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Global Warming, its Causes, Environmental Effects, and Solution to Avoid this Phenomenon: Review

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الاحتباس الحراري، أسبابه، التأثيرات البيئية والحلول لتجنب هذه الظاهرة

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ABSTRACT

This review aims to identify the causes that contribute to global warming and offers the most likely cause, according to the published evidence. Additionally, this page provides various mitigation strategies for the global warming issue. The most practical economic and technical solution to the global warming problem is the simultaneous adoption of mitigation and adaptation techniques.

Global warming is a major consequence of human activities caused by the excessive use of old fuels as an energy- source, which has caused increased quantities of “greenhouse gases” (GHGs). The atmosphere contains gases that increase the Earth's average surface temperature, such as carbon dioxide, methane, nitrous oxide, and water vapor. Global warming phenomena have become a global problem with negative effects on various parts of the environment due to the glaciers melting, overflowing carbon dioxide (CO_2), and too much warming of aquatic bodies, among others. Generality people are still unaware of global warming and do not see it as a main problem in the coming years.

Keywords: global warming; greenhouse gases; atmosphere; human activity; environment.

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INTRODUCTION

When gases such ozone, water vapor, methane-, carbon dioxide, chlorofluorocarbons (CFCs), and nitrous oxide are more concentrated in the atmosphere, it causes global warming, which is defined as an increase in the earth's surface total temperature [1]

Humans have had a long history of affecting the environment. However, it wasn't being until the start of the industrial revolution that the effects of human activity have started to spread globally [2]. As a result of scientific knowledge regarding the Earth's changing climate and the increasing atmospheric quantity of greenhouse gases, environmental issues have grown to be humanity's top concern today. Temperatures are rising globally, and both the volume and distribution of rainfall are changing [3]. Prior to the industrial revolution, the atmosphere's primary producers of greenhouse gases (GHGs) thought to be volcanoes, forest fires, and seismic activity [13, Fig .1],[4-6].

The temperature of the world has increased by 0.7 degrees since industrialization and it might rise as high as 5 degrees in 2100 [7]. The temperature rise will have a drastic and disastrous impact on the environment, causing more extreme occurrences as well as a widespread loss of numerous animals and plant species [8]. The atmosphere now contains more greenhouse gases because of human activity, These gases include fluorinated gases from industrial operations, methane and nitrous oxide from waste and agriculture, andCO_2 from the burning of old fuels and deforestation. Since the start of the industrial revolution, concentrations of nitrous oxides (N_2O), methane (CH_4), and carbondioxide (CO_2) have all increased significantly. Compared to before 1750, CO_2 levels are currently roughly 30% higher. About a 50% increase in N_2O and a roughly doubling of CH4. Because of increasing fossil fuel consumption and changes in land use, more greenhouse gases discharged into the atmosphere of the Earth [9]. The greenhouse effect, brought on by this rise in temperature, has contributed to climate change [10].

Global warming is a significant issue causing the Earth's temperature to rise. Sunlight reaches Earth, which absorbs 30% of it and sends the rest back into space. This heats the planet's surface and atmosphere, making life possible. However, greenhouse gases reabsorb some of this radiation [11]. It is important to note that the average surface temperature of the Earth would be exceedingly cool without greenhouse gases; therefore, this re-absorption process is advantageous [12].

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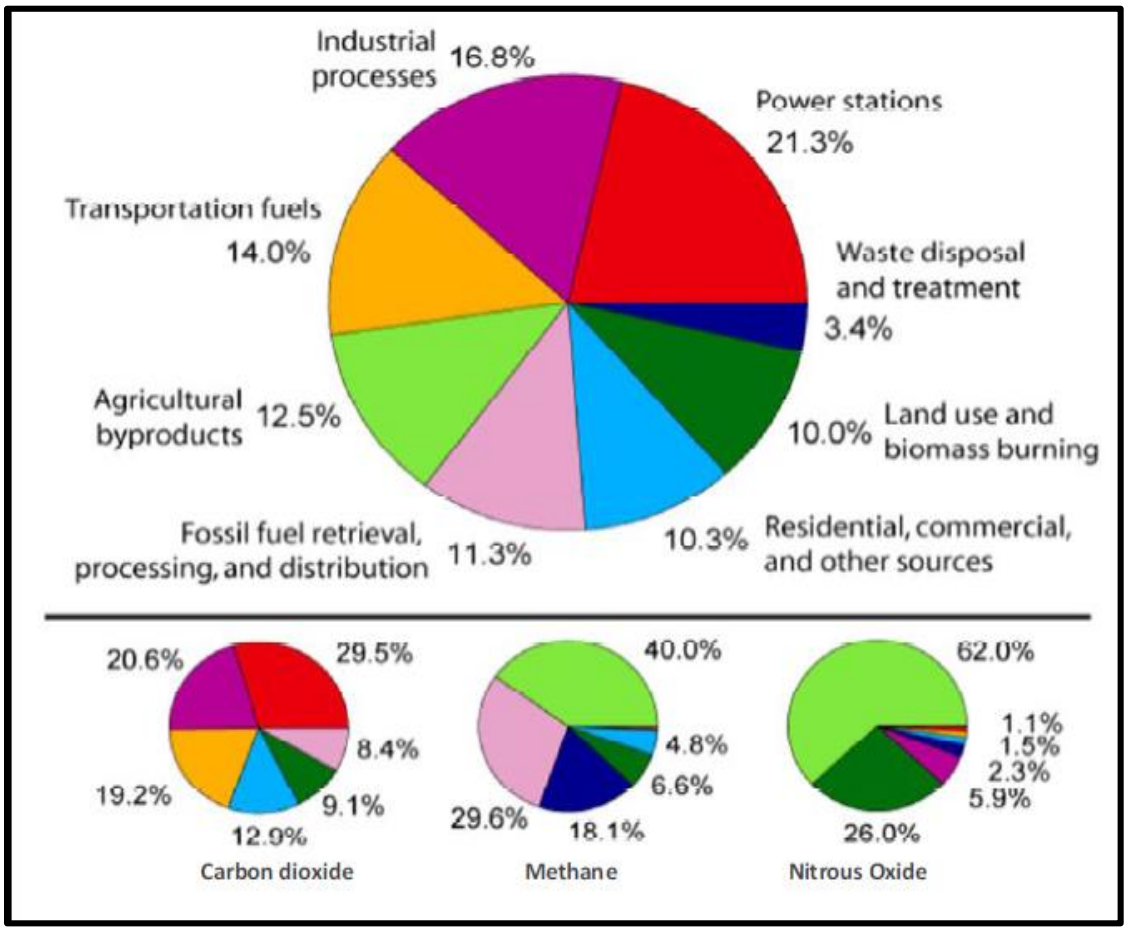

Figure 1: greenhouse gas emissions from various sector [13]

Factors led to Global warming

"Greenhouse gases" are the main contributors to worldwide heating. They occasionally include gases like CO_2, methane, and nitrous oxide along with metals like bromine and chlorine. The radioactive equilibrium of the atmosphere changed when these gases build up. Greenhouse gases have the overall effect of warming the Earth's surface and the lower atmosphere because they absorb a little solar ray and reflect some of them toward the surface. Carbon dioxide is responsible for around 50% of the greenhouse effect and half of the heat stored in the atmosphere by trace gases [14].

Between 1850 and the end of the 20th century, 2.5 W/m2 of net warming occurred, with methane contributing 25%, carbon dioxide 60%, and nitrous oxides and halocarbons accounting for the remaining portion[15].The ozone layer thinning is the second main contributor, primarily caused by chlorine-releasing gases. Aerosols in the atmosphere reflect and absorb solar and infrared light, altering cloud characteristics and affecting air temperature. Human activities contribute to aerosol production, including farming byproducts, biomass burning, industrial operations, and transportation exhaust emissions [12].

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Effect of Global warming

Effects on Environment

The number of pollutants in the climate has grown by up to 33% since begin of the revolution in the second half of the 18th century [16]. little of the change that have recently been found in the world wide that have been led to an increase in global heat include flooding, coastal erosion, droughts, salt water entrance into the soil, exceptionally- high numbers of “tropical storms and cyclones”, and a lot of rain. In many regions of the world, floods- happen because of rising sea levels [18, Fig 2]. Since the turn of the century, the warming of our planet has caused the sea level to increase by almost one meter [17].

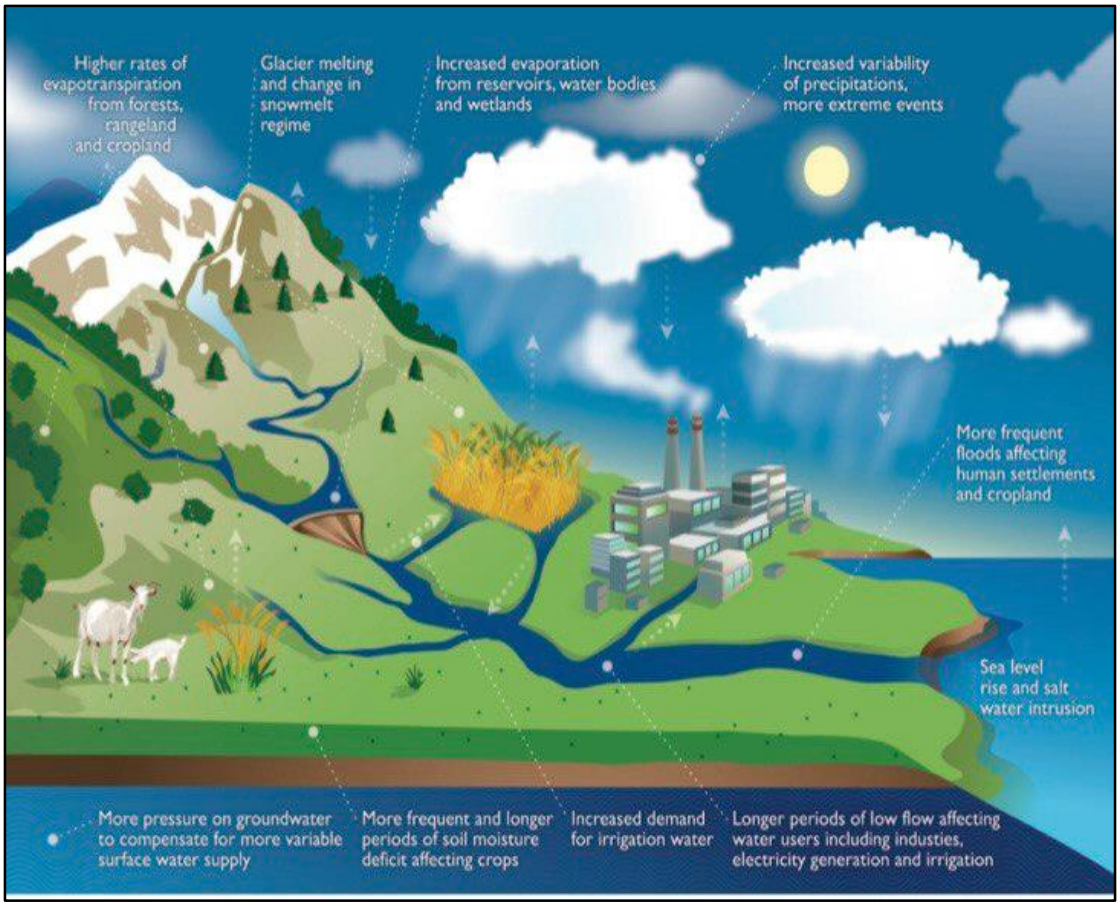

Figure 2: Environmental effects of global warming [18]

Temperature rise

As long as people keep abusing the environment, particularly by burning fossil fuels, the total surface heat of the earth will continue to rise. Finally, of the twenty-first century, scientists project that the surface temperature would increase by 2–6°C based on three CO2 emissions scenarios [19]. The right ambient temperature and an adequate supply of water are essential for the survival and growth of plants, crops, and animals. Their ability to develop and reproduce will be hampered by an increase in the earth's temperature [20]. In addition, sever climate condition like absence of precipitation, storms, heat waves, and floods will intensify and spread more widely as

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global temperatures increase [21]. This will result in more deaths and property damage. In addition, Snow and ice melt when the temperature rises, which raises sea levels and causes snowy surfaces to change from reflecting sunlight to absorbing it, so trapping more energy in the earth's atmosphere [22, 23].

Melting of Glaciers

In the near future, droughts followed by flooding may be caused by global glacier melting. Due to increased demand for drinking water, industry, and irrigation as well as significant losses of moisture through evapotranspiration, water supply may become a serious social and agricultural issue. Coastal biodiversity is disappearing more quickly, especially the mangrove plant and animal species that are essential to conserving the coastal environment, which may result from coastal inundation brought on by sea level rise and water expansion [7]. More water enters the oceans than was previously locked in land-based glaciers like the Greenland and Antarctic ice sheets as the global temperature balance rises. The majority of glaciers globally expected to lose 60% of their volume on average until 2050 [25,Fig.3]. Greenland's overall annual ice melt rate is 2.39± 23 cubic km. Up to 6.5 meters of sea level rise would affect the Indian Ocean, sections of Canada, and the United States [24].

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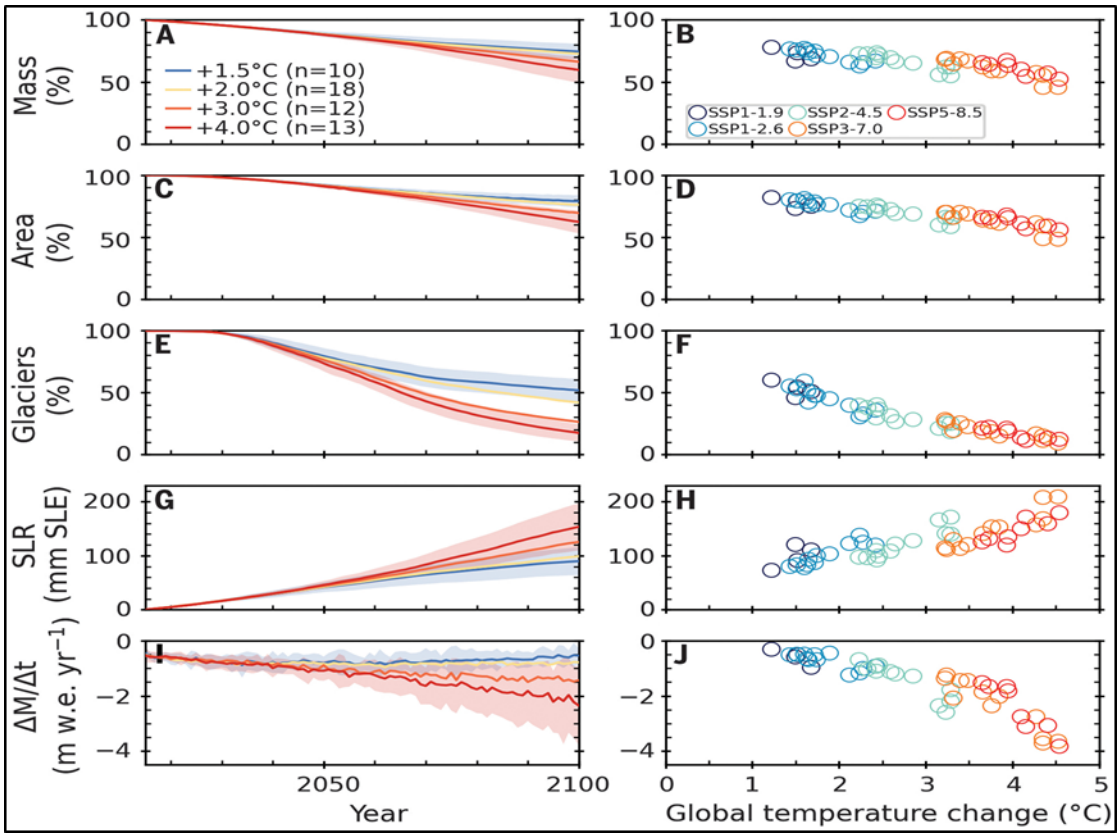

Figure 3: Global glacier variations predicted under several scenarios of a rise in average global temperature [25].

The remaining mass (A) and (B), area (C) and (D), glaciers (E) and (F), sea level rise (SLR) from glaciers (G) and (H), shows the average mass change rate across the region (J and I) for all glaciers worldwide. The projections are displayed at 2100 (right panels) and from 2015 to 2100 (left panels). [(A) to (H)] values compared to 2015. The possibilities related to changes in global mean temperature (left panels) and the SSPs associated with those changes (right panels) represented by colors. The legend displays the number (n) of glacier projections that fit within each temperature change scenario using several general circulation models (GCMs) and SSPs. The left panels display the ensemble median, with shading denoting the 95% confidence interval for each scenario including variation in temperature.

Oceans and Marine Life

With time, the oceans have absorbed half of the anthropogenic CO2, which lessens climate warming, but at a significant cost to the water's chemistry [34,Fig.4]. The formation of carbonic acid when carbon dioxide dissolves in water lowers the pH of the surface water [26]. Since 300 million years ago, the pH of the oceans has been around 8.2, but now it is closer to 8.1. This reduction in pH indicates a 25% rise in acidity during the previous 200 years, and it will have an impact on the life cycles of many marine organisms [27].

In addition, oceans absorb roughly 80%of the heat that greenhouse gases trap, raising the temperature of the water and causing it to expand. According to scientists, thermal expansion is responsible for nearly half of the increase in sea level over the

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last century [28] .Since 1990 the sea level has been rising at a pace of 0.14 inches per year, with thermal expansion of water being the main contributor. Additionally, when the temperature warms up, snow and ice will melt, raising the sea level [29]. Scientists predict that a of numerous species. The quantity and distribution of organisms in their ecosystem may be impacted by climate change [31,32] . One of the most striking repercussions of global warming is coral bleaching, this happens when the algae that inhabit coral dies due to a rise in water temperature. Because these algae are the coral's sole food supply, the coral will perish if they eliminated [33]

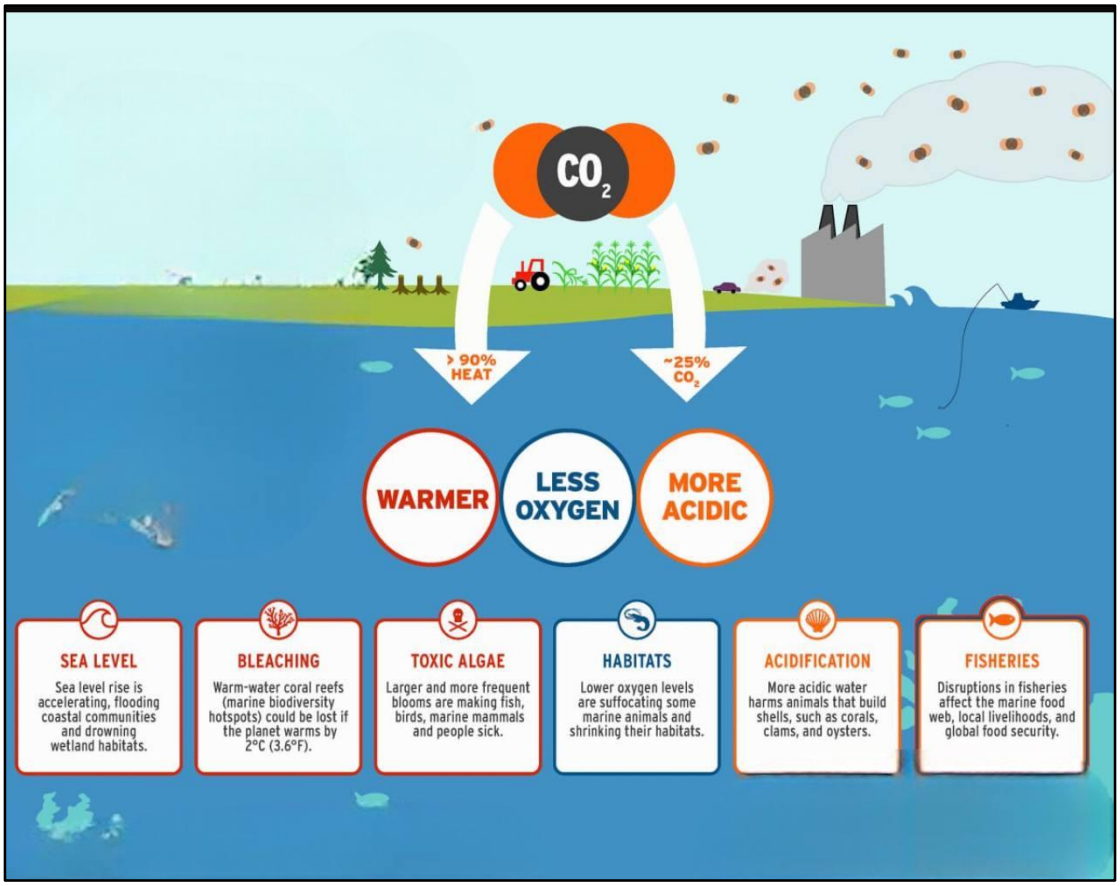

Figure 4: Explain the impacts of global warming on aquatic organisms [34].

Effect on Agriculture

A significant source of worry is the effect of climate change on the output of agriculture worldwide. First, concerns about food security a prominently listed among the human endeavors and ecological functions that imperiled by anthropogenic climate change. Second, every country is understandably concerned about the potential negative and because it will have an impact on local and international policy, trade patterns, resource usage, regional planning, and ultimately their welfare, the phenomenon might have beneficial impacts on its population over the following decades [35]. The divide between developed and poor nations will certainly expand

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because of the consequences of extreme weather, shifting precipitation patterns, and potentially more frequent extreme weather conditions like drought and floods, according to recent studies [7]. Even though, the real way that to employee CO2 levels even in the absence of climate change. Everyone agrees that developing nations are more vulnerable to the effects of climate change than wealthy countries because their economies are based mostly on agriculture, there is a lack of money for adaption measures, their baseline climates are warmer, and they are exposed to more severe occurrences. Thus, given that there are 800 million undernourished people in underdeveloped nations, climate change may have particularly harmful effects there. An assortment of more than 40 "least developed" countries, especially in sub-Saharan Africa, have domestic food output per person that is below average, has decreased by 10% during the previous 20 years. There is clear clue to conclude that is agriculture impacted by environmental change [36].

The quantity of CO2 present and the surrounding temperature affect how rapidly a plant develops. The length of the plant or crop's growth season affected by how quickly plants grow which changes as temperatures and CO2 levels rise[37]. For every 1% increase in the mean temperature of the growing season, which spans from 30 to 400 °C, rice output predicted to decline by 10%. The increase in lowest temperature will have a greater influence on the reduction in rice grain yield than the increase in maximum temperature, which will have less of an effect. At a rate of 3-4% for every 0°C increase in mean air temperature, wheat productivity must decrease. While high temperatures encourage the development of vegetative organs like stems and leaves stems, they will have a negative impact on reproductive organs like pollen spikelets. Due to the high proportion of pollen and spike sterility caused by high temperatures, wheat and rice plants both seem to be particularly vulnerable to them. Compared to Khari harvests, Rabi crops are likely to suffer more losses. Global warming anticipated posing a threat to the growing of wheat furthermore to additional hypothermophilic plants like cabbage and cauliflower in Central India and tepid plants such as cherries, apples, plums, and peaches in Northern India. Less frequent frost damage predicted in northern India. Global warming may significantly influence the survival of indigenous crops like litchi and basmati rice. Food trade is unfair since it benefits Europe and North America while having a detrimental impact on countries that are tropical or subtropical, such as India, Brazil, and Mexico [7, 36].

Global Warming mitigation and adaptation

The most important elements in addressing the response to climate change are adaptation and mitigation [38]. Researchers define climate change mitigation, whereas adaptation such as floods has a direct bearing on the phenomenon. Because mitigation serves to restrict or regulate greenhouse gas emissions to some extent, it is beneficial to the environment as well as the economy [38,39]

The first is to do nothing and allow greenhouse gases to keep accumulating in the atmosphere, which would eventually wipe out all life on Earth. There are three

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ways to address environmental change. Reduce human greenhouse gas emissions is the second option, the third step is adaptation to environmental change, which entails creating policies and behaviors that will lessen the effects of climate change [40].

Reducing greenhouse gas emissions through the adoption of more modern and low-GHG emitting technologies offers significant possibilities for mitigation in both the short and long terms [41], and this improvement has occurred in some nations more quickly than anticipated. The following are examples of technological means:

1- Provides solar energy equipment for both industrial and home use, as well as wind turbines.
2- Supporting the development and production of vehicles with effective hybrid engines.
3- Hazardous gases, such as the chlorofluorocarbons created during the manufacturing of aluminum and the nitrous oxide released during the synthesis of adipic acid, should be disposed of quickly.
4- The development of fuel cell technology sometimes referred to as carbon dioxide geological storage.
5- Promoting and placing a high priority on research and development in the fields of sustainable technology and renewable energy.
6- Campaigns to increase environmental consciousness and run extensive media campaigns, especially in poor nations, can be launched utilizing placards, posters, and logos.
7- Nuclear power consider part of good energy producing with little effect to the environment. However, it costly and not briefed economically so it would not attractive to use of nuclear power [12].

CONCLUSION

Since fossil fuel-based industrial revolution, countries have been in competition with one another due to development, which has elevated global warming to a major risk to both human health and the environment wellbeing. Global warming cause's drought, excessive precipitation, and precipitation that is advantageous to crops. Tropical storms, extreme flooding, and drought are already leading to destruction in many regions of the world. All countries must however, collaborate to reduce greenhouse gas emissions to an acceptable scale in order to secure the planet from the devastating impacts of global warming. Nations should priorities renewable energy instead of energy produced from fossil fuels in order to grow.

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Conflict of interests.

There are non-conflicts of interest.

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الخلاصة

تهدف هذه المقالة الى التعرف على المسببات التي تساهم في ظاهرة الاحتباس الحراري وتقدم السبب الأكثر احتمالا، وفقا للأدلة المنشورة. بالإضافة إلى ذلك، توفر هذه الصفحة استراتيجيات تخفيف متنوعة لمشكلة الاحتباس الحراري. إن الحل الاقتصادي والتقني الأكثر عملية لمشكلة الاحتباس الحراري العالمي يتلخص في التبني المتزامن لتقنيات التخفيف والتكيف.

يعد الاحتباس الحراري نتيجة رئيسية للأنشطة البشرية الناجمة عن الإفراط في استخدام الوقود الأحفوري كمصدر للطاقة، مما أدى إلى زيادة تركيز الغازات الدفيئة (GHGs). يحتوي الغلاف الجوي على غازات تزيد من متوسط درجة حرارة سطح الأرض، مثل ثاني أكسيد الكربون، والميثان، وأكسيد النيتروز، وبخار الماء. أصبحت ظاهرة الاحتباس الحراري مشكلة عالمية لها آثار سلبية على أجزاء مختلفة من البيئة بسبب ذوبان الأنهار الجليدية، وزيادة ثاني أكسيد الكربون (CO_2)، وارتفاع درجة حرارة المسطحات المائية، عمومًا لا يزال الناس غير مدركين لظاهرة الاحتباس الحراري ولا يرون أنها مشكلة رئيسية في السنوات القادمة.

الكلمات المفتاحية: الاحتباس الحراري، غازات الدفيئة، الغلاف الجوي، النشاط البشري ،البيئة.