ISSN: 3029-0724

Research Article

Journal of Environmental Science and Agricultural Research

The Real Cause of Global Warming: Infrared Radiation Emissions

Romdhane Ben Slama

ISSAT, University of Gabes, Tunisia

Corresponding author
Romdhane Ben Slama, ISSAT, University of Gabes, Tunisia.

Received: October 26, 2024; **Accepted:** November 09, 2024; **Published:** November 14, 2024

ABSTRACT

For decades, efforts have been made to limit global warming. A unique action to reduce greenhouse gas emissions is therefore insufficient. Indeed, the other direct but invisible cause, which combines with GHGs, was not taken into consideration during the various previous COPs. These are infrared emissions from the earth and particularly from artificial soils. The analogy is made between the greenhouse effect present in an agricultural greenhouse, a solar thermal collector and the Earth's atmosphere.

Significative Statement: The global warming due to the terrestrial green House Effect is effectively due to the Infrared Radiation emissions of soils of earth. The COP 28 do not indicate this important parameter. Thus, the exit from fossil fuels, carbon neutrality in 2050, and the use of nuclear power will not avoid the growth of global warming if we do not, at the same time, reduce the emissions of infrared radiation emissions from artificialized soils of the earth.

Keywords: Greenhouse Effect, GHGs, Infrared Radiation, Solar Collector, Global Warming, Solar Plant, Deforestation

Highlights

Analogy between the greenhouse effect in a solar collector and the earth. The different greenhouse gases. Deforestation and urban expansion disrupt the ecosystem. Infrared radiation emission from artificial soils.

Introduction

Thermal solar energy experts know this and agree that a solar collector (water or air) heats well because it benefits from the greenhouse effect. This is known long before the appearance of the terrestrial global warming of our time, because of the greenhouse effect [1]. Returning to the solar collector, it is said to be selective because it is transparent to solar radiation and is opaque to the radiation of the black absorber which emits far infrared radiation. This radiation is due to the absorber heating up due to its dark color, usually black. The phenomenon would not exist if the absorber were light in color, white in this case. Thus, whether for a solar collector, the planet earth and its atmosphere, or even an agricultural greenhouse, the phenomenon of the greenhouse effect is the same. A surface sends infrared radiation towards space which is returned to it by the glass which is pierced above in the case of the solar collector, or a polyethylene plastic film in the case of a greenhouse or finally a gas at greenhouse effect (CO_2 and equivalents in the case of planet earth). If for the solar collector and the agricultural greenhouse, the greenhouse effect is beneficial to heat them, we cannot say that for the earth, the greenhouse effect is harmful, on the contrary, since it is necessary like other criteria to form the necessary conditions for life on earth. However, the current global warming of the earth is due to the surplus of the greenhouse effect on earth created therefore by the anthropological greenhouse gases generated by human activity increasingly intense and polluting. On the other hand, the radiation of the earth is intensifying due to the rapid expansion of artificial soils (roads, extension of cities, roads, etc.). Current human action to fight against global warming is concentrated on GHGs (Cf. COP27). by attempting to reduce these emissions, which currently amount to 36,000 million tons of CO_2 equivalent, and this by resorting to renewable energies, eclectic vehicles... We forget the other side: artificial soils and their infrared radiation emissions [2-9].

Citation: Romdhane Ben Slama. The Real Cause of Global Warming: Infrared Radiation Emissions. J Envi Sci Agri Res. 2024. 2(4): 1-6.
DOI: doi.org/10.61440/JESAR.2024.v2.34

The Thermal Solar Collector

There is a similarity between the greenhouse effect currently known by everyone and which causes global warming and the greenhouse effect known by solar energy specialists and which concerns solar thermal collectors. Obviously, the greenhouse effect exists in the heating of agricultural greenhouses and this is where knowledge of the phenomenon began.

Membership

A solar collector consists of an absorber (black), insulation (to reduce heat loss, glazing (to create the greenhouse effect), an exchanger (to transmit heat to the coolant) and a box to encompass the whole thing.

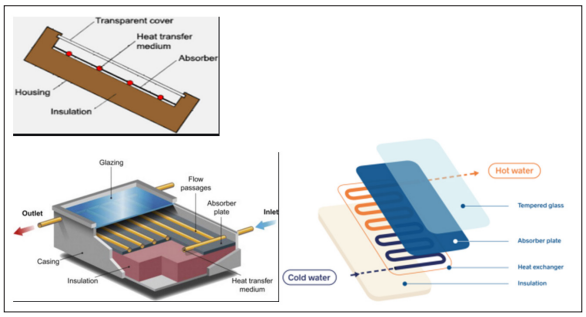


Figure 1: Construction of a double-glazed solar collector. Creation of the greenhouse effect.

For those experienced in the field of solar energy, the greenhouse effect has always been used to allow solar collectors (water or air) to heat well. Indeed, the collector without glazing does not heat too much, it may be used for low temperatures. The glass sensor (single or double) al-lows higher temperatures to be reached. The secret lies in the selectivity of the glazing which allows solar radiation to pass, the spectrum of which ranges from ultra-violet to near infrared [0.25 - 2.5 µm], and on the other hand is op-posed to infrared radiation. Far wavelength that exceeds [4.1 - 41 µm], emitted by the dark surface of the absorber.

The Absorber Color Role in Solar Collector Heating

Experiments have been carried out showing the effect of the color of the absorber on the heating of the coolant.

Which colours of surfaces produce the IR from solar radiation: only dark-colored surfaces, such as roads, pavements, building coatings, vehicle bodies, and even our clothes all these visible surfaces absorb sunlight and convert it into far IR, which is then trapped by greenhouse gases. As for the white or light colours, they absorb only very little solar radiation, and therefore reflecting it and not heat up very little, and consequently their emittance in the IR spectrum, remains low.

Table 1: Coefficient of Albedo According to the Nature of the Surface

Surface	Albedo
Fresh asphalt	0.04
Wom asphalt	0.12
Forest	0.15
Bare soil	0.17
Desert sand	0.40
New concrete	0.55
Ocean ice	0.60
Fresh snow	0.80

On the other hand, it is possible to avoid its absorption by the use of clear and non-dark surfaces. Indeed, the absorption coefficient of solar radiation by a surface depends on its color.

Role of the Glazing

During operation, it is necessary to place a glazing that lets the solar spectrum and which reflects thereafter the infrared emitted by the absorber; moreover black; that is how the far IR is product.

Cons Example: Imagine now if the absorber is white, so it will directly reflect incoming solar radiation which will be possible to pass through the selective glazing; so there will be no heating in the collector!

By analogy, these observations of the phenomenon of the greenhouse effect throughout the solar collector can be extrapolated across the planet earth on receipt of solar radiation and warming by greenhouse gases.

Figure 2 illustrates this phenomenon: solar radiation transmission and reflection of infrared radiation.

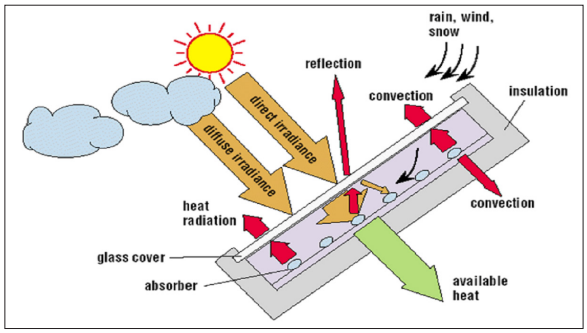


Figure 2: Solar radiation transmission and reflection of infrared radiation.

Analogy Between the two Greenhouse Effects

The imprisonment of the radiation emitted by the receiving surfaces is done by;

- The glazing in the case of the solar collector
- The earth's atmosphere itself in the case of the earth itself unpolluted

As for the radiations emitted, they are a function of the temperatures, approximately 60°C for the solar collector and 15°C for the earth; they are therefore relatively close compared to 6000°C at the surface of the sun.

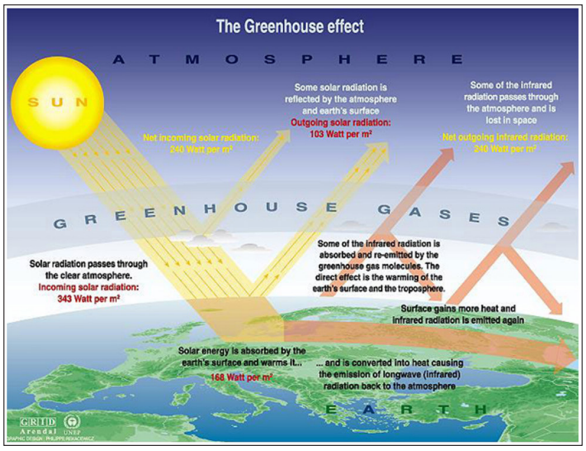


Figure 3: Flow of energy in and out of the earth.

Radiation wavelength and greenhouse effect [9-13].

We tries to answer a **question about the greenhouse effect:** "Greenhouse gases prevent the infrared rays from leaving the Earth's atmosphere, but why do they not prevent additional solar radiation from entering the atmosphere?"

The key is the difference of wavelength or frequency between the solar radiation and infrared radiation. Let's have a look at the greenhouse effect (see also the graph about radiation transmitted by atmosphere below):

1. About 70 to 75% of the solar radiation passes through the atmosphere and reaches the Earth
2. This solar radiation is absorbed on the Earth surface, which warms up the Earth surface.
3. When a body is warmer than its environment, it emits infrared radiation. The is also true for the warmed-up surface of the Earth: The surface of the Earth emits infrared radiation.
4. Because infrared radiation has a different wavelength than solar radiation, its transmission behaviour through the atmosphere is different: 15-30% will be transmitted and 70 to 85% will be reflected back to the Earth. This leads to a further increase of temperature on Earth.

You could summarize this in saying the atmosphere does transmit 70 to 75% of solar radiation but only 15 to 30% of heat radiation.

This effect has always been there, it is not new at all. When the concentration of so-called greenhouse gases (carbon dioxide, Methane, NOx, etc.) is increased, the percentage of infrared radiation which is beeing transmitted through the atmosphere is reduced or in other words: When the concentration of greenhouse gases in the atmosphere is increased, more infrared radiation is reflected back to the Earth by the atmosphere. This leads to an increased temperature of the surface of the Earth. This increased effect due to higher concentration of greenhouse gases is normally called global warming or climate change.

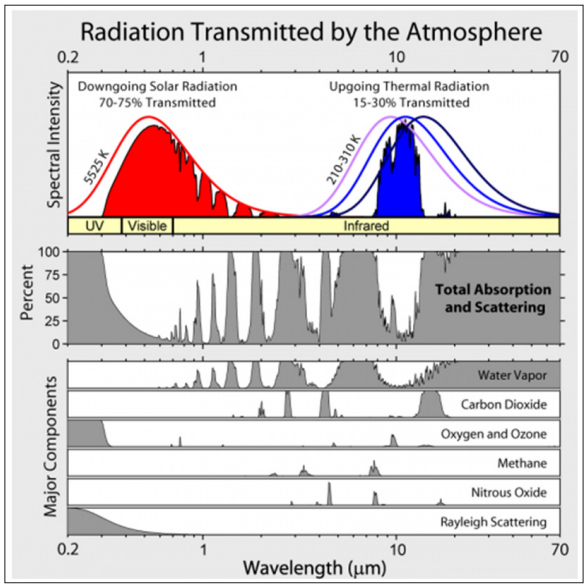


Figure 4: The Black-body emission curves from the sun (T = 5780 K) and the earth (T= 290 K), shows the opera¬tion of Wien's Law. The two graphs are not to scale.

Indeed for the sun, the corresponding average wavelength. λmean is given by:
λmean = 0.5 μm And the spectrum spreads to 0.5. λmean at 5. Λmean That is to say: [0.25 - 2.5 μm),

For the radiation emitted by the absorber assumed to be at 50 °C for example on average, λmean = 8.97 μm And the spectrum spreads to 0.5. λmean to 5. λmean, that is to say: [4.5 - 45 μm], then in IR spectrum.

Artificial Soils of the Earth and Deforestation

The transition from pale natural colors to more or less dark artificial colors means that artificial soils contribute to modifying the albedo coefficient of soils and the capacity to absorb carbon. This concerns roads, cities extension …

Decrease of albedo coefficient → Absorption of the solar radiation → Emission of Infrared radiation → Formation of the greenhouse effect

Figure 5: Artificialization of soils reducing albedo and increasing infrared emissions [9]

Figure 6: Massive deforestation

Forests absorb carbon through their photosynthesis and act as carbon sinks. Deforestation is therefore a negative action and accentuates the concentration of carbon in the air and consequently global warming through the greenhouse effect.

Solar Power Plants

The installation of large-scale solar power plants requires large ground surfaces which changes the landscape. Thus, recourse is made to deforestation, floating power stations, roads, etc.

There is a rise of 3 to 4°C between the solar field and the distant zones of a few hundred meters; this is similar to the phenomenon observed in large cities, known as the island effect.

Is it reasonable to produce solar electricity and then lose it by the Joule effect in the power lines on the one hand and waste it on inefficient devices? It is better to start by investing in energy sobriety. and produce solar electricity for local consumption.

Deforestation

The use of solar power plants for the production of electric current is certainly CO_2-free, but current technology with dark-colored surfaces contributes to the increase in infrared radiation emissions and therefore promotes the greenhouse effect and global warming. climate: a vicious circle, alas!

Apart from that, there is generally deforestation to install these power stations, modification of the albedo coefficient on the ground towards the reduction therefore towards the absorption of solar radiation and warming, finally modification of the landscape.

Figure 7: Deforestation to install solar power plants

Modification of the Ground Albedo

Pale color of land and landscape has a high albedo coefficient, but artificial soils have a low albedo coefficient. This generates an increased absorption of solar radiation and consequently an emission of infrared radiation towards the atmosphere which then sends it back towards the earth and induces the global warming.

Ce qui engendre une absorption accrue du rayonnement solaire et par suite une émission de radiation infrarouge vers l'atmosphère qui le renvoie par la suite vers la terre et induit son réchauffement.

Floating Solar Power Plant

For floating power plants, there is a reduction in the evaporation of water due to a lack of sunshine and a reduction in temperature, thus altering the animal and plant world found there.

Adequate biodiversity studies should be carried out in this context Des études adéquates de biodiversité devraient être menées dans ce contexte.

Recapitulating

Figure 10 recapitulates the effects of the actions of the man on the climatic reheating and this by: 1) the gas emissions for purpose of greenhouse, but also by 2) the atificialision of the grounds which modify their albedo and thus the absorption of the solar radiation and thus their reheating and consequently their infrared emissions qui is a component fondamentale with the GEF to cause the climatic reheating. Finally, one shows modification 3) due to heat released by the combustion of any

type of combustible fossil or renewable. Is it also allowed (finally?) to evoke the absorptive heat of the solar radiation by all surfaces artificialized and become darker (clearly must I say) that what they were naturally.

Figure 8: Modification of the albedo coefficient of soils

Figure 9: Some floating solar power plant

Naturally	One century ago	Clean atmosphere → Terrestrial infrared radiation at 15°C ⇒ Desired greenhouse effect for the life on the earth
Humann Modification1	Effet of combustion product CO_2	Clean atmosphere; GHGs 35.10^9 tCO_2e → Infrared Radiation at 15 °C ⇒ Imbalance. Increase of the Green House Effect ⇒ Global warming 2 to 6
Humann Modification2	Effect of the artificialisation of the floors	Clean atmosphere; Infrared Radiation at 15°C; Radiation from artificialized floors ⇒ Imbalance. Increase of the Green House Effect ⇒ Global Warming ? at ? °C/ century
Human Modifications 1+2	Effect of combustion product CO_2 + artificialisation of the floors	Clean atmosphere; Green House Gazes; Infrared Radiation at 15°C; Radiation from artificialized floors ⇒ Imbalance. Increased greenhouse effect ⇒ Global warming 2 to 6
Humann Modification 3	Heat of combustion Effect 15 000 Mtoe LHV = 10 kWh/ litre	Atmospheric air heated Cpair = 1000 J/kg°C ⇒ Air heating 0.12 °C/year

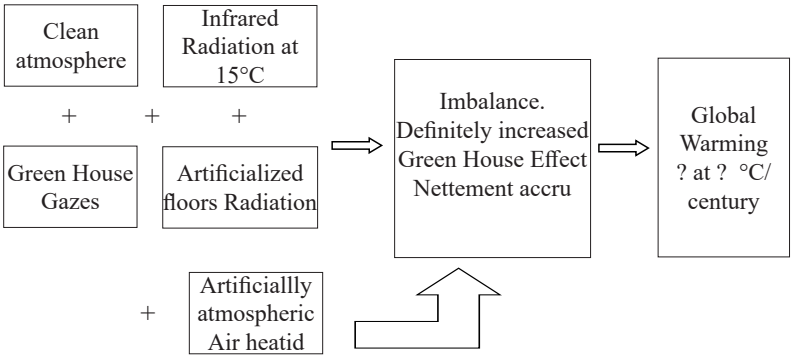
Humann Modification 1+2+3	Effect of combustion product CO_2 + artificialisation of the floors + Heat of combustion	
STOP	GROUND CRAME	BY THE HUMAN ACTION

Figure 10: Recapitulate

Recommendation by way of Conclusion to Reduce the Greenhouse Effect

Reduction of GHG emissions: All the COPs talk about it and agreements go in this direction: energy transition towards renewable energies...

Reduction of IR radiation emissions: the phenomenon is known but there are no concrete actions to study it and actions to try to reduce it.

It would be irrational to want to concentrate to produce a lot of electrical current and then get lost by the Joule effect in the lines of the electrical network. It is better to start by investing in energy sobriety.

Even the use of wind energy for electricity production will not solve global warming because the mixing of the air with the blades causes friction with the air and consequently its heating. The best energy is that which is not used, notion of negawatt and energy sobriety.

Availability Statement

No data or software are used in this paper.

References

1. Bulletin Climatologique de l'été en Tunisie. Institut National de la meteorologie. Sous-Direction de la Climatologie Service Produits climatiques. 2021.
2. Ben Slama R. Green House Effect vs. Infrared Radiation Emissions. Journal of Climatology & Weather Forecasting. 2016. 4: 1.
3. Ben Slama R. L'Effet de serre et les radiations infrarouges des zones urbaines et goudronnées sombres. International Congress on Energetic and Environmental Systems (IEES-2017) Djerba, Tunisia. 2017. 17-19.
4. Ben Slama R. Role of the dark surfaces of cities on the greenhouse effect increase. Int.Conf.on Sustainible development» Ottawa, Ontario Canada. Visioconference. 2017. 9-10.
5. Ben Slama R. Effet de serre vs émissions terrestres de rayonnement infrarouge : l'effet de serre n'est pas dû qu'au dégagement des Gaz à Effet de Serre. Colloque 604. Congres de l'ACFAS 85éme édition, sur le thème : « Regards croisés sur l'adaptation aux changements climatiques dans le transport terrestre : Quelles formes, insuffisances et nouvelles pistes ? » Mercredi; Université McGill, Montréal, Québec, Canada. 2017.
6. Ben Slama R. Impact of the Artificial Surfaces Sunk on the Global Warming by the Absorption of the Solar Radiation and the Albedo Coefficient Modification. Journal of Climatology and Weather Forecasting. 2018. 6: 2.
7. Ben Slama R. Modification of the terrestrial albedo following the absorption of the solar radiation by the dark artificial surfaces and its influence on the greenhouse effect. Physics & Astronomy International Journal. 2018. 2.
8. Ben Slama R. Dual Anthropogenic Origin of Global Warming through GHGs and IR Radiation Emissions from Artificialized Soils. Journal of Atmospheric Science Research. 2021. 4: 36-41.
9. Jancovici, Climate change. 2003.
10. Cliche JF. Des panneaux solaires qui réchauffent le climat, est-ce que ça se peut? 2023.
11. COASTS, The enhanced greenhouse effect (Global warming). 2010.
12. Dufresne, Bilan énergétique de la Terre et rôle de l'effet de serre. 2010.
13. Time for change, Radiation wavelength and greenhouse effect. 2018.