine ecosystems, it can affect the global productivity of the oceans and sea, and with it, the global production of products. fisheries for human consumption.

The human population will also have to face and suffer from future changes, for example, an increase in heat-related deaths and illnesses and a decrease in deaths caused by winter cold have been predicted in some temperate regions; Strong changes in temperature also have effects on the geographical distribution of disease-transmitting animals or vectors, such as mosquitoes, ticks, bedbugs, fleas, cockroaches, rats, mice and others. Some of them, such as those that transmit dengue and malaria, live in warm areas, so if global temperature increases and areas with warm climates expand, they could move to latitudes that were previously cold, expanding transmission areas. of malaria and dengue, diseases that annually kill a large number of people in the world. Also, the quality and availability of water, one of the most important resources for humanity, could be affected by the increase in global temperature. The increase in temperature reduces the concentration of oxygen dissolved in water, which is essential for survival of aquatic organisms, added to this, the available water reserves will be greatly reduced in many of the areas where it is currently insufficient due to evaporation processes. The impacts described above come from mathematical models that, although they try to take into account most of the variables that currently act on the climate, are unable to accurately predict what will happen in the future, that is, although they are likely to occur in the way it has been predicted can also be done differently and with another magnitude. The impacts on the environment generated by climate change can also affect society in different aspects, including quality of life and health.

Use of Science and Technology in GHGs

The main environmental problem that GHGs have been generating is climate change (warming-cooling), among which CO_2 is the main gas and although numerous efforts are being made to combat this problem such as the use of clean renewable energies and the plantation mass of trees, it does not seem that the problem will be significantly resolved in the short or medium term. One of the most promising alternatives to reduce CO_2 emissions into the atmosphere is the use of Carbon Capture and Storage (CCS) technology (Daví D, Sanni M, Trujillo E [8]). The global problem regarding CO_2 emissions is that energy demand will continue to increase in the coming years; oil, natural gas and coal continue to be the main energy sources; According to British Petroleum, renewable energy will only provide half of the additional energy required by 2035, so it is of utmost importance to promote CO_2 capture and storage projects to avoid the emissions of thousands of additional tons of CO_2 and reduce the current emissions. emitted, it is necessary to invest in the research of new processes and materials that are more efficient and cheaper for the capture, transport and storage of CO_2. (Saldívar Esparza S, Cabrera Robles J S, Reta Hernández M [9]). Achieving zero carbon emissions through global political agreements does not seem to save the planet from annihilation if something truly effective and permanent is not done. It is urgently required and in global collaboration to extract carbon from the planet's atmosphere on a massive scale, to Being able to do so and achieve an effective and significant global impact requires a global effort unlike anything humanity has ever seen in modern times [10].

The extreme climate that is becoming more noticeable and devastating every day is almost certainly going to get worse as a result of the 2.4 billion tons of CO_2 that has been released into the atmosphere in the last century and what is left of it, for this It is sought that with the help of science and the development of existing technology (and that to come in the immediate future) the objectives and goals of significantly reducing CO_2 can be achieved. As part of the mission of the United Nations Intergovernmental Panel on Climate Change (IIPC), fossil fuel emissions need to be drastically reduced and up to 12 billion tons of carbon per year removed from the atmosphere by mid-century. With this duo in collaboration (science and technology) it is thought that the immediate solution would be to send CO_2 to the depth of the planet's land and sea surface. CO_2 as a representative of the great spirit of the development of human civilization, but also today its worst nightmare. Several methods have emerged to extract carbon from the atmosphere and store it deep underground or at the bottom of the ocean and seas; some procedures would trap carbon for hundreds of years and others permanently, some would convert it into energy for consumption for human needs. In some cases it will take decades to operate some of these processes on a significant scale. The Icelandic company CARBFIX is working on a technique that consists of mixing captured CO_2 with water and then passing it through

a complex system of pipes that descend 750 meters. underground, at that depth the water combined with CO_2 meets a terrestrial layer of porous basalt that traps the CO_2 creating dots in the cream-colored rock.

This capture technology so far only represents 0.1% of the extraction of this gas. On the other hand, in Arizona a team of engineering researchers is experimenting with a mechanical tree that will be able to do the function and work of a thousand natural trees in the near future in terms of capturing and storing this gas. In another part of the planet, in Australia, an oceanography researcher works with a marine garden made up of kelp and wakame, which are a type of algae that grows in shallow oceans and can reach great heights and are full of health benefits. health, this researcher tries to find and understand the way in which these algae can store billions of tons of CO_2; This with the intention of finding immediate alternatives to reduce the concentration of CO_2 in the atmosphere, which for thousands of years remained below 280 ppm until the Industrial Revolution began to raise it, currently reaching 420 ppm. Another project is to plant genetically treated trees to grow quickly, last for many years and not require much water to do so. These forests would be natural carbon sinks so they would store the carbon they capture for many years. The company CLIMEWOKS uses another technological alternative that consists of capturing carbon directly from the air, for this it has built giant fans that would direct the air from the atmosphere through filters towards liquid and solid solvents to which the CO_2 adheres to trap it and then These would be buried underground, despite using geothermal energy for their operation, the main problem is the high cost that their massive implementation would imply.

The TURECEK Company develops modules that work with solar energy to trap CO_2 and store it in fissures in the earth. To do so, it builds units that are the size of a small tent that contain a fan that directs the air towards a panel made of polymer. special that separates CO_2 from other gases and then deposits the polymer in large earthly concavities, On the other hand, for some years now, plants have been cultivated, harvested and burned to obtain energy (biomass), which absorb carbon when growing, trap and store the CO_2 that is released during this conversion, which must be purified and trapped in large limestone filters before burying this substrate in the subsoil, its handling requires great care to avoid leaks; Another option is carbon mineralization, stones such as basalt can react and adhere to carbon in the atmosphere and then deposit those sediments in large caves. Using smart agriculture can also help sequester carbon, rather than tilling entire fields, managed tillage keeps it in the soil, equally cover crops between seasons also reduce the release of carbon from cropland. Despite the use of science and technology to reduce and trap GHG emissions and in particular CO_2, it is urgent that humanity and industry do two things at the same time, reduce their current and future emissions and reverse the effects. From what has already been issued, under this position there is great optimism among scientists when it comes to technology, but not so when it comes to considering the political disposition and its representatives.

Conclusion

Climate change caused by the large amount of GHG that currently exists in the planet's atmosphere is so severe, broad and critical that it is not possible to solve it in a short or medium time, nor by means of a technology and/or strategy, to This requires the sum and symbiosis of several, as well as the political availability of the rulers and the population in general. The hopeful thing is that there are currently several technologies, some still in development, that can be applied to solve the problem of climate change; the big problem for their application continues to be their high costs. For now, changing the way we behave, modifying the way we produce and consume energy is essential to find significant global results. Promote policies and actions to have less waste and more intelligent use of our renewable and non-renewable resources, improve the efficient use of energy and fuel savings for the vehicles that are produced, the increase in the use of wind energy and solar energy, the use of biofuels from organic waste and the efficient and effective protection of terrestrial and maritime forests (algae and corals), are also effective actions to mainly reduce CO_2 (the main GHG) and other gases that trap heat on the planet due to the greenhouse effect they cause. However, the global demand to stop, control and reduce greenhouse gas emissions is fundamental, little progress has been achieved, look back, support and promote the work, projects and progress achieved so far with the use of science and technology regarding the capture, storage or elimination of GHGs, mainly CO_2, is possibly the way to more quickly confront, control and/or reduce the climate imbalance produced by global warming and cooling; Although hopes are placed on the massive development of technology, we must not forget that practically none of them are harmless, each one to a lesser or greater extent can also cause pollution, which is why it is necessary to continue working to find their application with the highest level of social, energy and anti-pollution responsibility.

References

1. Neipp C, Hernández A, Rodes Roca J, Márquez A (2003) An analysis of the classical Doppler Effect. European Journal of Physics 24(5): 497.
2. Seddon N, Bearpark T (2003) New look for the Doppler Effect. Science 302: 1537.
3. Paik A (2021) Doppler Effect and its application.
4. Glushchenko AG, Glushchenko EP, Ustinova ES (2017) Peculiarities of the Doppler Effect in a multimode waveguide. Computer Optics 41(5): 687-693.
5. Croswell K (2022) Astronomers uncover new way to measure the speed of stars, Science Writer PNAS. 119(3): e2122586119.
6. Gupta OP (1996) The Doppler Effect: A unified approach for sound and light waves. Physics Education 31(6): 31 351.

7. Daniele SD (2020) The Doppler Effect in Contemporary Physics.
8. Niu Y, Ding J, Fei D, Zhongи Z, Liu Y (2019) Doppler Effect on High-Speed Railway at 465 MHz. IEEE International Symposium on Antennas and Propagation and USNC-URSI. Radio Science Meeting, pp. 2117-2118.
9. Petrescu F (2015) Im proving Medical Imaging and Blood Flow Measurement by Using a New Doppler Effect Relationship. Am J of Eng and Appl Scien 8(4): 582-588.
10. Ying Luo, Yi-Jun Chen, Yong-Zhong Zhu, Wang-Yang Li, Qun Zhang (2020) Doppler Effect and micro-Doppler effect of vortex-electromagnetic-wave-based radar. IET Radar, Sonar and Navigation 14(1): 2-9.
11. Service B (2003) Doppler done backward. Science.
12. Kuzelev MV, Rukhadze A (2005) Anomalous Doppler Effect and stimulated Cherenkov Effect in a plasma waveguide with a thin-walled annular beam. Plasma Physics 31(8): 638-645.
13. Mazilu T, Dumitriu M (2011) On the Anomalous Doppler Effect. RJAV 8(2): 120.
14. Liu C, Long H, Zhou C, Ying Cheng, Xiaojun Liu (2020) Reversed Doppler Effect based on hybridized acoustic Mie resonances. Sci Rep 10: 1519.
15. Jiang Q, Chen J, Wang Y, Liang B, Hu J, et al. (2016) Mechanism Analysis of the Inverse Doppler Effect in Two-Dimensional Photonic Crystal based on Phase Evolution. Scient Reports 6: 24790.
16. Jiang Q, Chen J, Cao L, Zhuang S, Jin G, et al. (2018) Dual Doppler Effect in Wedge-Type Photonic Crystals. Sci Rep 8(1): 6527.
17. Garetz BA (1980) Angular Doppler Effect. J Opt Soc Am 71(5): 609-611.
18. Dholakia K (1998) An experiment to demonstrate the angular Doppler Effect on laser light. Am J Phys 66(11): 1007-1010.
19. Brasselet E (2016) Harmonic angular Doppler Effect. Nature Photonics. Nature Publishing Group 10(6): 362-364.
20. Qiu S, Jinwen W, Yang X, Cao M, Shougang Zhang, et al. (2022) Observation of the Rotational Doppler Effect with Structured Beams in Atomic Vapor. Frontiers in Physics 9: 2021.
21. Korech O, Steinitz U, Gordon RJ, Averbukh, Prior Y (2013) Observing molecular spinning via the rotational Doppler Effect. Nature Photon 7: 711-714.
22. Giuliani G (2014) On the Doppler Effect for photons in rotating systems. European Journal of Physics 35(2): 025015.
23. Zhai S, Zhao X, Liu S, Shen F, Li L (2016) Inverse Doppler Effects in Broadband Acoustic Metamaterials. Sci Rep 6: 32388.
24. Yuanfei H, Zhiwei C, Shenyan G, Yiping H (2021) Propagation dynamics of vortex electromagnetic waves in dispersive left-handed materials. Waves in Random and Complex Media 33(1): 122-135.
25. Ran J, Zhang Y, Chen X, Fang K, Zhao J, et al. (2015) Realizing Tunable Inverse and Normal Doppler Shifts in Reconfigurable RF Metamaterials. Sci Rep 5: 11659.
26. Guixin L, Zentgraf T, Zhang S (2016) Doppler Effekt in nonlinear optics. Nature Physics 12: 736-740.
27. Qimeng S, Song Q, Tong L, Weijie W, Yuan R (2021) Doppler effect of polarization grating. Applied Optics 60(10): 2788-2794.
28. Ying Luo, Yi-Jun Chen, Yong-Zhong Zhu, Wang-Yang L, Qun Z (2020) Doppler Effect and micro-Doppler effect of vortex-electromagnetic-wave-based radar. IET Radar, Sonar & Navigation 14(1): 2-9.
29. Shukri K, Berisha V (2018) The Doppler effect and similar triangles. Results in Physics 12(2019): 846-852.
30. Ritz V, Ritz W (1908) Recherches critiques surl'Électrodynamiquegénérale. Ann De Chim Phys 13: 145.
31. Othman M, Ali M, Farouk R (2011) Analytical Solution for Acoustic Waves Propagation in Fluids. World Journal of Mechanics 1(5): 243-246.
32. Semikov SA (2013) The Ballistic Theory of Ritz and the Pattern of the Universe. Revolution in Science and Engineering). (3rd Edn.)., Nizhni Novgorod.
33. Seddon N, Bearpark T (2003) Observation of the inverse Doppler Effect. Science 302(5650): 1537-1540.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2024.56.008837

Jesús Rivas Gutiérrez. Biomed J Sci & Tech Res

This work is licensed under Creative *Commons* Attribution 4.0 License

Submission Link: https://biomedres.us/submit-manuscript.php

Assets of Publishing with us

- Global archiving of articles
- Immediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles

https://biomedres.us/