Effective measures to reduce the increased global warming

MINI PROJECT REPORT SUBMITTED

TO

THE DEPARTMENT OF PHYSICS

By

MEENU KRISHNA (23022100016)

MEENU KUTTY S S (23022100017)

ROSHNI. A (23022100018)

SHANI SHAJI (23022100019)

SRUTHI.S (23022100020)

ALFA.N.A(23022100021)

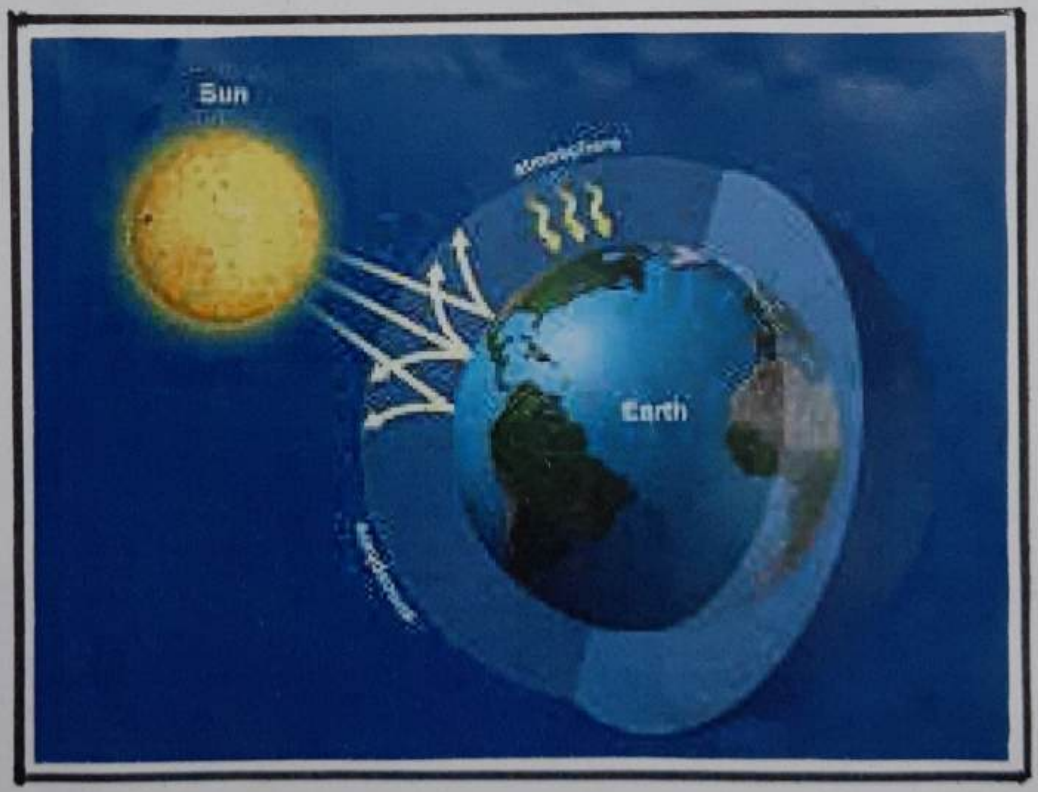
JEEVITHA ANNA GEORGY (23022100022)

JENIFAR.P (23022100023)

ALL SAINTS' COLLEGE

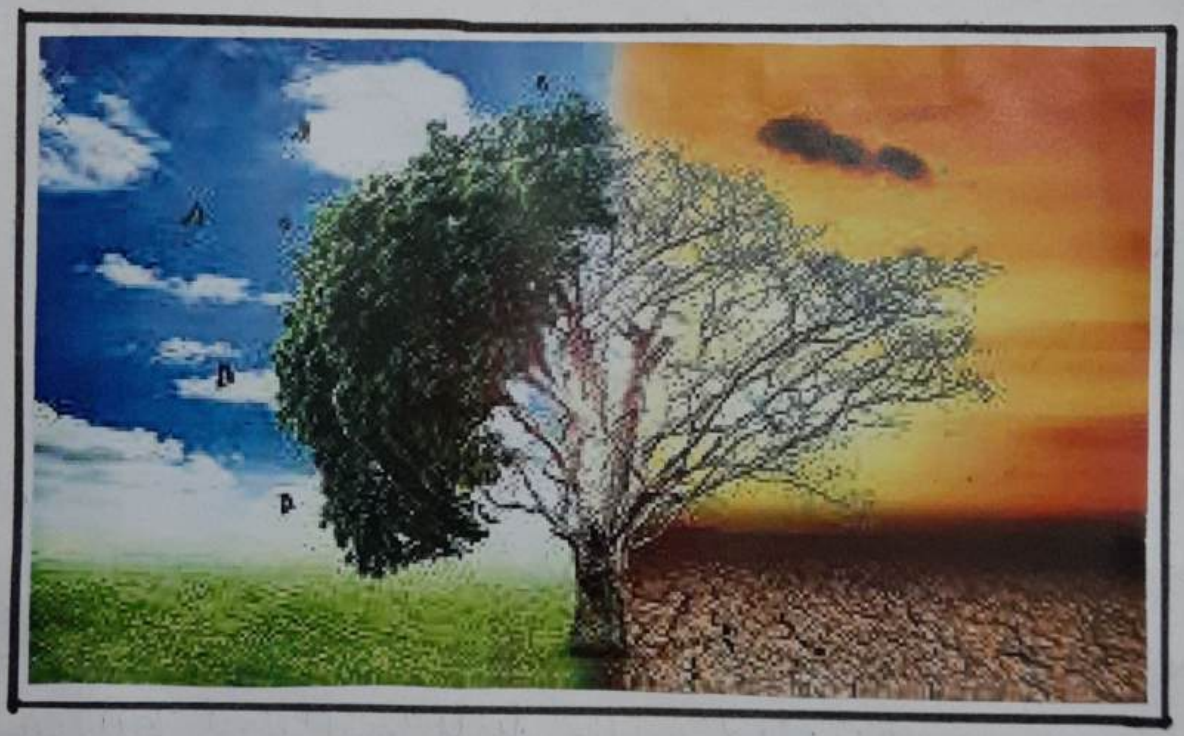
THIRUVANANTHAPURAM

2023-2024


Sun
Earth

During the middle Holocene, some 5000 - 7000 years ago, conditions appear to have been relatively warm & indeed perhaps warmer than today in some parts of the world and during certain seasons. For this reason, this interval is sometimes referred to as the Mid Holocene Climatic optimum. The relative warmth & average mean surface air temperatures at this time, however is somewhat unclear. Changes in the pattern & insolation favoured warmer summers at higher altitude in the Northern Hemisphere, but these changes also produced cooler winters in the Northern Hemisphere and relatively cool conditions year round in the tropics. Any overall hemispheric or global mean temperature changes thus reflected a balance between competing regional and regional changes. In fact the latest theoretical climate model studies suggest that global mean temperatures during the middle Holocene were probably 0.2 - 0.8° C colder than the average late 20th century.

Over the subsequent millennia, conditions appear to have cooled relative to the middle Holocene levels this period has sometimes been referred to as Neoglacial. In the middle glacials the cooling trend was associated with intermittent periods of advancing and retreating mountain glaciers reminiscent of the more advance and retreat Pleistocene Epoch.



Greenhouse gases

As discussed above, greenhouse gases warm earth's surface by increasing the net downward long wave radiation reaching the surface. The relationship between atmospheric concentration of greenhouse gases and associated positive radiative forcing of the surface is different for each gas. A complicated relationship exists between the chemical properties of each greenhouse gas and the relative amounts of long wave radiation follows a discussion of the radiative behaviour of each major greenhouse gas.

Water vapour

Water vapour is the most potent of the greenhouse gases in Earth's atmosphere but its behaviour is fundamentally different from that of other greenhouse gases. The primary role of water vapour is not as a direct agent of radioactive forcing but rather as a climate feedback that is as a response within the climate system that influences the system's continued activity. This distinction arises from the fact that the amount of water vapour in the atmosphere cannot be generally be directly modified by human behaviour but is instead set by temperatures the warmer the surface the greater the evaporation rate of water from the surface. As a result increased Evaporation leads to greater concentration of water vapour in lower atmosphere.


GLOBAL WARMING
SOLUTIONS

which is associated with increased concentrations of greenhouse gases caused by human activity. In particular the burning of fossil fuels raises the concentrations of the major greenhouse gases in the atmosphere and these higher concentrations have the potential to warm the atmosphere by several degrees

Radiative forcing

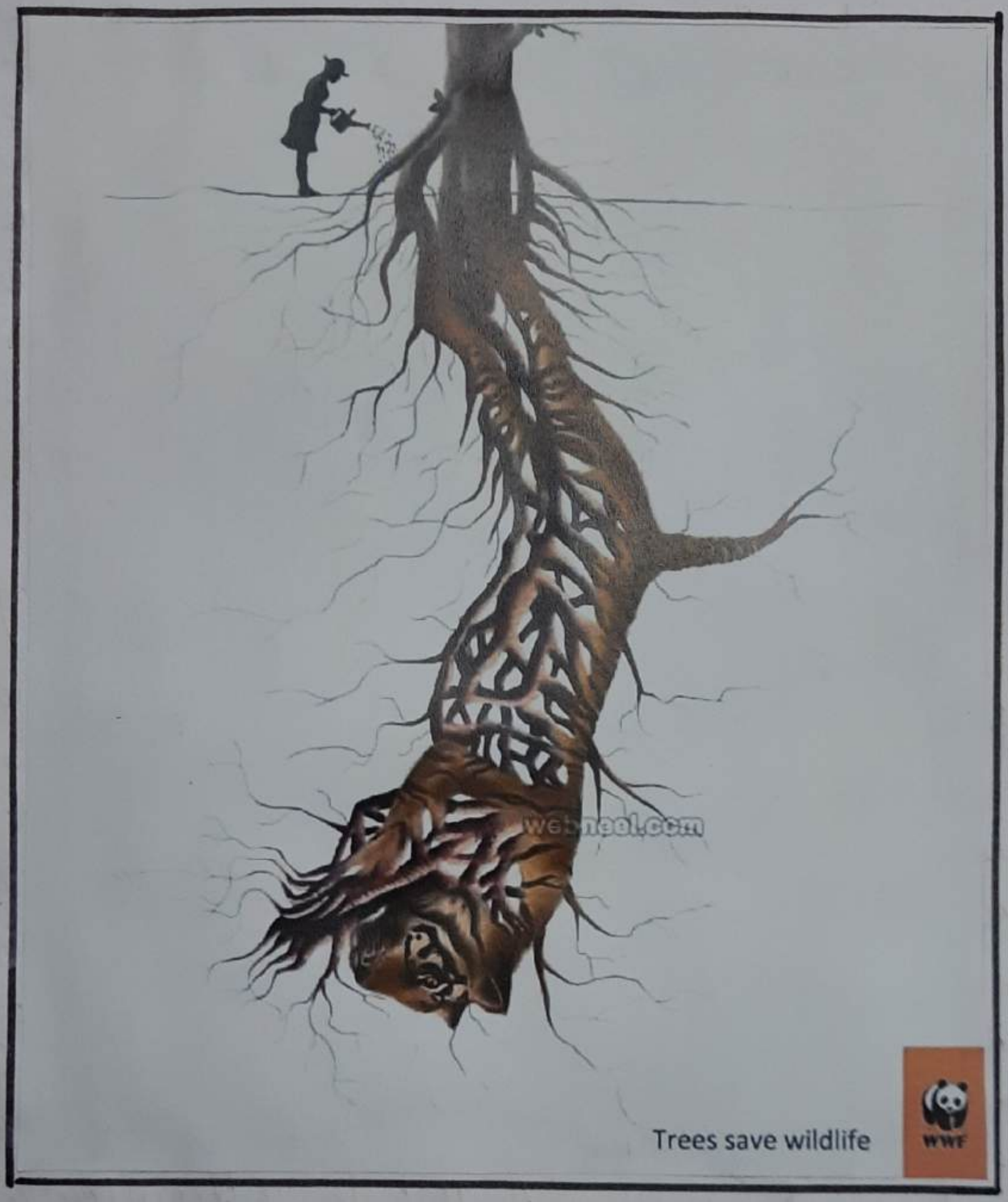
In light of the discussions above of the greenhouse effect it is apparent that the temperature of Earth's surface and lower atmosphere may be modified in three ways (1) through a net increase in the solar radiation entering at the top of Earth's atmosphere, (2) through a change in the fraction of radiation reaching the surface and through a change in the concentration of greenhouse gases in the atmosphere. In each case the changes can be thought of terms of radiative forcing. As defining by the IPCC radiative forcing.

The Influences of human activity on Climate.

Human activity has influenced global surface temperature by changing the radiative balance governing the Earth on various timescales at at varying spatial scales. The most profound and well known anthropogenic influence. The Elevation of concentrations of greenhouse gases in atmosphere Humans also influence climate by changing the concentrations and aerosols and ozone and by modifying the land covers of Earth's surface

Equally in all directions (that is, as much downward as upward), the net effect of absorption by greenhouse gases is to increase the total amount of radiation emitted downwards towards Earth's surface and lower atmosphere must emit more radiation than original 40 units. Consequently, the surface temperature must be higher. This process is not quite the same as that which governs a true greenhouse, but the end effect is similar. The presence of greenhouse gases in the atmosphere leads to a warming of the surface and lower part of the atmosphere (and a cooling higher up in the atmosphere) relative to what would be expected in the absence of greenhouse gases.

It is essential to distinguish the "natural" or background greenhouse effect from the enhanced greenhouse effect associated with human activity. The natural greenhouse effect is associated with surface warming properties of natural constituents of Earth's atmosphere especially water vapour, carbon dioxide and methane. The existence of this effect is accepted by all scientists. Indeed, in its absence, Earth's average temperature would be approximately 33°C (59°F) colder than today and Earth would be a frozen and likely uninhabitable planet. What has been subject to controversy is the so called enhanced greenhouse effect, which is associated with increased concentrations of greenhouse gases caused by human activity.

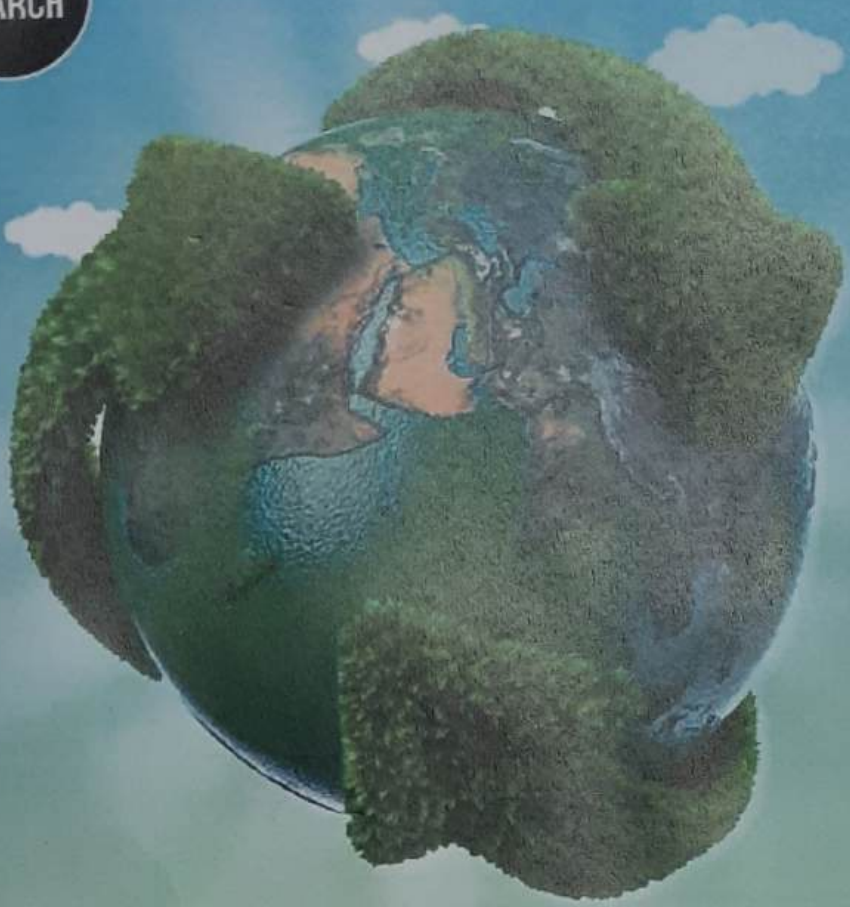

Trees save wildlife
WWF

The Greenhouse Effect.

The average surface temperature of Earth is maintained by a balance of various forms of solar and terrestrial radiation. Solar radiation is often called "shortwave" radiation because the frequencies of the radiation are relatively high and wavelengths relatively short close to the visible portion of Electromagnetic spectrum. Terrestrial radiation, on the other hand is often called longwave radiation because the frequencies are relatively low and wavelengths. relatively long somewhere in the infrared part of the spectrum. Downward moving solar Energy is typically measured in watts per square metre. The Energy of total incoming solar radiation at the top of Earth's atmosphere amounts roughly to 1366 watts per square metre annually. Adjusting for the fact that only one half of the planet's surface receives solar radiation at any given time, the average surface Isolation is 342 watts per square metre.

The amount of solar energy absorbed by Earth's surface is only a small fraction of the total solar radiation entering the atmosphere. For every 100 units of incoming solar radiation roughly 30 units are reflected back to space by either clouds, the atmosphere or reflective regions of Earth's surface. is only a small fraction of the total solar radiation entering the atmosphere. For every 100.

12TH
MARCH



SAVE OUR PLANET

In light of the COVID-19 pandemic, many of this year's Earth Day celebrations are now being held virtually. The great part is that it's now much easier to attend events from all over the world in your own home

JOIN THE CAMPAIGHN

define climate. Normally, climate change can be visited as combination of various natural forces occuring over diverse timescales. Since the advent of human civilization climate change has involved an anthropogenic or exclusively human caused element and this anthropogenic element has become more important the Industrial period of past two centuries. The term global warming is used specifically to refer to any warming of near surface air during the past two centuries that can be traced to anthropogenic causes.

To define the concepts of global warming and climate change properly, it is first necessary to recognise that the climate of Earth has varied across many timescales, ranging from an individual human life span to billions of years. This variable climate history is typically classified in terms of "regimes" or "epochs". For instance, the pleistocene glacial epoch (about 2600000 to 11700 years ago was marked by substantial variations in the global extent of glaciers and ice sheets. These variations took place on timescale of tens to hundreds of milennia and were driven by changes in the distribution of solar radiation across Earth's surface. The distribution of solar radiation is known as the insolation pattern and it is strongly affected by the geometry of Earth orbit around the sun and by the orientation or tilt of Earth's axis relative to the direct rays of the Sun.


2019
20??
How many days to extinction?

of the 20th century could be attributed to human activities. It predicted that the global mean surface temperature should increase between 3 and 4°C by 2100 relative to the 1986-2005 average should carbon emissions continue at their current rate. The predicted rise in temperature was based on a range of possible scenarios that accounted for future greenhouse gas emissions and mitigation measures and on uncertainties in the model projections. Some of the main uncertainties include the precise role of feedback processes and the impact of industrial pollutants known as aerosols, which may offset some warming.

Many climate scientists agree that significant social economic and ecological damage would result if global average temperature rose by more than 2°C (3.6F) in such a short time. Such damage would include increased extinction of many plants and animals species, shifts in pattern of agriculture and rising sea levels. By 2015 all but a few national governments had begun the process of instituting carbon reduction plans as part of the paris agreement a treaty designed to help countries keep global warming to 1.5°C above pre industrial levels in order to avoid the worst of the predicted effects. Past IPCC reports assessments reported that the global average sea level rose by some 19-21cms (7.5-8.3 inches) between 1901 and 2010 and that between 1901 & 2010 and that sea levels rose faster in second half of 20th Century than in first half.

www.nature.org

149

ACRES

of rainforest are destroyed every minute.

The Nature Conservancy

Protecting nature. Preserving life.™

units of incoming solar radiation roughly 30 units are reflected back to space by clouds the atmosphere or reflective regions of Earth's surface. This reflective capacity is defined so as Earth's planetary albedo and it need not remain fixed over time, since the spatial extent and distribution of reflective formations, such as clouds and ice cover, can change the 70 units of solar radiations that are not reflected may be absorbed by the atmosphere clouds or the surface. In the absence of further complications, in order to maintain Athermody anamic Equilibrium Earth's surface and atmosphere must radiate these same 70 units back to space. Earth's surface temperature is tied to the magnitude of this emission of outgoing radiation according to the Stefan Boltzmann law.

Earths energy budget is further complicated by greenhouse effect. Trace gases with certain chemical properties the so called greenhouse gases mainly CO_2, N_2O, CH_4 and N_2O absorb some of infrared radiations produced by Earth's surface Because of this absorption, some fraction of original 70 units does not directly escape to space Because greenhouse gases emit the same amount of radition they absorb and because this radiation is emitted


SAVE THE TREES
SAVE THE EARTH
EVERYTHING WE DO WITH TREES AFFECTS TO THE EARTH!

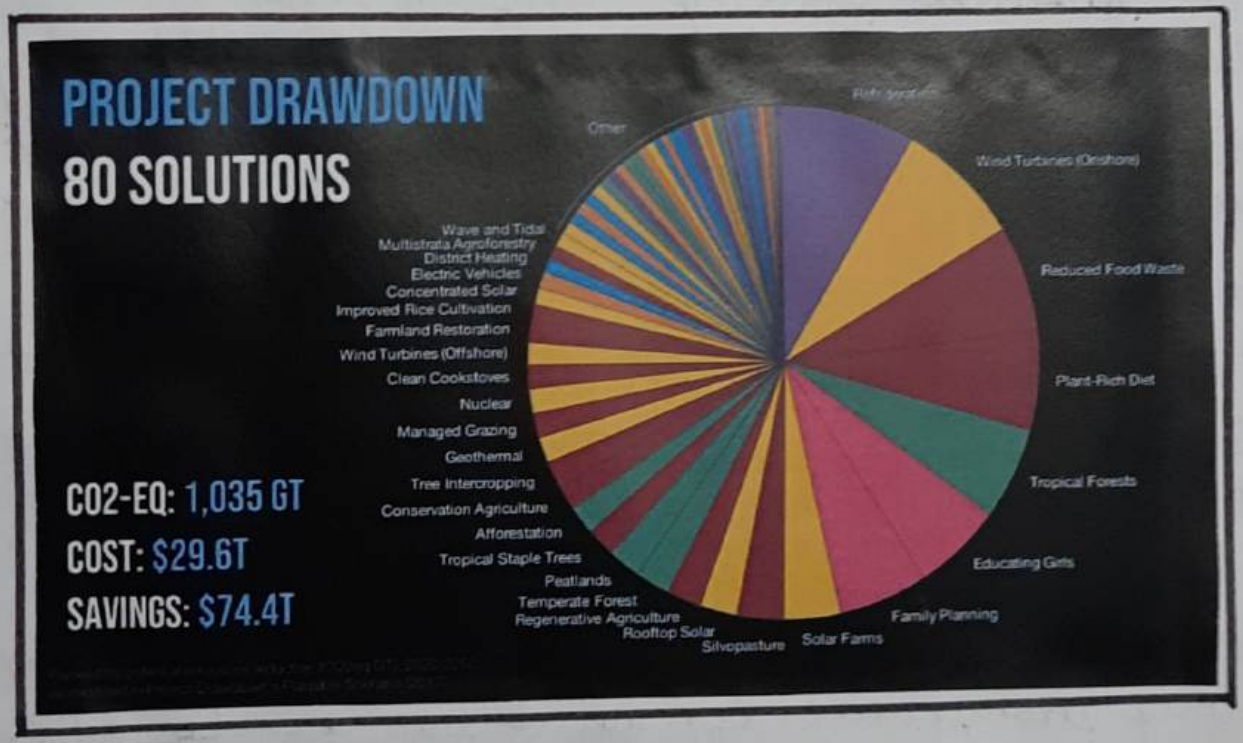
Carbon dioxide.

Of the greenhouse gases Carbon dioxide is most significant. Natural sources of atmospheric CO_2 include sources of atmospheric CO_2 include outgassing from volcanoes, the combustion and natural decay of organic matter and respiration by aerobic (oxygen using) organisms. These sources are balanced or managed by a set of physical chemical or biological processes called sinks that tends to remove CO_2 from the atmosphere. Significant natural sinks include terrestrial vegetation, which takes up CO_2 during the process of photosynthesis.

A number of ocanic process also act as Carbon sinks. One such process called solubility pump involves the descent of surface seawater containing dissolved CO_2. Another process the biological pump involves the uptake of dissolved CO_2 by marine vegetation of phytoplankton living in the upper ocean or by other marine that use CO_2 to build skeleton and other structures made of $CaCO_3$. As these organisms expire and fall to the ocean floor, the carbon they contain is transported downward & eventually buried at depths. A long term balance between these natural sources and sinks leads to the background or natural, level of CO_2 in the atmosphere.

The surface level ozone and other compounds the next most significant greenhouse gas is surface or low level ozone (O_3) Surface O_3 is a result of air pollution It must be distinguished from naturally occuring stratospheric O_3, which has a very different role in the planetary radiation balance.


#218499967


PROJECT DRAWDOWN
80 SOLUTIONS
CO2-EQ: 1,035 GT
COST: $29.6T
SAVINGS: $74.4T
Other
Wind Turbines (Onshore)
Reduced Food Waste
Plant-Rich Diet
Tropical Forests
Educating Girls
Family Planning
Solar Farms
Silvopasture
Rooftop Solar
Regenerative Agriculture
Temperate Forest
Peatlands
Tropical Staple Trees
Afforestation
Conservation Agriculture
Tree Intercropping
Geothermal
Managed Grazing
Nuclear
Clean Cookstoves
Wind Turbines (Offshore)
Farmland Restoration
Improved Rice Cultivation
Concentrated Solar
Electric Vehicles
District Heating
Multistrata Agroforestry
Wave and Tidal

Nitrous oxides and fluorinated gases
Additional trace gases produced by industrial activity that have greenhouse properties includes nitrous oxides (N_2O and fluorinated gases (halocarbons) the latter include sulfur hexafluorides..
hydro fluorocarbons and perfluorocarbons. Nitrous oxide is responsible for 0.16 watt per square metre radiative forcing, while fluorinated gases are collectively responsible for 0.34 watt. per square metre. nitrous oxides have small background concentrations due to natural biological reaction in soil and water, whereas the fluorinated gases owe their existence almost entirely to industrial sources.

Aerosols

The production of aerosols represents an important anthropogenic radiative forcing of climate, Collectively aerosols block that is reflect and absorb a portion of incoming solar radiation) and this creates a negative radiative force. Aerosols are second only to greenhouse gases in relative importance in their impact on near-surface air temperatures. Unlike the decade long residence times of the well mixed greenhouse gases such as CO_2 and CH_4 aerosols are readily flushed out of atmosphere within days, either by rain or snow / or by settling out of the air they must therefore be continually generated in order to produce a steady effect on radioactive force Aerosols have the ability to influence climate directly by absorbing or reflecting incoming solar


alamy stock photo

radiation but they can also produce indirect effects on climate by modifying cloud formation or cloud properties. Most aerosols cause as a condensation nuclei however darker coloured aerosols may hinder cloud formation by absorption sunlight and heating up the surrounding air. Aerosols can be transported thousands of kilometres from their sources of origin by winds and upper level circulation in the atmosphere

Perhaps the most important type of anthropogenic aerosol is radiative forcing is sulphate aerosol. It is produced from sulphur dioxide (SO_2) emissions associated with the burning of coal and oil. Since the late 1980s, global emissions of SO_2 have decreased from about 15.15 million tonnes (167.0 million tons) to less than 100 million tons.

Natural Influences on Climate

There are number of natural factors that influence Earth's climate. These factors include external influence such as explosive eruptions, natural variations in the output of the Sun. In addition there are natural oscillation in Earth's climate that alter global patterns of wind circulation precipation, and surface temperature one such phenomenon is the EL Nino/Southern a coupled atmosphere and ocanic event that occurs in the pacific Ocean every three to seven years. In addition the altalantic multidecal Oscillation (AMO) is similar phenomenon that occurs over decades in North Altalantic Ocean.

The scenarios referred to above depends mainly on future concentrations of certain trace gases, called greenhouse gases that have been injected into the Earth's atmosphere in increasing amount through the burning of fossil fuels for industry transportation and residential uses. Modern global warming is the result of an increase in magnitude of so called greenhouse effect, a warming of Earth's surface and lower atmosphere caused by the presence of water vapour, Carbon dioxide, methane, nitrous oxide and other greenhouse gases. In 2014 the IPCC reported that concentrations of Carbon dioxide, methane and nitrous oxides in the atmosphere surpassed those found in ice cores dating back 800 000 years.

Of all these gases, carbon dioxide is the most important, both for its role in the greenhouse effect and for its role in human economy. It has been estimated that at the beginning of the Industrial age in the mid 18th century, Carbon dioxide concentrations in the atmosphere were roughly 280 ppm. by the middle of 2018 they had risen to 406 ppm and if fossil fuels continue to be burned at current rates they are projected to reach 550 ppm by mid 21st century - essentially a doubling of carbon dioxide concentrations in 300 years.

Climatic Variation Since the last Glaciation.

Global warming is related to more general phenomenon of climate change, which refers to the changes in the totality of attributes that.


22 trees
are required
everyday to meet the oxygen demands of one person

Global warming the phenomenon of increasing average air temperature near the surface of Earth over the past one to two centuries. Climate scientists have since have the mid 20th century gathered detailed observations of various weather phenomenon (such as temperatures, precipitation and storms) of related influences on climate (such as ocean currents and the atmosphere's chemical composition.) these data indicate that Earth's climate has changed over almost every conceivable timescale since the beginning of geologic time and that the influence of human activities since at least the beginning of the Industrial Revolution has been deeply woven into the very fabric of climate change.

Giving voice to a growing conviction of most of the scientific community the Intergovernmental panel on climate change (IPCC) was formed in 1988 by the World Meteorological organisation (WMO) and the united Nations Environment program (UNEP) in 2013 the IPCC reported that the interval between 1880 and 2012 saw an increase in global average surface temperature of approximately 0.9°C the increase is closer to 1.1°C when masked relative to preindustrial mean temperature.

A special report produced by the IPCC in 2018 found this estimate further, noting that human beings and human activities have been responsible for a worldwide average temperature increase

Between 0.8 - 1.2°C of global warming observed since the mid half.