

ARTICLE

Global Warming and Its Multiple Causes

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ABSTRACT

The global warming which preoccupies humanity, is still considered to be linked to a single cause which is the emission of greenhouse gases, CO₂ in particular. In this article, we try to show that, on the one hand, the greenhouse effect (the radiative imprisonment to use the scientific term) took place in conjunction with the infrared radiation emitted by the earth. The surplus of CO₂ due to the combustion of fossil fuels, but also the surplus of infrared emissions from artificialized soils contribute together or each separately, to the imbalance of the natural greenhouse effect and the trend of global warming. In addition, another actor acting directly and instantaneously on the warming of the ambient air is the heat released by fossil fuels estimated at 17415.1010 kWh / year inducing a rise in temperature of 0.122°C, or 12.2°C / century.

1. Introduction

Global warming, an object of current world occupation is attached above all to the greenhouse effect (anthropogenic), due to human activity, and this by the combustion of fossil energies (coal, oil and gas) and their emissions of greenhouse effect gas. This warming should prompt us to look for the cause to avoid it or provide remedies.

2. Greenhouse Effect and CO₂ Emission

In fact, the annual global consumption of energy amounts to around 15,000 Mtoe generating the emission of almost 35,000 MtCO₂e (Figure1 à 3) [1]. This quantity is added to atmospheric gas (air and humidity) to create a surplus of anthropogenic GHGs causing global warming, the COP 21 ... 26 of which strives to reduce its effects by encouraging states to limit their CO₂ emissions. Although the share of CO₂ emitted represents only 0.0007% of the

atmospheric mass, but it reaches 2.3% of the mass of CO₂ contained in the atmosphere.

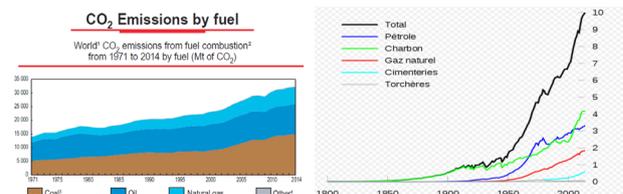


Figure 1. Global CO₂ emission [1]

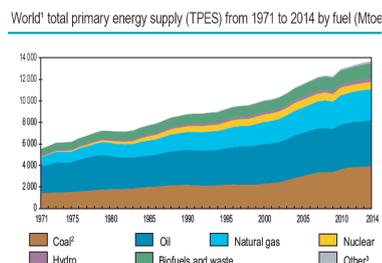


Figure 2. Evolution of energy consumption world [1]

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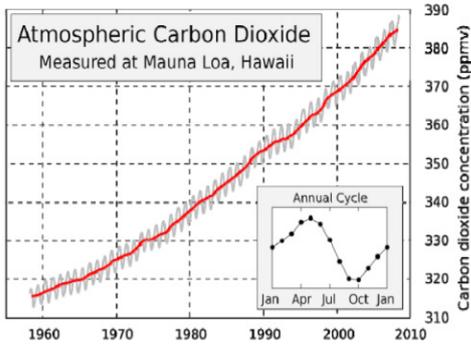


Figure 3. Evolution of concentration of particles in the air

However, other considerations must be taken into account to create the greenhouse effect, although the name is not perfect, because an agricultural greenhouse does not heat only by the plastic or the glass that envelops it because if we opens it, it cools, so it's the absence of transfer by convection with the outside by the immobilization of the air in its movement and not the radiation that heats a greenhouse [2-6]. For the earth, on the contrary: it is the radiative imprisonment of this planet which heats it. Capturing the air of the earth makes no sense.

GHGs are selective: they allows short wavelength sunlight [0.25 to 2.5m] to pass through the earth and are opaque to terrestrial infrared emission [5 to 50m] (Figure 4) towards space. Thank goodness this is necessary for life on earth by maintaining an average temperature of 15 ° C currently, against -18°C in fact the absence of the greenhouse effect.

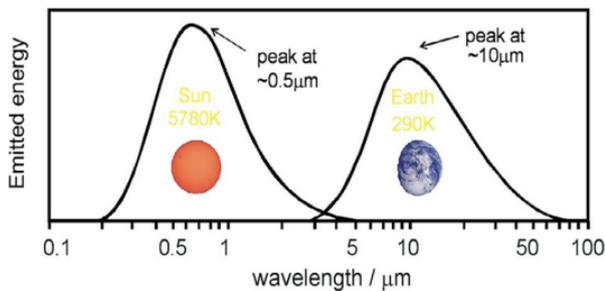


Figure 4. Solar and terrestrial radiative spectrum

However, “human activity” has favored CO2 emissions, causing a climatic imbalance, minimal as it is, but sufficient to cause the melting of the polar ice, the rise in sea level, the retreat of the coastline in many areas. coastal regions, the advancing desert, and climate change in general. Some believe that we must adapt to these climate changes. Conversely, we think it would be more rational for the future of the earth to stop the cause of this scourge in the first place, like the various conferences of the parties of the United Nations COP by limiting CO2 emissions.

3. Greenhouse Effect and Infrared Emission from Earth and Artificial Soils [7]

So far, much has been written about the greenhouse effect linked to GHG emissions. If now we make the analogy with the greenhouse effect used in a solar thermal collector (Figure 5), we observe that the glazing which creates the greenhouse effect opposes IR radiation all the more powerful as the absorbing surface is dark color (black in this case).

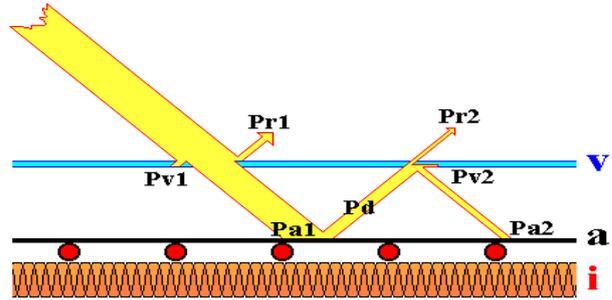


Figure 5. Analogy with the greenhouse effect of a solar thermal collector

So for the earth, all artificial soils (roads, roads, buildings), dark in color will absorb sunlight and re-emit in far IR which does not cross the atmosphere, all the more if this is polluted.



Figure 6. Examples of dark colored roads and buildings participating in the IR emissions to which the GHGs are opaque

Another action which therefore remains to be carried out and to develop the above studies concerns the infrared radiation emission from artificial soils. Here again, if this emission is natural, it can only be beneficial for humanity (maintains an average temperature on earth at +15°C instead of -18°C without natural greenhouse effect). However, by the artificialisation of soils, (paved roads, roads, dark colored buildings, etc.), (Figure 6), terrestrial infrared emissions are closely related to the increase in

the absorption coefficient of solar radiation by the artificial soils and the decrease of the albedo coefficient. This infrared emission parameter not “yet” currently taken into account by the COP has, in our opinion, a responsibility, at least comparable to that of CO₂ emissions, to say the least, because if the IR emissions of the earth increase, but with an atmosphere “healthy” there would be radiative imprisonment and therefore global warming. The efforts to be deployed must therefore be commensurate with the climatic issue in question. Indeed, a soil is naturally light in color, and if it is covered with plants, which absorb less than 1% of the incident solar radiation. Conversely, a black tarmac road absorbs a large amount of solar energy (90%), heats up and reemits in the far infrared which is absorbed by the atmosphere and partially returned to the earth causing the radiative imprisonment popularly called: greenhouse effect.

4. Greenhouse Effect Generated by the Combustion of Fossil Fuels

Apart from GHGs and their interaction with terrestrial (natural and artificial) infrared emissions leading to global warming, another factor of global warming is not addressed in the analyzes of global warming, despite its evidence and its direct impact on the heating of surrounding air, this time it is not the effect of CO₂ which is a product of combustion, but rather the direct effect of combustion (heat given off by the flame) on the heating of the air in direct contact and therefore the increase in atmospheric temperature.

Knowing that approximately 15,000 Mtoe are burned annually, representing a calorific energy calculated by the product of the calorific power by the mass of the fuel, that is: PCI.m.

The oil PCI is 10 kWh / liter with a mass volume of 1161 liter / toe; thus PCI.m = $15 \cdot 10^9 \times 1161 \times 10 = 17415 \cdot 10^{10}$ kWh / year.

This energy risks heating the atmospheric air according to the energy balance:

(PCI.m) petroleum = (m.Cp.DT) air

With mair = $5.14 \cdot 10^{18}$ kg and Cp air = 1000 J / (Kg. °C)

This generates an annual temperature rise of 0.122 °C.

So after ten years (quickly gone!) Global warming would have exceeded 1 °C, which is not nothing, compared to the objective set by the COP 21... 26 to limit global warming at 2 °C per century.

So terrestrial global warming is at fortiori, indirectly caused by the greenhouse effect (due to both GHG emissions and infrared radiation from artificialized soils), combined with direct heating of the air following the heat

released by burning fossil fuels.

This is what has been observed in recent years, and already at the start of 2020, the temperatures measured for example in France exceed 2.5 °C the averages of past decades.

And global warming is almost a vicious circle, because the melting ice of the north and south poles will promote the absorption of solar radiation by reducing albedo and amplifying the natural terrestrial infrared radiation emissions. On the other hand, there would be an increase in GHGs generated by the microorganisms that will take place due to the change in vegetation.

Even renewable energies, used on a very large scale such as the thermal conversion of solar energy can contribute to heat the climate directly and indirectly by the emission of infrared radiation.

The best energy is the one we don't use.

5. Conclusion

To meet the objective of 2°C of global warming per century, it is necessary:

- (1) Take an interest not only in limiting CO₂ emissions worldwide (use of renewable energies), but also in: Limit the commercialization of soils, especially towards dark-colored buildings
- (2) Limit the artificialisation of soils, especially towards dark-colored buildings which absorb solar radiation and emit into the IR, such as roads, buildings, etc.
- (3) Reduce the combustion of fossil fuels that heat atmospheric air and improve the efficiency of energy systems.

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